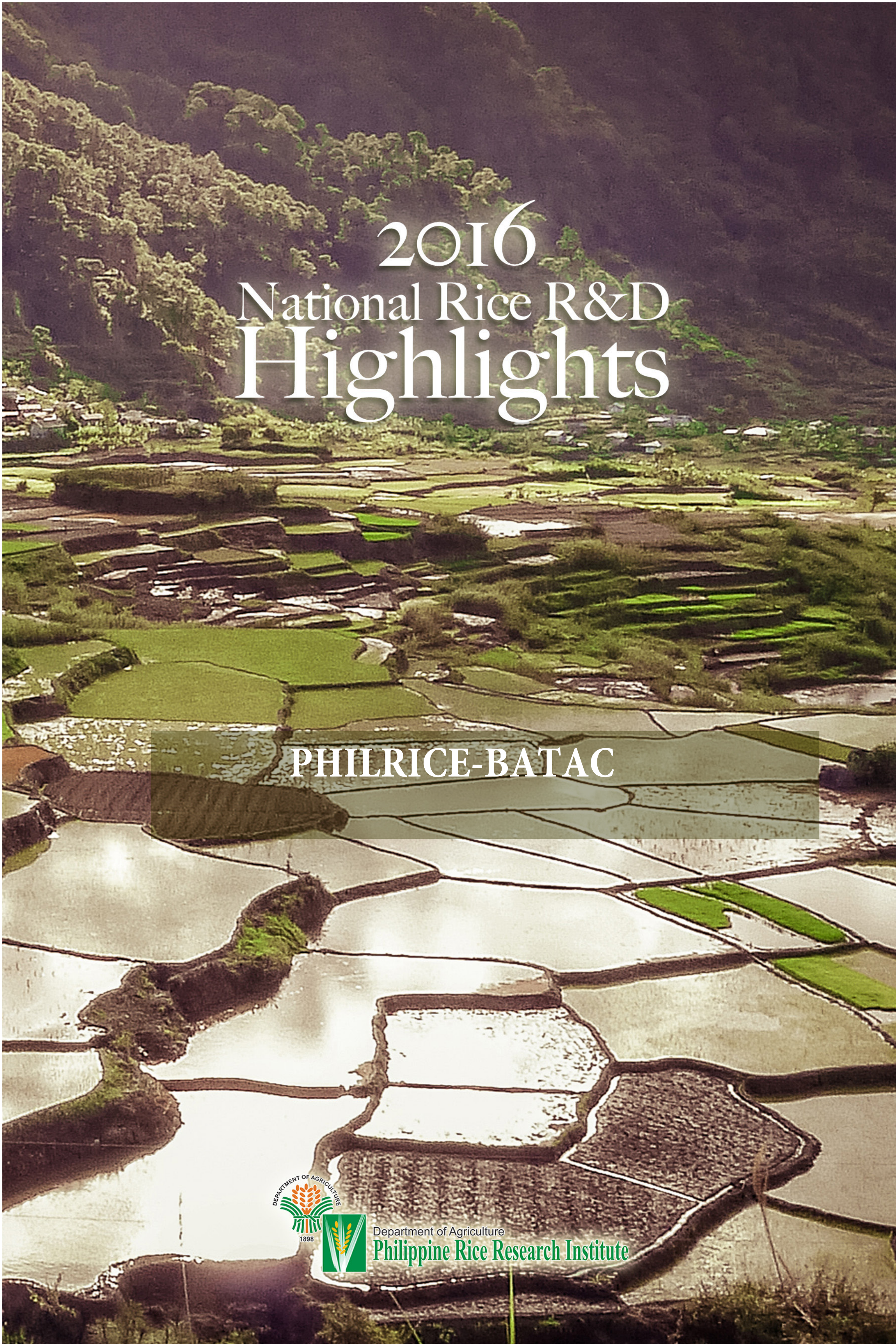
2016 National Rice R&D Highlights

PHILRICE-BATAC



DEPARTMENT OF AGRICULTURE 1898

Department of Agriculture
Philippine Rice Research Institute

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Branch-Based Highlights

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PhilRice Batac

Branch Director – Mary Ann U. Baradi

Executive Summary

PhilRice Batac, for more than a decade now, has been generating and promoting rice and rice-based farming systems technologies in northwest Luzon. Its operation covers the provinces of Ilocos Norte, Ilocos Sur, La Union, Abra and Apayao. Most areas in these provinces, except in Apayao, have distinct climatological pattern of wet for four months and dry for the rest of the year. Hence, rice is only grown in these areas once a year. This prompts the station to concentrate on developing technologies and management options for rainfed and drought-prone environments. Areas of research, therefore, lean toward varieties for stress-prone environments, fertilizer and irrigation management, water harvesting, small-farm mechanization, postproduction management, and farm waste utilization. In addition, Batac has been developing production technologies for dryland crops, particularly vegetables.

It has always been the mission of the station to encompass interventions in all endeavors within the farm to have a holistic impact in improving the welfare of rice-based farming households. Early on, Batac has recognized that focusing only on the rice component of the farm will result to incomplete and unbalanced technology advancement of the majority of northwest Luzon farmers.

Partnership with entities engaged in agriculture, including local government units, the academe, regional offices, and the private sector, has been maintained and strengthened by collaboration in on-farm endeavors. Membership to regional committees and consortia allows consultation and sharing of technologies and information.

The R&D activities of PhilRice Batac are concentrated on adaptive research and proactive technology promotion. This 2016, the development sector of the station has 6 core-, 1 program- and 8 externally-funded projects and activities; one of which is by KOPIA. Its research sector is conducting 8 division-, 3 program- and 3 externally-funded studies. Several of these researches are unique and have been conceptualized by station researchers based on deemed needs of local farmers.

A. Development

I. Clean, Green, Practical and Smart On-Farm Learning Center (BIN-032-000)

Project Leader: JMSantiago

A 0.5-hectare learning farm is being maintained at the station to showcase and package appropriate technology interventions most useful for the capacity enhancement of station trainees and for briefing of touring and walk-in visitors. The farm includes relay rice planting, rice-based cropping pattern, dry direct seeded rice, and off-season vegetable technologies. In addition, the Palayabangan challenge is undertaken during the wet season, participated by a number of competing and non-competing entities. Programmed training courses are likewise provided to farmers, students, and station staff wherein the Learning Farm is used for the main venue of their hands-on learning sessions.

Learning Farm

JMSantiago, R SibucaoJr, SVBriones, BMCatudan, and MAUBaradi

Activities:

- The concurrent six stages rice relay setup has been implemented in the station since 2014. It was established and maintained following the technologies of the PalayCheck System, specific to the station's conditions. Each plot was 185 m^2. Owing to limited water in the station from January to August, the 21 days planting interval was stretched from 23 to 34 in some instances and shortened to 14 days thereafter to catch up for the 16 relay schedules for the entire year. The technology package of the 2015 WS Palayabangan entry with the highest yield was used in 2016. Fine-tuning of the fertilizer requirement, however, was made based on MOET results and LCC reading since the hybrid variety used in the Palayabangan setup was replaced with NSIC Rc302. The inbred variety, however, showed susceptibility to brown spot and was in turn replaced with NSIC Rc352 which showed outstanding yield performance at the station in 2015 WS.

- As of November, 14 of the 16 planting schedules were implemented. The remaining two planting schedules are targeted to be established until the end of the year.

- A plot (90m^2) was included in the learning farm during the regular wet season planting schedule in the station to showcase the technology package of Mestizo 19, which attained the highest yield during the station's 2015 WS Palayabangan challenge.

- A 775 m^2 plot to showcase a rice-tomato/corn-mungbean cropping pattern was started in 2015WS. After the WS rice, the tomato and corn relay was not established because of limited water source in the station owing to the occurrence of El Niño. Mungbean, however, was planted in late February.

- The 1.5m x 41m with 1m depth tilapia pond refuge along one side of the rice relay setup was reconstructed and stocked with 80 fingerlings.

- An idle field was maintained to serve as a practicum field for trainees on farm machine operation. Its size, however, was reduced from 980m^2 to 400 m^2 to accommodate the wet season MOET App demo setup.

- A 425 m^2 GulayCheck setup was established and maintained year-round to showcase the TCP3 package of technologies for vegetables. The establishment of ridge gourd, tomato, bitter gourd and eggplant was scheduled to enable showcasing simultaneously four growth stages (seedling, vegetative, flowering and fruiting) of the vegetables.

- A showcase of snake gourd (uleg a paria) using various soil media was added at the GulayCheck Farm.

- Fruit trees and medicinal plants were maintained in vacant spaces around the learning farm.

Results:

- The rice relay setup served as hands-on field of trainees for seedbed preparation, land preparation, seedling pulling and transplanting, fertilizer application, AESA, agronomic data gathering, manual and mechanical harvesting, and threshing (Figure 1).

- The yield of NSIC Rc302 in the relay plots planted from January to March were very low (0.5 to 1.35t/ha) owing to limited water caused by the occurrence of El Niño and the consequent damage from brown spot, rice bug and birds. The replacement variety (NSIC Rc352).

- Mestizo 19 is still at its milk grain stage.

- The mungbean in the rice-based cropping pattern plot produced 1.78t/ha yield. By June, the plot was prepared and Rc348 was sown for the establishment of WS rice.

- The wet season direct-seeded rice was established using MDDST and the IRRI multi-purpose seeder. The variety usedn was NSIC Rc348.

- With the delayed moonsoon rains, the establishment of direct-seeded rice was late in the season. Hence, relay planting of tomato and corn after rice was not followed. To circumvent the potential problem in marketing if the tomato was planted during the peak season, instead, half of the area was planted with honey white corn and the other half with tomato, squash, bush sitao, eggplant and finger pepper.

- After typhoon Lawin, rainfall became abnormally limited, hence, the tilapia in the pond refuge will be transferred to the SFR of the station by December.

- The practicum field was used by 58 trainees from three training courses as hands-on field in operating 4-wheel and hand tractors.

- In the GulayCheck plots, student trainees had hands-on experience in raising seedlings, transplanting and harvesting.

- Existing fruit trees within the learning farm were maintained, and 12 calamansi and 5 katuray seedlings were added. Medicinal plants were established between the vegetable plots and fruit trees.

Figure 1. Learning farm, PhilRice-Batac.

Palayabangan
LGInocencio and LMdCTapec

Activities:

- In its 4th year of implementation, private companies and progressive farmers were invited to participate in the Palayabangan challenge of the station this 2016WS. A briefing was conducted before the start of the season.

- The activities implemented by each entry in the field were monitored.

- All material and labor costs of each of the participants were properly monitored and recorded.

Results:

- Three competing entries from private companies (Bayer Crop Science, Jardine Distribution and SL Agritech) and three non-competing entry from the station registered for the 2016WS Palayabangan challenge.

- The briefing of participants on the mechanics and guidelines of

Palayabangan challenge was conducted on June 8.

- Each activity implemented by the entries were monitored. The material and labor inputs used and the technologies followed by each participant were properly documented.

- One of the non-competing entries of PhilRice Batac attained the highest yield (5.92t/ha). Yield loss occurred among all entries owing to the damage caused by typhoon Lawin at grain filling stage (Table 1).

Table 1. Yield performance of participants, Palayabangan 10-5 Challenge, PhilRice-Batac, 2016 WS.

Entry Category	Name of Participant	Variety	Sowing Date	Area (m^2)	Yield (kg/ha)
C	Bayer Crop Science	Bigante plus	July 1	1,926	3,865
C	SL-Agritech	SL 12	June 30	2,163	5,531
C	Jardine Distribution Inc.	TH82	July 4	2,137	3,005
NC	PhilRice Batac 1	NSIC Rc352	July 1	1,869	5,929
NC	PhilRice Batac 2	PSB Rc82	July 11	1,926	4,947
NC	PhilRice Batac 3	NSIC Rc358	June 29	1,600	4,878

C - competing
NC - non-competing

Customized Training

JMSantiago and RISibucaoJr

Activities:

- The Clean, Green, Practical and Smart Training Course on PalayCheck and Palayamanan Plus was conducted during summer. The course intends to enhance the experience of fresh graduates on how farm activities and operations are implemented. The Learning Farm setups served as the hands-on training venue of the students.

- Month-long on-the-job training programs were provided to MMSU and BNATS students. Both schools are regular clients of the station.

- The Appreciation Course on PalayCheck and Palayamanan Plus for PhiRice Staff was conducted to equip the technical and non-technical staff on rice and rice-based production technologies.

- The experiential learning for PhilRice Batac Trainers was re-scheduled from November to December due to conflict of activities among the participants.

Results:

- The Clean GPS training course was participated by 38 new graduates in agriculture from four SUCs in Ilocos Norte, Ilocos Sur, La Union and Abra (Table 2). The course lasted for 10 days. The written diagnostic tests covering practical and theoretical concepts showed that the trainees gained knowledge by 21% after the training course (Table 2).

- The OJT students from MMSU and BNATS were trained on the production technologies of the PalayCheck system, vegetables, and oyster mushroom. Additional training topics include extension strategies and facilitation skills, and rice straw composting for the MMSU students. BNATS students likewise learned the Palayamanan concept and asexual propagation.

- The Appreciation Course was participated by 22 PhilRice staff. Aside from the PalayCheck and Palayamanan Plus concepts, topics included mind-setting, values orientation, germination testing principles and procedures, inbred seed production practices, proper handling of pesticides, farm machinery operation and maintenance and organic farming. The evaluation examination to measure increase in knowledge and skills of the participants will be given on December 2.

Table 2. Costumized training courses conducted, PhilRice-Batac, January to November, 2016.

Course	Trainees	School	No. of Trainees	Period Covered
On-the-Job Training	Agriculture students major in Extension	MMSU	15	Jan 4 – Feb 15
	K-12 students	BNATS	5	Feb 16 – Mar 16
Clean GPS Training Course on *PalayCheck* and *Palayamanan* Plus	new graduates of agriculture and related sciences	ASIST ISPSC DMMMSU MMSU	38	May 10-20
Appreciation Course on PalayCheck and Palayamanan for PhilRice Staff	Technical and non-technical PhilRice Batac Staff		22	July 22-Nov 25

ASIST – Abra State Institute of Science and Technology
BNATS – Bukig National Agricultural and Technical School
ISPSC – Ilocos Sur Polytechnic State College
DMMMSU – Don Mariano Marcos Memorial State University
MMSU – Mariano Marcos State University

II. One-Stop Shop for Technology Information and Promotion of Rice and Rice-based Knowledge Products (BIN-033-000)

Project Leader: MBAlupay

This support service aims to responsively and holistically provide stakeholders information and production technologies generated by PhilRice and other research institutions working on rice. It likewise intends to quickly respond to technical assistance requested by partners and stakeholders.

Rice Science Museum and Library of PhilRice Batac

MBAlupay

Activities:

- The museum and the library of the station are being maintained and their contents regularly updated (Figure 2).

Results:

- Paintings of the parts of a palay seed and growth stages of the rice plant were commissioned to improve the Rice Science section of the museum. A new welcome signage was likewise installed at the entrance of the museum.

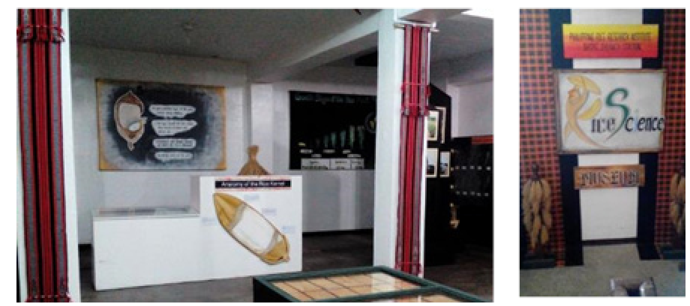
- The accession catalogue of the Rice Science Museum was finalized and continuously being updated of new cultural material collections. Seven items of five cultural materials were added, including 2 tanguyob, 1 salakut, 1 suyod, 2 kuribot, and 1 large labba.

- The Rice Science Museum was viewed by not less than 600 logged visitors (5 KOICA 250 MMSU students, 48 Albay stakeholders, 60 touring Pangasinan farmers and LGU officials, 58 boot campers, 40 OJT students, 57 farmers and LGU officials Bacnotan in La Union, 67 students from the City of Batac National High School, 38 teachers of Pagudpud, Ilocos Norte, 50 walk-in farmers and other visitors).

- The INFOLIB was updated by adding 28 new books that were turned over by PhilRice CES Library.

- The station participated in the launching of the Balligi ni Mannalon exhibit at Balay Dingras, an initiative of the Ilocos Norte Provincial Tourism Office and the municipal LGU, which was attended by 266 visitors from various sectors (Figure 3). As a result of this collaboration, the provincial tourism office asked PhilRice for to submit to the governor a proposal to further develop the Balay Dingras, making it an experiential museum, and to include the establishment of a rice garden.

Visitors of the Rice Science Museum learn more about rice



Paintings of the Parts of the Rice Seed and Growth Stages of the Rice Plant added to the Rice Science section, and welcome signage of the Rice Science Museum

Figure 2. PhilRice-Batac Rice Science Museum.

Figure 3. Launching of the Balligi ni Mannalon exhibit at Balay Dingras, Dingras, Ilocos Norte.

Database Management of R&D Outputs of the Station
LMdCTapec and BMCatudan

Activities:

- The PhilRice Batac Information System (PBIS) serves as single repository of R&D documents. The Adobe Lightroom software is used as the database for official photos of the station.
- The contents of the two database systems are regularly updated and databases for documents which are deemed relevant are periodically added in the PBIS.

Results:

- Databases for list of station staff, station memos and research protocols were commissioned to be added in the PBIS. The last two databases were already added in the PBIS by the commissioned system developer.
- Hardcopy 153 of station memos from 2005-2015 were consolidated, converted to PDF format, and uploaded and tagged in the PBIS.
- Over 5000 additional official photos were consolidated, and uploaded and tagged in the photo database.
- Consolidation research protocols from previous years was already started.
- Glitches in the database were corrected.

Reproduction and Distribution of IEC Materials and Publications
MBAlupay, LMdCTapec, and BMCatudan

Activities:

- Location-specific technologies developed by the station are packaged into techno-bulletins and some IEC materials from CES as translated into the Iluko dialect.
- IEC materials from CES were distributed to various entities.
- Some SUC libraries were furnished with IEC materials, books and other publications.

Results:

- The techno-bulletin for localized Rice Production for Saline Areas in Iluko dialect was finalized and an initial 50 copies of the technology bulletin was printed. The budget for printing 500 copies each for the Iluko and English version was approved by DA-RFO1 but the budget was not yet released. The provisions were for the RFO's technical working group to critique and revise the technology bulletin, and for the names of involved parties to be added in the printed IEC material.
- The technology bulletin for oyster mushroom and LDIS, both in Iluko dialect, had been laid out in camera-ready format and ready for reproduction.
- The leaflet on seed sowing in Iluko had been developed with 500 copies printed and being distributed to farmers visiting the station to buy quality seeds.
- IEC materials (fliers, bulletins/publications and posters) were distributed to 29 LGUs and FITS centers in Ilocos Norte, Ilocos Sur, La Union and Apayao. Walk-in clients (farmers, AEWs and teachers) were likewise provided IEC materials of interest.
- To support the massive campaign to promote the PhilRice Text

Center, the Tagalog leaflet was translated into the Iluko dialect and 10,000 copies were printed; 1,000 copies each was distributed to the Provincial Agriculture Offices of Ilocos Norte, Sur, La Union, Abra and Apayao.

- The libraries of DMMMSU and ASIST were furnished with 68 copies IEC materials, books and publications. A written agreement was forged with the libraries indicating that the books are in the form of deposit by PhilRice to the university's library.

Briefings cum On-station Technology Tour of Walk-in and Arranged Visits of Clients

MBAlupay, JMSantiago, and RISibucao Jr

Activities:

- A briefing on the services of the station and the Institute and a tour around the station's R&D setups were conducting to visiting clients and trainees.

Results:

- A total of 595 visiting farmers, students and other stakeholders were briefed on the services of the station and the Institute, and toured to the station's R&D setups. This included 20 Lubong-Kabayugan Sanjera Farmers of Sarrat, Ilocos Norte; 5 KOICA staff; 60 farmers and LGU staff from Binalonan, Pangasinan; 48 farmers and LGU staff from Albay, Camarines Sur; and 250 1st year BS Agriculture students of MMSU; 57 farmers from Bacnotan, La Union; and 38 teachers from Pagudpud, Ilocos Norte and 67 students from City of Batac National High School, Payao Campus, and 50 walk-in farmers and other visitors. Another 2 groups of teachers (Pasuquin and Banna) are scheduled to be briefed on the services of the station on December 1 and 2).

- Students who had undergone OJT training in the station were likewise briefed on the services being provided by the station and toured to the station's R&D setups and facilities at the onset of their training programs.

Exhibits

Activities:

- The station set up exhibits, featuring the rice technologies developed and services provided by PhilRice, during festivals of requesting LGUs.

Results:

- Exhibits were put up at the Abrenian Kawayan on Festival in Bangued, Abra on March 6 to 10 and the Farmer's Festival of the City of Batac May 1 to 7. In addition, a rice production briefing, attended by 48 farmers and other stakeholders, was conducted at the Abrenian Kawayan Festival.

Responsive Training

MBAlupay, JMSantiago, and RISibucao Jr

Activities:

- The station responded to training requests by various sectors.

Results:

- The station catered to requests of MMSU for on-the job-training of its students from various areas of specialization. This year, five batches of OJTs were accommodated by the station (Table 3).

- Requests for training on oyster mushroom production were provided to 121 participants: 4 from San Ildefonso, Ilocos Sur and Bacarra, Ilocos Norte; 115 4Ps members from Macatcatud, San Clemente and San Lucas, Magsingal, Ilocos Sur; and 2 aspiring entrepreneurs from Laoag City.

- The National Irrigation Administration requested their IAs to be trained on the PalayCheck System. The 2-day training is scheduled to be conducted on December 6 to 9 in 2 batches with 112 participants.

Table 3. Responsive on-the-job training hosted by PhilRice-Batac 2016.

Course	Duration	Skills Developed
BS Agriculture major in Agricultural Extension (21)	35 days/batch (4 batches)	• Crop production (rice and vegetables) • Extension and training of farmers
BS Development Communication (5)	14 days	• Development of IEC materials • Conceptualizing and setting up production technology exhibits

Radio Broadcast

Activities:

- PhilRice Batac has been airing a radio program "PhilRice Hour", covering June to September and targeting rice farmers as listeners, is being implemented by the station. It consists of 14 episodes, aired at DZRL Batac every Wednesday at 5:30 to 6:00PM. The 30-minute airtime covers the following segments: news bits about PhilRice, topic-of-the-day with expert's discussion, promotion of the services of the PhilRice Text Center; and Q&A portion. Be Riceponsible plugs were aired in-between segments.

- Broadcast releases were written for radio stations in Ilocos Norte.

Results:

- The topics concerning the rice industry covered by the radio program are shown in Table 4.

- The topic-of-the-day included a recorded interview of subject matter specialists from the station and progressive farmers in the locality. In the 4th episode, the success story of a farmer who adopted the dry direct seeding technology was featured. After attending the season-long PalayCheck training which included the dry-direct seeding technology, he adopted the technology for 2 season. He recently he acquired his own drum-seeder and plans to add a furrower attachment to increase labor efficiency. He now shares the technology to other farmers in his locality.

- Twelve rice production technology press releases and development news stories were disseminated through the Provincial Media Office of Ilocos Norte for distribution to various radio stations in the province.

- Two broadcast interviews on Climate Change was facilitated by PhilRice Batac for the School on the Air on Garlic Production, a joint activity of MMSU, ATI and LGUs.

Table 4. Topics covered by the radio program, PhilRice-Batac, 2016.

Table 4. Topics covered by the radio program, PhilRice Batac, 2016.

Date	Topics
Jun 15	• PhilRice services, products and programs; interview with Dr. Mary Ann U. Baradi, Acting Director 1 • The importance of using quality seeds and the different varieties for different ecosystems, with Silvestre V. Briones, Science Research Specialist 1
Jun 22	• Rice industry situation; interview with Bethzaida M. Catudan, R&D Coordinator • A well-prepared field is one of the secrets for higher yield in rice production • Direct seeding technology: solution to the problem of water scarcity
Jun 27	• Climate change and what can we do to mitigate its effects, particularly on farming; interview with Johnny Maloom, SrSRS
Jul 6	• Interview with RTM farmer Sosimo Aspiras on his experience and learnings from practicing the dry direct seeding technology • Discussion of the dry direct seeding technology, particularly on production cost of savings • Tips on being Riceponsible
Jul 13	• Importance of knowing the available and limiting nutrients in the field and the tools (Nutrient Management, MOET, Nutrient Manager, LCC) available; interview with Silvestre V. Briones, SRS1
Jul 21	• Measures implemented by LGU Batac to help farmers mitigate the effects of lack/no rain, interview with Merryline Gappi, City Agriculturist • Methods of crop establishment; interview and discussion with Benjamin Pajarillo Jr., Agriculturist 2 • Be Riceponsible campaign update on activities being implemented by the station
Jul 27	• Continuation of the nutrient management topic, particularly on basal and topdress fertilizer application; discussion/interview with Benjamin Pajarillo Jr., Agriculturist 2 • Answers **to the following questions asked by farmer listeners**: (1) Is application of fertilizer at 10, 21 and 41 DAT correct? (2) Does the rice plant need water all the time to grow healthy and produce high yield? (3) How to diagnose/know if the rice plant was affected with disease or has nutrient deficiency? (4) What is zinc deficiency?
Aug 3	• Water management; interview with Engr. Noel D. Ganotisi, SrSRS • How to maintain quality seeds and how to become a seed grower; interview with Alma Ribac, BPI NSQCS
Aug 23	• Announcement of the new Executive Director of PhilRice • Convergence project of ATI and other agencies at Nueva Era, Ilocos Norte • How PhilRice does its development and extension activities to reach farmers and extension workers; interview with Bethzaida Catudan, R&D Coordinator • Be Riceponsible campaign of PhilRice in schools
Sep 7	• Pest Management
Sep 14	• Harvest Management

Experts Dispatch
Station R&D staff

Activities:

- The station responded to requests for technical assistance by various sectors.

Results:

- Station technical experts were dispatch to nine requests made by various partners (Table 5).

Table 5. Techincal experts dispatched by PhilRice-Batac, 2016.

Table 5. Technical expert dispatch of PhilRice Batac, 2016.

Requesting Party	Date	Assistance Provided	Results
Farmer-entrepreneur from Banna, Ilocos Norte	Jun 24	• Demonstration of wet direct seeding technology using the drumseeder	• The stand of the crop was comparable to transplanted rice, with savings on labor in seed sowing, seedling management, hand pulling and transplanting
LGU Lidlidda, Ilocos Sur	May 25	• Ocular visit to assess the suitability of pilot testing a solar-wind pump system	• Only a solar pump system is suitable in the area
Bongga Pump IAs in Ilocos Norte	Series of dates	• Sharing of rice production technologies	• Attended by 300 farmers
Farmer from Paoay, Ilocos Norte	Jul 25	• Demonstration on wet direct seeding using the drumseeder	• Farmer bought his own drumseeder after confirming huge savings in labor
Seed growers from Ilocos Norte (3 batches) and CAR (1 batch)	Aug 17-18; Sep 5-9	• Lectures on varieties, cultural management during the different growth stages of the rice plant, harvest and postharvest technologies during the basic training course on inbred rice seed production	• In Ilocos Norte 65 participants • CAR 17 participants
Farmer from Solsona, Ilocos Norte	Aug 16,	• Assessment of low-germination seeds bought from PhilRice	• Improper pre-sowing practice of the farmer who incubated the seeds for 24 hours in open field, covered with wet and partially decomposed rice straw; the farmer was briefed on the proper way to soak and incubate seeds; a flyer on the topic was produced by the station
LGU San Juan, Ilocos Sur	Aug 5	• Assessment of disease damage in the rice techno demo at barangay Sabangan	• Advised the LGU to instruct their farmer-partner to weed the field, apply the required fertilizer based from LCC reading, and irrigate the field as the rice plants had developed new and disease-free leaves

III. Agromet-Batac (BIN-035-000)
Project Leader: JMMaloom

Weather data are a necessity in interpreting outcomes of research and development setups in the station. Hence, a database of weather variables is being maintained by PhilRice Batac to serve as a common source for researchers. Data come from Field Monitoring System (FMON) at the branch station, PAGASA stations in Laoag and Sinait, and Agromet stations in MMSU, Carasi, Solsona, Pagudpud, Banna and Nueva Era.

Activities:

- Daily weather data were obtained from Laoag and Sinait PAGASA stations, and MMSU Agromet station.

- Daily weather data of PhilRice Batac FMON and Automatic Weather Station (AWS) of MMSU, Carasi, Solsona, Pagudpud, Banna and Nueva Era were downloaded from FMON website.

- The weather sensors of FMON in the station were periodically monitored if they are functioning properly.

Results:

- For 2016, weather data from PAGASA stations (Laoag City, Ilocos Norte and Sinait, Ilocos Sur) and MMSU Agromet station from January 1980 to present were obtained. Weather data from the different AWS in Ilocos Norte (MMSU, Carasi, Solsona, Pagudpud, Banna and Nueva Era) covered from January 2016 to June 2016 were likewise obtained.

- The gathered weather data were saved in the Network Attached Storage (NAS) for future reference and analysis.

- The sensors of the FMON in the station were cleaned and serviced every month to ensure the quality and continuous transfer of data to the server.

IV. PhilRice Batac Intensified Rice-Based Agri-Bio Systems (BIN-036-000)

Poject Leader: MAUBaradi

The Intensified Rice-based Agri-bio System (IRBAS) aims to develop sustainable, ecological efficient, and socially acceptable technology-based enterprise models for small farms. It advocates an integrated operation within the farm through diversification, value-adding and farm waste utilization, thus consequently maximizing profits of the farming household. The IRBAS Project at PhilRice Batac includes four components, namely: rice and other crops cropping system, oyster mushroom production, vermicomposting, and cattle fattening (Figure 4). These components constitute the station's IRBAS model which is being verified for viability before its eventual transfer or promotion to communities or farmers.

Rice-based Cropping System

LGInocencio

Activities:

- The rice – white corn + watermelon + sweet potato cropping pattern is being fine-tuned as a component of the IRBAS model being developed in the station. The dry season crops were grown during the first semester. The wet season rice crop was established on the 4th week of July using NSIC Rc352 and harvested on 1st week of November.

Results:

- Four staggered planting schedules of dry season white corn, after wet season rice, commenced in December 2015 in 11,500m2. From the last week of February to middle of April, 4035 ears of green corn were harvested. To add value to the product, 91% of the green corn harvested were sold in boiled form to take advantage of the PhP2.66 price difference from the PhP3.00 unit price of fresh ears. Corn ears that passed green stage were left to mature and produced 1572kg of grain, sold at PhP23.15/kg.

- Watermelon was planted after rice in three staggered schedules, occupying 1500m^2. Harvested fruits weighed 1511kg and disposed at PhP15 to 20/kg.

- Sweet potato was planted after rice in 700m2 area, producing 305kg tubers which were sold at PhP15/kg.

- Gross income from the three dry season crops amounted to PhP88,712, incurring PhP45,295 production cost.

- The watermelon plots served as hands-on training fields for BS Agriculture students from MMSU and K-12 students from BNATS who underwent OJT in the station.

- The wet season rice (NSIC Rc352) was established on the 4th week of July and harvested on 1st week of November. From the 16,804m2 area, 6.1 mt/ha yield was attained. At PhP19.00/kg, the produce was valued at PhP195,130.

- Gross income from the three dry season crops and wet season rice amounted to PhP283,833, incurring PhP116,804 production cost.

Oyster Mushroom Production

FCDiza

Activities:

- A setup of oyster mushroom established in late 2015 spilled over to early part this year. It was maintained until it ceased to be productive. Two cycles (1000 and 833 fruiting bags, respectively) were established this 2016, the productive cycle of the 2nd batch has not yet been completed.

- Harvesting was done daily. A portion of the harvest was sundried to prolong shelf-life and to add value to the product. The oyster mushroom converts from 5kg fresh to 1kg dry. The products were turned over to BDD for disposal.

- Rice straw and sawdust were used as substrates. Collection of substrates and production of fruiting bags were done before the production cycle of the current setup ended.

- Pure oyster mushroom spawn was cultured to supply the requirements of grain spawn production. The grain spawn produced caters to the needs of the station IRBAS setups and clients.

- A pasteurization facility was constructed.

- The technology developed for oyster mushroom production was extend to interested parties from various sectors.

Results:

- From the 1st cycle, 241kg of fresh mushroom was harvested. Fresh mushroom was sold at PhP150/kg, disposed in 200g packaging; dried mushroom was sold at PhP1000/kg, packaged in 100g packets.

- A total of 57 bottles of pure culture, and 23 square-bottomed and 73 round-bottomed bottles of grain spawn were produced. Walk-in small-scale oyster mushroom growers bought 47 bottles of the grain spawn at PhP60 and PhP100 each for round-bottomed and square-bottomed bottles, respectively.

- After the construction of the pasteurization facility was completed, its performance was tested for load optimization. The tests showed that there was no difference in the colonization of the spawn at 30, 60, 90 and 120 fruiting bags pasteurization loads.

- Training on oyster mushroom production was provided to three batches of OJT students from MMSU, PhilRice Staff, farmers from Ilocos Norte and Ilocos Sur, 4Ps recipients from three barangays of Magsingal in Ilocos Sur, and SUC bootcampers.

- A group of students from the Batac National High School (Poblacion Campus) were assisted in conducting their investigatory project entitled Sensory Evaluation of Oyster Mushroom (Pleurotus florida) on Different Substrates.

Vermicomposting
LGInocencio

Activities:

- Vermicompost was produced from the 12-bin facility of the station. Rice straw and buffalo manure were used as substrates. These were mixed in 7:3 ratio and pre-decomposed in piles for 3 months before they were placed in the vermi-bins. Vermicomposting took 6 weeks.

- When a production cycle ended, the vermicompost was separated from vermi-worms and sieved to separate partially decomposed substrates. The processed vermicompost was packed in 50kg sacks and turned over to the station BDD for disposal.

- To test the presence of dormant seeds in the vermicompost, a simple experiment was conducted. Samples were obtained each from vermicompost covered with rice straw and corn stalk during composting. The vermicompost samples for the simple seed mixture test were watered regularly and observed for any germinating seeds.

- The biomass conversion of 70% rice straw and 30% carabao manure substrate combination in dry form, and 60% corncob 40% carabao manure substrate combination was determined to enable projection of the amount of vermicompost that can be produced from a given volume of substrates.

Results:

- From January to November, 7837kg of vermicompost was produced, valued at PhP39,185.

- The population of the vermi-worms in the facility drastically decreased owing to typhoon Lawin damage.

- The test for presence of dormant seeds in the vermicompost showed no seed contamination on the vermicompost covered with the two types of farm wastes.

- The small investigatory setup showed that at 7:3 rice straw and carabao manure substrate, 100kg of dry substrate mixture produced 71 kg of vermicompost. This was lower with 6:4 combination of corncobs and carabao manure.

Cattle Fattening
LGInocencio and FCDiza

Activities:

- Three heads of cattle, procured in 2015, were maintained for fattening. Their weight gain was monitored every quarter by using the body length and heart girth method.

- The cattle were tethered to graze on grass in untilled lots within the station. To have steady source of cut-and-carry roughage, the existing plots of 40m^2 setaria and 500m2 Napier grass were maintained. Likewise, a 600m^2 plot was planted with sweet sorghum. These three roughages were alternately fed to the animals when they are kept in their shed.

- Urea Molasses Mineral Block (UMMB) was produced to serve as food supplement of the cattle.

Results:

- From January to November, each cattle gained an average of 81kg.
- Daily roughage consumption of each cattle was 10 to 20kg.
- The 24 pieces of 2-kg UMMB produced was given to the cattle, each consuming approximately 100 to 200g daily.

Figure 4. Components of the PhilRice Batac IRBAS model under validation, 2016.

Figure 4. Components of the PhilRice-Batac IRBAs model under validation, 2016.

V. PalaYamaNayon the Rural Transformation Movement (BIN-037-000)

LMdCTapec, JMSantiago, R SibucaoJr, BMCatudan, and MAUBaradi

The Rural Transformation Movement (RTM) is an initiative that mobilizes various expertise, organizations, and resources to rally and catalyze rural transformation with PhilRice as the lead agency. The movement's goal is to improve farmers' economic as well as social and environmental well-being. Unlike the conventional agricultural development programs, this campaign is behavioral change driven rather than a mere technology transfer. The campaign specifically aims to enhance farmers' perceptions, attitudes, practices, and life chances with rice-based agriculture as a driver for inclusive and sustainable growth in rural farming communities. Barangay Nagbacalan is the RTM pilot site in Batac. The barangay has seven sitios delineated by hilly terrain. Few agricultural programs reach the barangay. Before project intervention, there was no active farmers' group operating in the area.

Activities:

- The results of the community profiling and survey of 18 participating farmers in 2015 was written to serve as a future reference when assessing the impact of the project.
- The results of needs assessment of the farmer group conducted in December 2015 was consolidated and served as a basis in planning for the interventions to be implemented this 2016.
- The 64 farmer participants of the RTM pilot site were organized into an association. With the assistance of experts from the College of Business, Economics and Accountancy of MMSU, the group's constitution and by-laws was crafted.
- A community planning of the activities to be undertaken for the year was conducted with RTM staff from CES.
- An FB page was created to serve as a campaign media tool for the local RTM activities.
- A season-long training on the PalayCheck system following the Palay-usapan method is being conducted every 1st Tuesday of the month.
- A cross-visit to progressive farms was conducted.
- A Lakbay Palay to PhilRice CES was conducted for the farmers.
- Training on vermicomposting, and entrepreneurship and

financial management were conducted for the farmer partners.
- The KSL farm was launched.

Results:

- The baseline profile of the community and the participating farmers was finalized.
- The needs assessment of the community identified limited water supply, lower price of palay offered by traders than NFA during harvest season, high interest rate of micro-financing by the traders, and poor pest management of vegetables as the major problems (Figure 5).
- The farmers' organization was registered at SEC as Nagbacalan Rural Transformation Movement (RTM) Farmers' Association and its TIN number was secured from BIR.
- The farmer group identified vermicomposting and volvariella mushroom production as their possible rice-based enterprises.
- The #tularansimgJuan hashtag developed for RTM was localized and translated into the Iluko dialect and posted at the FB page.
- The season-long training on PalayCheck system was conducted following the Palay-usapan method which gave the farmers more time to share the experiences and problems they encountered in their farms that were related to the topic in each meeting. Problems shared by the farmers were immediately addressed or visited by experts, if needed, after each session.
- In the cross visit of the farmers to the Santa Organic Farm and the bio-intensive gardening program of the provincial jail of Ilocos Sur, the farmers were briefed on the importance of organic farming, especially on vegetable production. This was very helpful to the farmers as they were heavy users of chemical pesticides on their vegetable crops.
- The farmers were taught at the Santa Organic Farm on how to make their own bio-pesticides from resources that are readily available in their rural surroundings. The farmers were encouraged to go into organic farming when they visited the bio-intensive gardening of the provincial jail of Ilocos Sur.
- In the Lakbay Palay hosted by PhilRice CES, the farmers visited

various field setups showcasing the latest released varieties and crop establishment methods, including the Future Rice Farm which showcased advanced technology in rice production. The farmers were give tokens of new released rice seeds.

- The owner of the KSL farm was tapped as the resource speaker for the training on vermicomposting. The training equipped the farmers the knowledge and skills on how to turn biomass in their farms into vermicompost. The resource speaker likewise encouraged them to be industrious, patient, and open to any positive changes in rice farming in order to be successful. The vermicomposting project at the pilot site was started immediately after the training.
- The experts from MMSU were invited again to reinforce the concept and skills in entrepreneurship and financial management among the farmers. The farmers learned about the desirable qualities of a successful entrepreneur, how to be a successful entrepreneur, how to save, and how to manage their finances.
- The launching of KSL farm was an avenue for the farmers to share, learn and analyze other farmers' experiences in enhancing farm productivity.

Figure 5. RTM activities, Batac site, 2016.

VI. Be Riceponsible Campaign (BIN-038-000)

MBAlupay, LMdCTapec, JMSantiago, RISibucao,Jr, BAPajarillo,Jr, SVBriones, DPLigayo, and BMCatudan

The campaign aims to sustain efforts for rice conservation awareness and help attain food sufficiency. The station integrates the campaign with other activities, whenever possible. The concentration of the campaign this year is on students.

Activities:

- Briefings and exhibits were used as avenues to increase awareness of the campaign. The briefing module included an overview lecture, videos and campaign print materials (Figure 6).

Results:

- A total of 1,991 students from 20 schools in Ilocos Norte, Ilocos Sur, Abra, La Union and Apayao were briefed (Table 6).

- The Be Riceponsible campaign was included as topic in the "PhilRice Hour" radio program at DZRL Batac City. In addition, radio plugs of the campaign were aired between segments of the radio broadcast.

- Brown rice feeding activity cum Be Riceponsible briefing was conducted during the culminating activity of the Nutrition Month celebration of the City of Batac. The activity was attended by more than 250 students, LGU staff, teachers, and members of the 4Ps.

- Staff at the station were briefed and encouraged to participate in the Brown4Good challenge. As part of the campaign, the canteen at the station offered brown rice every Friday and advocated a choice serving of ½ cup of rice.
- The Be Riceponsible campaign was likewise included in the exhibits of the station at the Farmers' Festival of the City of Batac, Abrenian Farmers' Festival in Bangued, and Organic Congress in Laoag City.

- The Be Riceponsible campaign was part of the information included during the briefing for 250 1st year students (6 batches) of MMSU on the services and R&D projects of PhilRice.

- The 38 station bootcampers were briefed on how to actively participate in the Be Riceponsible Campaign.

Figure 6. BeRiceponsible campaign briefings with students at different schools in Region 1 and CAR.

Table 6. List of BeRiceponsible campaign breifings conducted in Region 1 and CAR.

Participants	Date	Number of Participants
Clean, Green, Practical, and Smart Training Course on *PalayCheck* and *Palayamanan* Plus trainees	May 19	38
Mariano Marcos State University, City of Batac	May 10-16	250
Burgos Agro-Industrial School, Burgos, Ilocos Norte	Aug 23	165
Bangui National High School, Bangui, Ilocos Norte	Aug 23	150
San Nicolas National High School, San Nicolas, Ilocos Norte	Aug 24	203
Alilem National High School, Alilem, Ilocos Sur	Sep 27	56
Sugpon National High School, Sugpon, Ilocos Sur	Sep 26	33
Cervantes National High School, Cervantes, Ilocos Sur	Sep 26	41
San Gabriel Academy, San Gabriel, La Union	Nov 15	102
San Gabriel Vocational High School, San Gabriel, La Union	Nov 15	122
Bagulin Integrated National High School, Bagulin, La Union	Nov 16	228
Burgos National High School, Burgos, La Union	Nov 16	96
Abra High School, Bangued, Abra	Nov 18	56
Tagodtod National High School, Lagangilang, Abra	Nov 18	134
Luna-Apayao Science High School, Luna, Apayao	Nov 23	75
Pudtol Vocational National High School, Pudtol, Apayao	Nov 23	92
Allig National Agriculture and Trade High School, Flora, Apayao	Nov 24	100
Mayor Guillermo A. Barsatan Memorial School of Arts and Trades, Sta. Marcela, Apayao	Nov 24	88
TOTAL		**1,991**

VII. Agribusiness Analysis of IRBAS Enterprises (IRB-016-000)

Project Leaders: BMCatudan and LMdCTapec

The Intensified Rice-Based Agri-Bio Systems (IRBAS) is a development program of PhilRice that intends to treat the operation of a portion of the farm assets of each branch station as profit-earning resources. The program targets to generate PhP 1M per ha gross income annually by integrating potential income sources that can be super-imposed into a rice-based farm. These include other crops, vermicomposting, mushroom, livestock, poultry, fish, and farm machinery and equipment custom service. It also eyes post-production ventures that can add value to its farm outputs. PhilRice envisions coming up with efficient farming system models that can be later duplicated by farmers in actual realm. Since 2014, PhilRice stations have each been implementing a combination of the component enterprises. Over the years, they have fine-tuned the technology package and assessed the performance and input requirements of each enterprise. It is then high time to produce a technology bulletin for each enterprise that can be adopted by local farmers and agri-entrepreneurs in the stations' respective areas of operation.

Activities:

- The templates of the production technology bulletins of each component enterprise being developed in all stations have been prepared.

Results:

- Templates of the production technology bulletins for rice seed and other crops, livestock, duck, fish, mushroom, vermicomposting have been constructed.

- The initial plan to conduct a workshop with all stations on the preparation of the technology bulletin has been shelved.

VIII. Accelerating Development, Demonstration and Adoption of Palayamanan Plus in Lowland Farms (171A-RTF-022)

Project Leader: RGCorales

Ilocos Norte Pilot Site

BMCatudan, FBPaleracio, NQAbrogena, and MAUBaradi

The Palayamanan Plus is an innovative approach to promote diversification, intensification and integration of different farming components in a rice-based production system to gain more income, enhance value-adding and move towards marketing. The project, which started in 2014, is being implemented in eight sites nationwide with Batac as the last site included in 2016.

Activities:

- The involvement of Batac commenced during the project's Planning Workshop during the first week of March in Balanga, Bataan wherein the site's workplan for 2016 was presented.
- Together with the active participation of the City of Batac Agriculture Office (CAO), the planned activities in the site are being implemented. Brgy Pimentel was identified as the site as it met all the selection criteria set – existence of an organized farmers' group; diverse farming endeavors in the area; the target farmer group has at least 20ha contiguous farms; and the farmers are receptive to new ideas and technologies. The members of the Pimentel Federated Irrigators' Association (zanjera) were the farmer partners of the project.
- A briefing about the project was conducted to present the purpose and expected outcome of the project.
- A needs assessment to determine the areas for intervention and participatory planning to identify activities to be implemented for the year were conducted.
- A quick survey of 22 farmer participants was conducted to determine their household labor sources, crops grown, poultry and livestock raised, and other farming enterprises they were involved in.
- Female goats and piglets were procured to serve as starter stocks of the farmer partners. Rice seeds were likewise offered to interested farmers. The cost of the rice seed and livestock availed by the farmers shall be paid back to the zanjera which will serve as seed money of the association in sustaining the farm enterprises intervened by the project.
- Materials for the construction of the vermicomposting and mushroom facilities for the pilot site were procured.

Results:

- The briefing about the project was conducted in April. It was participated by 36 farmers, 4 CAO personnel, the Sangguniang Panglungsod Chair for Agriculture, and staff of PhilRice involved in the project.
- The needs assessment and participatory planning session was conducted with 23 officers and members of the federated zanjera, CAO personnel, and PhilRice project site staff. Officers were tasked to identify the plot where the mushroom and composting facilities will be established.
- The results of the quick survey served as a basis in identifying the enterprise interventions to be undertaken.
- Since most of the farmer participants raise goat and swine for fattening and breeding, the list of those interested to avail of the livestock dispersal component of the project was obtained. The livestock (13 Boer mestizo goats and 17 piglets) turned over to the recipient farmers in July.
- Since most of the farmers received subsidized rice seeds from the local government, only a few indicated their interest to avail of the rice seed dispersal component of the project. During the start of wet season crop establishment, 140kg of inbred and 13 bags hybrid seeds were given to the farmers.
- Training on rice PalayCheck, goat raising, swine raising, and vermicomposting were conducted for the farmer partners.
- The construction of the vermicomposting and mushroom production facilities was delayed due to material procurement constraints. It is targeted to commence by mid-December.

IX. Accelerating the Development and Dissemination of Associated Rice Production Technologies that are Resource-Use Efficient (172A-Y3-RTF-002)

Project Leaders: SVBriones, BMCatudan, MAUBaradi, EBSibayan and MJCRegalado

The project aims to increase yield, reduce inputs and increase net income from rice production through development, dissemination, and adoption of associated crop management technologies. The station took over the implementation of the project in Ilocos Norte and Ilocos Sur early this year, which used to be implemented by CES.

Activities:

- Management of the 2016DS variety and AWD demo farm setups (7 in Ilocos Norte and 5 in Ilocos Sur) was continued by the station in February. The same demo sites were maintained during 2016WS. Aside from the two associated technologies previously demonstrated, two crop establishment options, use of drum-seeder and MDDST, have been included for demonstration.

- In Ilocos Norte, 26 observation wells were installed in the demo farms to monitor the perched water table.

- On-site briefing sessions were conducted to familiarize the farmers on the activities to be implemented in the demo sites.

Results:

- Based on farmers' observation and NIA findings, the AWD technology required 3 to 4 days irrigation interval in paddies with sandy soil and 7 days interval in fields with clay loam soil. This implies that the 21 days water delivery interval in the NIS may have caused insufficient water supply for the rice plants.

- Nine on-site briefing sessions were conducted during the onset of wet season, attended by 267 farmers.

- The new varieties demonstrated in Ilocos Norte during 2016DS attained the following yield levels per ha: 6490kg for NSIC Rc360, 6233kg for NSIC Rc392, and 6297kg for NSIC Rc23. The common variety used by farmers, PSB Rc82, attained 5200kg yield. In Ilocos Sur, the yield levels attained by the new varieties were 5286kg for NSIC Rc226, 4489kg for NSIC Rc240, and 4835kg for NSIC Rc342. The farmers' variety, NSIC Rc222 yielded 3840kg.

- For 2016WS, 4 demo farms showcased use of plastic drum seeder in crop establishment, 2 on variety trials, and 1 on MDDST in Ilocos Sur. In Ilocos Norte, 4 sites demonstrated variety trial and 1 on use of plastic drum seeder (Figure 7).

- A field day was conducted in the demo site in Caterman, Candon City, Ilocos Sur showcasing a comparison between direct seeding using the plastic drum seeder and transplanting in crop establishment. Roughly 100 participants, comprising of farmers, youths (locally tagged as farmbassadors) LGU officials, and PhilRice and IRRI staff.

- Consolidation of the yield and production costs of the technologies showcased and the famers' practice from the 2016WS setups is on-going.

Figure 7. Associated crop management technologies demonstrated and field day, Caterman, Candon, Ilocos Sur, 2016.

X. Knowledge Sharing and Learning (174D-RTF-022)
Project Leaders: MJCVives, RISibucao and JMSantiago

The activity aimed to provide the latest information and technologies on rice, ICT-based resources and tools on rice/agriculture, and opportunities for partnership in information technology dissemination. The KSL activities are envisioned to give farmers broader perspective of current and future challenges they face in producing food for the populace, and to do more for farmers to become more competitive.

Activities:

- KSL sessions commenced with a short video showing, followed by introducing the use of the ICT tools.
- During the conduct of various training courses in the station, a session was allocated for KSL.
- KSL activities were likewise conducted outside the station for farmers and agriculture graduates.
- The modules for faculty and staff, and students used in the academe-based KSL sessions were patterned from the those prepared by IPAd-KSL Team from PhilRice CES. The flow of the activities was as follows: (a) information of the challenges faced by agriculture and farmers who produce food; (b) commendation of the participants in their current effort to improve the agriculture sector and help the farmers; (c) offering the participants useful information, ICT-based resources, and materials to complement their efforts; and (d) challenging the participants to do more to help the farmers.

Results:

- In the station training courses, 92 agriculture students and graduates attended the KSL activities.
- Roughly 60 farmers from Candon, Ilocos Sur were briefed on the use of ICT tools. The briefing emphasized the use of MOET App, PhilRice Text Center and Rice Crop Manager.
- The KSL-IPaD team of PhilRice, in collaboration with IRRI and ATI, held a KSL briefing for 38 outstanding agriculture graduates from MMSU, ISPSC, ASIST, and DMMSU to showcase the different ICT tools and resources developed by their respective institutions.
- The KSL session for faculty and staff from the academe held in September was attended by 17 target participants; however, 45 agriculture students likewise attended.
- The four KSL sessions for students held in November was attended by 198 agriculture students.

XI. Philippine Rice Information System (PRiSM) An Operational System for Rice Monitoring to Support Decision Making towards Increased Rice Production in the Philippines (175A-RTF-022)

PhilRice Batac
JMMaloom, MJCVives and NIMartin

The PRiSM project aims to develop a monitoring and information system for rice production in the Philippines. PRISM's main purpose is to gather and organize information on rice area, yield, yield gaps and the causes of these yield gaps, and to provide this information to key stakeholders for policy support. PRiSM relies on data from remote sensing, crop models, in-field crop surveys, and other fieldwork to deliver actionable information on rice crop seasonality; area; yield; damage from flood, wind, or drought; and yield-reducing factors, such as diseases, animal pests, and weeds. The project is a collaboration between the Department of Agriculture, PhilRice, IRRI, and sarmap.

Activities:

- Monitoring was done in rice fields from the provinces in CAR and Region 1 covered by PhilRice Batac operation. In each location, 20 monitoring fields (MFs) were visited every 11 to 12 days to collect data in time with the scheduled passes made by the satellite being used in the project.
- Rice and non-rice validation was conducted in the two regions for the accuracy assessment of the generated rice area maps.
- Customized training courses for PRISM regional partners from CAR and Region 1 were conducted.
- The damage caused by typhoon Lawin in Region 1 and CAR was assessed.

Results:

- In 2016 DS, only two locations (San Manuel, Pangasinan; Luna, Apayao) were monitored, and 17 data collectors from DA-RFOs and LGUs were supervised. Monitoring of Batac City, Ilocos Norte was excluded during the dry season as it has rainfed ecosystem, hence no rice was established in the MFs.

- For 2016 WS, two new provinces (Ilocos Sur and La Union) were added to the three original locations. Three monitoring visits were conducted.

- All the data gathered (field profile, cultural management, crop production, monitoring and pest and injuries) were cleaned, validated and submitted to the Mapping and Evaluation Team for processing.

- The 240 validation points for landcover/vegetation of rice and non-rice areas in Region I were visited during 2016 DS and 2016WS.

- Six (6) customized training courses were conducted for PRISM Regional partners from CAR and Region 1. The training courses include protocols of Mapping and Yield Estimation, Pest and Diseases Management and Basic Geographic Information System (GIS). Overall, 102 regional partners were trained.

- Assessment of the damage caused by typhoon Lawin in severely affected areas in Region 1 was validated in 42 points of rice areas. These validations points were in Laoag Banna, Paoay and Batac in Ilocos Norte; Candon, Galimuyod and Narvacan in Ilocos Sur; and Lagangilang, Pidigan and Tayum in Abra.

XII. Purification, Multiplication and Commercialization of Selected Aromatic Upland Rice Varieties in Support to the DA's Initiative on Rice Exportation (176D-Y2-RTF-002)

Project Leader: RBMiranda

PhilRice Batac
SVPAquino

Premium traditional rice varieties command higher prices in niche market, both locally and internationally, but their potential as a lucrative livelihood is hindered by the inability of local farmers to produce these rice in higher seed quality, purity and greater quantities. Development in the uplands is not at all a hopeless case with strong agricultural research, complemented by hard working institutions and well-implemented policies and programs, even if climate change continue to bite. Hence, the project aims to enhance productivity, profitability and livelihoods of upland and highland farming communities by purifying and producing quality seeds of premium traditional rice varieties with high domestic and export potential and development of smallholder groups and enterprises as business models. The provinces covered by PhilRice Batac include Ilocos Norte, Ilocos Sur, La Union, Abra, and Apayao. The station is expected to produce seeds of top two varieties in each region.

Activities:

- In coordination with the DA-RFOs of Region 1 and CAR, PAOs of Abra and Ilocos Norte, and the MAOs of Pasuquin and Pudtol, two pigmented and/or aromatic upland varieties with high market potential in each region were identified for seed production. Seeds of the identified varieties were procured.

- The upland farmer partners to be involved in seed production were identified. Their seed production fields were periodically monitored.

- Small farm machines and equipment were distributed in the project site.

- As a result of the positive feedback on the performance of NSIC Rc23 in 2015 WS, in spite of the occurrence of the El Niño, 200kg registered seeds of the variety were procured and distributed to 11 upland farmers from Pasuquin, Ilocos Norte to serve as start-up seeds in the locality.

Results:

- Seeds of the identified varieties were procured: 8kg Sinumay, 16kg Azucena, 8kg Inipot-Ibon, and 60kg Redrice. Planting materials were difficult to find since the time of procurement was already near the onset of wet season planting.

- The upland farmer partners in seed production include: 1 in Langiden, Abra for Azucena; 2 in Pudtol, Apayao for Redrice; and 2 in Pasuquin, Ilocos Norte for Sinumay and Inipot-Ibon.

- The setup of Redrice at Doña Loreta, Pudtol, Apayao was discontinued owing to poor germination of seeds and abnormal absence of rainfall at the onset of the season.

- The setup of Redrice at Amado, Pudtol, Apayao had good crop stand but it was hit by the typhoon Lawin which resulted to lodging of all the plants and shattering of 95-98% of their grains (Figure 8).

- The setups for Inipot-Ibon and Sinumay at Sta. Matilde, Pasuquin, Ilocos Norte and Azucena at Quillat, Langiden, Abra were already harvested. Seeds produced are as follows: 330kg Inipot-Ibon, 250kg Sinumay, and 600kg Azucena.

- The crop stand of NSIC Rc23 distributed in Pasuquin was observed to be superior to local varieties. An arrangement was established for the farmers to pay back the LGU in kind, twice the amount of the seeds they received. The seeds shall be dispersed to farmers from other municipalities in Ilocos Norte.

Before the typhoon

Before the typhoon

Figure 8. Seed production setup of Redrice before and after typhoon Lawin, at Amado, Pudtol, Apayao, 2016 WS.

XIII. Field Demonstration of New Rainfed Varieties (Sahod Ulan) in Rainfed Lowland Rice (590-RTF-003)

PhilRice Batac
SVBriones, LCTaguda, NMBanayo, and YKato

The project aims to showcase the performance of Sahod Ulan varieties under Ilocos conditions. It also intends to showcase the performance of the multi-purpose seeder (MP seeder) developed by IRRI.

Activities:

- The three highest yielder and short-maturing Sahod Ulan varieties evaluated at PhilRice Batac and MMSU in 2015WS were seed increased in 2016 DS by DA-INREC in Dingras, Ilocos Norte through a simple collaborative agreement. These will serve as planting materials for the three demo sites for 2016 WS planting in Ilocos Norte.

- For 2016 WS, PhilRice Batac established a setup in the station demonstrating Sahod Ulan 12 variety and the IRRI multi-seeder for crop establishment. Two sites demonstrating the three Sahod Ulan varieties and farmers' variety were established and managed by the Provincial Government of Ilocos Norte with PhilRice providing only technical assistance.

Results:

- DA-INREC produced 400kg each for NSIC Rc282 (Sahod Ulan 7) and NSIC Rc288 (Sahod Ulan 10), and 300kg for NSIC Rc348 (Sahod Ulan 12). The seeds produced were used in the three 2016 WS demo sites.

- The station setup was harvested in November. The other two setups managed by the provincial government will still have a field day on the first week of December.

XIV. Agricultural Support Component-National Irrigation Sector Rehabilitation and Improvement Project (633-RTF-194)

Project Leader: LdRAbaoag

PhilRice Batac

BAPajarillo Jr., DPLigayo Jr., and MAUBaradi

The project aims to contribute to the national rice self-sufficiency program of the government by strengthening the irrigation sector in the country. The NISRIP project in Ilocos Norte involve farmers managing rice fields covered by the Madongan and Solsona River Irrigation Systems. The project is already on its last leg of implementation.

Activities:

- The rice production practices of participating farmers serviced by the Madongan and Solsona River Irrigation Systems (RIS) were gathered.
- The costs incurred in rice production of participating farmers from both RIS were gathered through individual interview.
- The farm equipment for the participating RIS were received by the station from the supplier. These were turned over to the farmer groups.

Results:

- The rice production practices of 163 participating farmers during 2016DS were gathered using the PalayCheck monitoring form. The data gathered were encoded and analyzed.
- The rice production costs of 75 participating farmers were surveyed. The data gathered were processed and turned over to the NISRIP project coordinator.
- The equipment for the participating farmers were delivered to the station in March. These include 21 units of hand tractors with pneumatic tire and cage wheel, each with plow (disc and spiral), comb-tooth harrow and leveler attachments. In addition, 13 flat-pan-type weighing scales with 100kg capacity and 500g graduation, 1 rice thresher with 16 hp gasoline engine, and 3 brush cutters were delivered. The engines of the hand tractors, however, had not yet arrived.

- Four of the five lots of agri-machines were already distributed to NISRIP irrigators' associations. Procurement of the rice mill component of the remaining lot is still under process

XV. Enhancing Vegetable Production through Gravity-Type Drip Irrigation System in Water-Limiting Areas and Seed Multiplication in Ilocos Region, Philippines

Project Leaders: NDGanotisi, BMCatudan, MGGalera, and HPAbando Jr.

The project aims to demonstrate the use of gravity-type drip irrigation system for enhanced vegetable production and to increase KOPIA seeds for distribution to farmers in Ilocos Region. It intends to empower farmers and agricultural extension workers by transferring the technology through the conduct of technology demonstration farms and training of farmers, and to encourage and assist the trained farmers to transfer the technology to neighboring farmers by developing workable plans with them.

Activities:

- The project's demo sites of the in Ilocos Norte were selected and the farmer cooperators and participating farmers were identified for the establishment of demo farms after 2016 WS rice.
- A baseline survey for 16 farmer cooperators and participating farmers was conducted and the results analyzed.
- The training modules on season-long vegetable production were prepared.
- Korean rice varieties were tested for adaptability at the station and at farmers' fields.

Results:

- Baseline survey results showed that weeding expenses in eggplant, pepper and tomato exceeded PhP1500/1000m^2 production area. Irrigation expenses on same farm size was almost PhP5000 for eggplant.
- In the adaptability testing, the highest yield attained by Milyang 23 was 5.82t/ha. Other Korean varieties which reached at least 5t/ha were Dasanbyeo and Taebaegbyeo. NSIC Rc216, the control variety, produced 5.22t/ha. In some fields, however, Milyang 23 and Dasanbyeo showed susceptibility to rice blast, and white-backed and brown plant

hoppers.

- One gravity-type drip irrigation system was already installed for dry season eggplant production in 1,000 m^2 area. Installation for the other two demo sites will be accomplished before the year ends

B. Research

I. Development of scalable farming system for production of edible Nostoc sp. within the rice environment (ABC-005-001)

AADela Cruz, TCFernando, HFMamucod, ESAvellanoza, JCYabes, MRMartinez-Goss, GOSanValentin

The emerging interest of development agencies is production of microalgae in scalable farms, focused on providing the nutritional gaps of people in resource-poor communities, particularly for their undernourished members (Piccolo, 2011). Nostoc sp. is blue-green alga (BGA) as inexpensive source of nutrients. BGA are extremely hardy survivors and can adapt to a wide range of environments. And the rice paddy provides favorable environment for their growth (Roger, 1985). In the Ilocos Region, one filamentous edible Nostoc species, locally called tabtaba, was studied (Rodulfo 1980). Small-scale production of Nostoc will be most important among the BGA since it is already a traditional food of the Ilocanos. This study aims to characterize the existing growing conditions where edible Nostoc species are growing prolifically, optimize the use of farm resources in growing edible them, identify and characterize dominant Nostoc species in rice fields, and design a scalable farming system for areas where the edible Nostoc are popularly consumed.

Activities:

- A survey questionnaire on local existence of Nostoc species was distributed to each of the 23 Municipal Agriculture Offices in Ilocos Norte.
- A key informant interview with the Municipal Agriculturists was conducted to obtain their knowledge on the presence of Nostoc species in their locality.
- Validation on the presence of Nostoc species was done and live sample were collected.
- In 2016WS, two setups (organic and inorganic rice fields) in San Nicolas were inoculated with the N. commune samples collected from Adams for survival test and biomass production. Three 1m x1m cages containing Nostoc were placed in each setup. Another two setups were established at the station with newly collected Nostoc sp. samples from Pasuquin.

Results:

- Only Nueva Era have not return the survey form among the

23 municipalities and cities of Ilocos Norte. The data collected will be used in constructing a map where Nostoc species thrive and can be used in future collection of samples.

- The Municipal Agriculturist (MA) of Dingras claimed that tabtaba no longer exist in the municipality; however, this is yet to be confirmed by local residents. Other MAs claimed that tabtaba exist in their locality during the wet season, or when rainfall is sufficient to retain moisture in the soil. There were locations, however, where tabtaba were previously observed but no longer exist. Climate change, occurrence of drought, and land conversion were attributed to the extinction of the species in these areas.

- In Adams, tabtaba were observed to grow year-round, contrary to their occurrence during the wet season only in most municipalities in Ilocos Norte. This may be attributed to the mountainous topography of the municipality wherein rain commonly occurs in the afternoon, a very conducive environment for Nostoc species to proliferate.

- This 2016, live samples of Nostoc were collected in Currimao, Batac City and Pasuquin (Figure 9). Collected samples were turned over to ABCRE at PhilRice CES for characterization and optimization.

- Most of the Nostoc species collected in Ilocos Norte were the flat-type; in San Nicolas and Badoc, however, spherical-shaped Nostoc species were observed. Both types were harvested by the locals either from hillsides, rice paddies, or at rivers. The alga serves as a viand of a typical Ilocano household. It is prepared by blanching then adding calamansi juice and fish sauce. In some locations in Region 1, the tabtaba is dried and added to mungbean or pinakbet dishes. In some areas, tabtaba is used as a substitute for gelatin in halo-halo.

- In all the inoculated field setups in 2016WS, the Nostoc did not proliferate. Small thin patches or growth on the soil surface of the fields, however, was observed. With no survival in the cages, consequently no Nostoc biomass was obtained from the fields after the cropping season. The fields, however, will be monitored in the succeeding rice seasons for possible survival of the species.

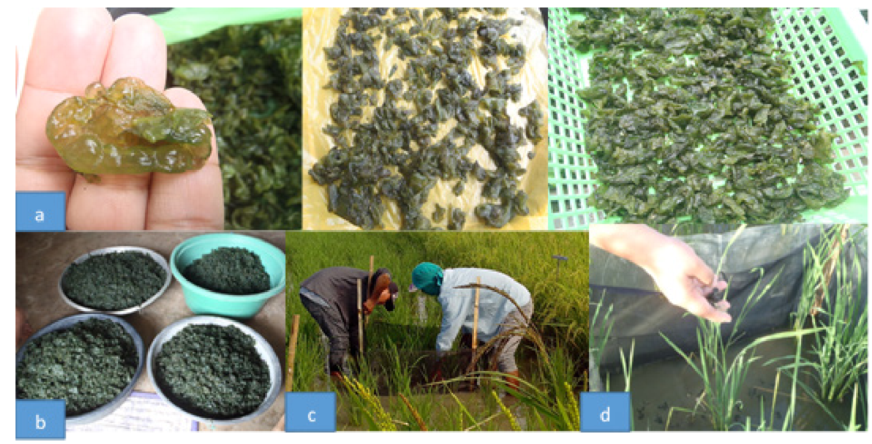


Figure 9. (a) *Nostoc sp*. samples collected from Batac; (b) *Nostoc sp*. collected from Pasuquin; (c) Installation of 1m x 1m cages in the field; (d) Inoculation of *Nostoc sp*. samples from the field.

II. Effects of water management and fertilizer N levels on rice yield (PSB Rc82) and incidence of pests and diseases in the rainfed rice ecosystem (ASD-006-001)

AYAlibuyog, SVPojas, and SVPAquino

Large areas for rainfed lowland rice, including areas in the Ilocos Region, have poor soils with a high degree of spatial and temporal variability in water availability. These have direct implications on nutrient management, particularly nitrogen (N). These adverse environmental conditions require adjustment on nutrient management, depending on the progress of the season, to maximize fertilizer-use efficiency. Untimely application of N fertilizer due to unavailability of water results in lower yield; unbalanced application may likewise cause buildup of pests and diseases. Owing to uncontrollable scenarios in rainfed areas, identifying of a window of opportunity when to apply N at its optimum level without compromising yield is necessary. The 3-year study includes 5 fertilizer and 3 water management treatments.

Activities:

- Research data from the 2014 and 2015 wet season setups were analyzed.
- Pre-implementation preparations for the 2016 WS setup had been conducted.
- The same set of treatments (3 water regime and 6 N treatments) in 2015 WS were re-evaluated in 2016 WS.
- The 2016 WS field setup was managed following the standard research protocol.

Results:

- Water management had no significant effect on the yield of PSB Rc82 for both 2014 and 2015 setups; however, supplemental irrigation (WR3) resulted to less weeds and less infection of brown spots.
- Results in 2014WS showed that among the N levels, the application of 120-30-30kg NPK/ha (N5) gave higher yield (2,728kg/ha) than the application of 90-30-30kg NPK/ha (N3 and N4) though statistically comparable. Among the treatment combinations, WR3N5 had the highest yield (3, 251 kg/ha).
- In 2015WS, N5 gave the highest yield (4,429kg/ha), but it was comparable with N3, N4 and N6. A 9.5% yield decline was observed when 120kg N/ha application was increased to 150kg N/ha. WR3N4 gave the highest (4,794kg/ha) yield among the treatment combinations.
- Results from the 2016WS setup showed that water and N application had no significant interaction in all the parameters measured, except for the number of tillers at tillering stage. Likewise, water management did not significantly affect yield and other parameters, except for plant height. On the other hand, N treatments had significantly affected all the parameters measured except for the number of filled grains, harvest index, number of tillers at tillering stage.
- The 120 and 150kg N/ha treatments attained the highest and statistically comparable yields at 4072 and 404 kg/ha, respectively.
- The application of 150 kg N gave the highest tiller count but still comparable with 120kg N. Likewise, higher N application produced significantly taller plants. Plant height was affected by water regime at tillering and booting stages but not at mature grain stage.
- The initial results of the study were presented as poster during the 46th CSSP Conference in General Santos City. Likewise, it was presented in one of the concurrent sessions during the 2016 National Rice R&D Conference. The research was selected to compete for oral presentation during 2016 Regional R&D Highlights of ILAARRDEC.

III. Germplasm collection and management in PhilRice Batac (GRD-002-008)

AYAlibuyog, JMSolero, NIMartin, BMCatudan, and MCFerrer

Although modern high-yielding varieties presently dominate the lowland rice paddies, traditional rice varieties (TRVs) continue to be planted by farmers in diverse ecosystems throughout the country. Farmers plant TRVs owing to their adaptability, resistance to extreme climatic conditions, tolerance to pests, minimal external input requirements excellent grain, and eating quality among others. It is a common practice, though, of farmers growing TRVs to recycle their seeds without any conscious selection and systematic purification process. This resulted to variety mixture and loss of seed vitality. The most serious problem is when seeds of a variety are totally lost in a locality from natural calamities. Unless a move is done to help conserve these traditional rice varieties, they may soon be completely obliterated from the agro-ecosystem. This activity aims help conserve TRVs in northwest Luzon.

Activities:

- An air-conditioned room is maintained in the station to serve as a repository of TRV seeds collected and purified. Periodic viability testing is conducted to these collections.

- Popular TRVs were seed-increased regularly to have sufficient stocks for requesting parties. TRVs with poor germination rate were likewise regenerated to improve the viability level of stored collections.

Results:

- This year, 29 TRVs were added in the collection: 3 from Nueva Era, Ilocos Norte; 14 from old collections of DA Ilocos Norte Research and Experiment Center; 5 from Sugpon and Alilem, Ilocos Sur; 4 from Bangar and San Gabriel, La Union; 1 from Pidigan, Abra; 1 from Davao; and 1 from an unknown donor. To date, PhilRice Batac has 268 collections, including duplicates.

- The 14 TRVs from DA-INREC were processed, cleaned and sent to PhilRice CES for duplication; the remaining 8 new collections are still for processing.

- Of the 268 collections, 254 were tested for viability. From 254 viable TRVs, only 145 (57%) had good viability while 109 had below 85% viability. From 109 TRVs with poor viability, 86 (79%) had zero viability.

- Thirty (30) TRVs were dried to 6-7% MC using silica gel. Overall, 70 TRV of the collections were silica-dried while drying of 6 TRVs is still on-going. Most of the drying was done at PhilRice CES owing to limited silica gel at the station.

- Seeds of 10 most in-demand TRVs (mostly pigmented) were seed increased to 1.5 to 2kg. Five TRVs had less than 2kg harvested grain due to typhoon Lawin damage. Likewise, 12 TRVs were planted for regeneration.

- Twenty-two (22) TRVs were sent to PhilRice Los Baños (in coordination with Mr. Alvin Tuaño) for grain analysis to complete the grain quality data for the TRV catalog being prepared. Grain analysis result is not yet available.

- The Precondition Certification had been secured from the National Commission on Indigenous People (NCIP) for the publication of the catalog containing the characteristics and photos of characterized TRVs. Enhancement of the layout of the catalogue is also on-going.

IV. Increasing the yield of Gal-ong, a traditional rice variety (special rice), through induced-mutation (PBD-002-017)

ESAvellanoza, RTMiranda, AADela Cruz and JCYabes

Traditional rice varieties are famous for its good grain, eating quality, and aroma. However, seeds produced from these varieties for commercialization and for export purposes are limited owing to low productivity. Mutation is defined as sudden heritable change in a characteristic of an organism. Mutation techniques have played a significant role in increasing rice production in the Asia-Pacific Region. Released mutant rice varieties have semi-dwarf statute, earlier maturity, improved grain yield, disease and cold-tolerance, and improved grain quality. The use of gamma radiation, chemical and several methods for induced mutation has been proven effective means to generate novel alleles. Gal-ong, though a very popular TRV in Abra and Benguet owing to its excellent grain quality and aroma, has low yield thus used as the plant material in this study.

Activities:

- In 2016 dry season, purified Gal-ong seeds were exposed to gamma irradiation to generate M1 materials. The irradiated seeds were planted to generate M2 population. The M2 seeds produced shall be planted for 2016WS observation.

- From another related research output, 96 Gal-ong M3 entries were evaluated of 28 characteristics for trait confirmation and segregation analysis. These entries came from individual plant selections of PhilRice CES and Batac during 2015WS.

- Genomic DNA extraction of Gal-ong wild type and M3 Gal-ong plants were done. Thirty-five Gal-ong M3 were randomly selected (based on their improved morpho-agronomic characteristics) for genotyping using 60 genomewide simple sequence repeat (SSR) markers.

- Gal-ong M2 seed materials harvested during 2016DS at PhilRice, CES were established and maintained 2016WS field evaluation and as M2 materials for plant selections.

- Advanced lines of 87 Gal-ong individual plant selections in M4 generation for field evaluation, trait confirmation and segregation analysis. These individual plant selections in M3 generation were forwarded and evaluated last 2016 DS at PhilRice, CES.

Results:

- In the field setup planted with M1 seeds, 3,213 Gal-ong plants were established and maintained for the generation of M2 population at PhilRice Central Experiment Station. Only 500g of M2 materials was produced owing to severe stemborer infestation in the entire growing season in spite of chemical management (Figure 10).

- Seeds from 14 Gal-ong M1 plants which were not severely affected by stemborer were harvested. After harvest, the plants were bowled, transferred to the screenhouse and ratooned to produce more seeds. They were selected and tagged as putative stem borer resistant mutants and will undergo further evaluation for stemborer screening to confirm if they have improved resistance against the pest. Chances are that during irradiation treatment, resistance was induced.

- In addition, five M1 plants were selected for their altered grain characteristics from the wild type such as pericarp color (colored and white), endosperm color (translucent and opaque), and grain shapes.

- The characteristics exhibited by 96 M3 entries were evaluated for trait confirmation and segregation analysis (Table 7). Basic agro-morphological characterization was done for comparison to the wild type. From these entries, 84 were observed to have moderate to resistant reaction and 12 with high susceptibility to stemborer infestation.

- In the genomic DNA extraction, 42 (72%) of the 60 SSRs used showed sharp resolution of amplicons (using RM488. These, along with their wild types, were monomorphic at loci RM26108 and RM165. The presence of heterozygous DNA bands was also noted.

- Data gathering for kernel evaluation, yield and yield components are still ongoing.

- The Gal-ong M2 seeds produced in 2016DS were sown for 2016WS field evaluation.

- In 2016WS approximately 2,000 individual M2 Gal-ong plants were planted in the field for M2 evaluation and plant selections. As targeted 10 M2 putative mutant lines will be tagged for any of the following traits: tiller count/panicle density/panicle length/plant height/days to maturity/percent spikelets fertility.

- The excessive rains that occurred August, submerged the plants, which were at early tillering stage, for almost three days in two consecutive weeks then followed by the alternate dry and wet conditions. As a result, pests and diseases incidence were very noticeable in the field due to these favorable conditions.

- Of 87 M4 individual plant selections evaluated, 17 showed susceptibility to blast infection and wipeout of test materials at their early maximum tillering stage. As expected wild type Gal-ong was also susceptible to blast and also to hopper burn infestation. Moreover, most of the infected materials are those selections with Gal-ong like characteristics and this explained why they were also susceptible (Table 8 and Figure 11). On the other hand, Gal-ong selections with improved plant type showed slight to moderate hopper burn infestation and with slight to moderate blast and bacterial blight infection and recovered well.

- M2 plant materials in the field were considered as a segregating population as shown in Figure 1d. Tagging of M2 individual plant selection were based on the traits mentioned above and also other interesting traits observed and M3 bulked seeds were harvested for further evaluation. On the other hand, due to typhoon Lawin majority of the materials lodged during heading to soft dough stages of the materials causing yield damaged.

- In terms of maturity, 25 individual plant selections were confirmed early maturing harvested at 86 DAT while the rest have medium to late maturity. Furthermore, majority of individual plant selections were uniform and a few having segregations in plants planted in panicle to the row and segregations within plants in a panicle were observed.

- Gathered agro-morphological characteristics of 87 M4 individual plant selections while data gathering of yield and yield components is ongoing. Preliminary yield results will be the basis in forwarding selections for further evaluation next season.

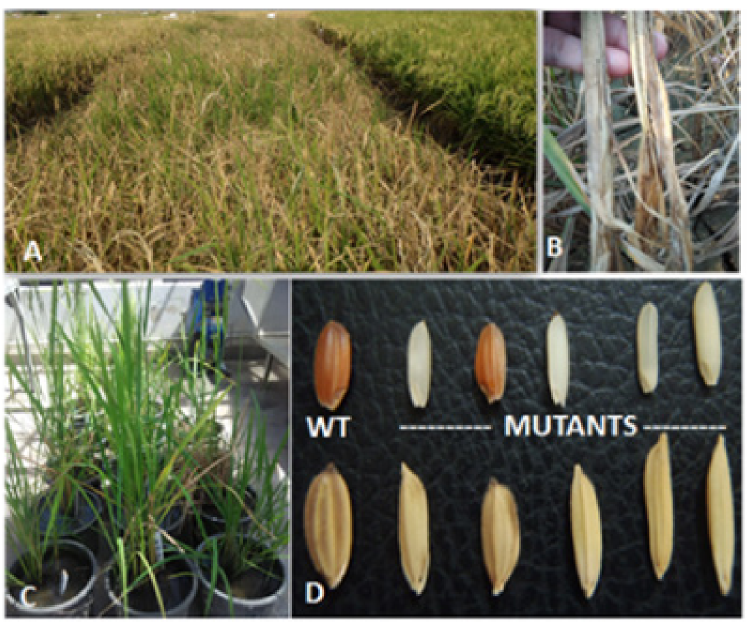


Figure 10. (A) *Gat-ong* M1 plant materials in the field with severe stemborer infestation and recovering plants; (B) damage caused by stemborer; (C) balled and ratooned M1 plants in the screenhouse; (D) *Gal-ong* wild type and selected M1 seeds with altered grain traits.

Table 7. Putative mutant traits of 96 *Gal-ong* M3 genearation, 2016 DS, PhilRice-CES.

Characteristics	No. of Entries
Bold grains	3
Gal-ong like straw bold grains	1
Gal-ong like with more unfilled grains	1
Gal-ong type mixed	1
Gal-ong type mixed grains	2
Gal-ong type/ mixed /short	1
Long grains/ shortened plants opaque	1
Long grains	5
Semi bold *Gal-ong* type with mixed grains	2
Semi bold *Gal-ong* type with unfilled and mixed grains	2
Semi bold grains	10
Semi bold, *Gal-ong* type mixed grains	2
Semi bold, *Gal-ong* type mixed grains with unfilled grains	1
Shortened plant/with unfilled and semi bold grains	1
Abnormal grains *Gal-ong* like but smaller grains	15
Dense panicles	2
Gal-ong like with slender mixed grains	1
Gal-ong type mixed grains	1
Long fine grains	1
Long grains	5
Medium stature	2
More tillers	2
Semi bold *Gal-ong* like	1
Semi bold grains	20
Semi bold/short plant	1
Long grains/ short plant	8
Slender grains	3
Very short, long grains	1

Table 8. Putative mutant traits of 87 *Gal-ong* M4 generation, 2016 WS, PhilRice-Batac.

Characteristics	No. of Entries	Remarks
Shortened plant with long grain, early maturing	24	***Gal-ong* (WT)** low, tilllering, very tall stature, big bold grains, long panicle and late maturing
Medium stature, dense panicles	4	
Medium stature, long fine grains	1	
Medium stature, long grains	10	
Medium stature, more tillers	2	
Medium stature, semi bold long grains, early maturing	15	
Short plant, semi bold	1	
Short plant, Long grains	8	
Slender grains	3	
Very short, long grains	2	

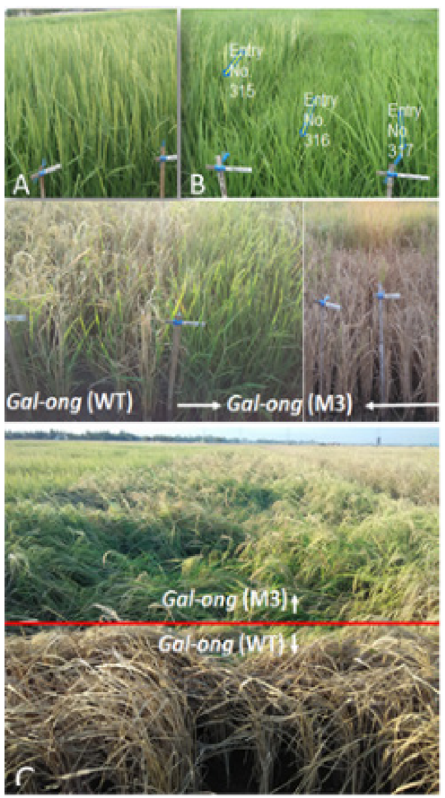


Figure 11. (A) Early-maturing plant selections; (B) medium- and short-stature plants; (C) wild type and M3 plants severely damaged by stemborer, 2016 DS, PhilRice-CES.

V. Multi-environment and adaptability tests of breeding lines in drought-prone rainfed lowland (PBD 009-004)

AYAlibuyog, JMSolero, MAROrbase, and JMNiones

Progress in developing improved germplasm for rainfed lowland rice in general and for less favorable rainfed lowland sub-ecosystems (*e.g.* drought-prone) in particular has been slow, mostly because of the complexity of socio-physical and biological environments, and high G x E interaction which determines the performance and adoption of rice varieties. With this dilemma, this study was conducted. The main objective of the study is to improve rice productivity in the target environments of drought-prone rainfed lowlands through more efficient and accelerated selection procedures of highly adaptable and acceptable rice lines for location-specific recommendations. The research setup at the station started in 2015 WS and will be continued in 2016WS. This includes 50 test entries and 20 check varieties.

Activities:

- One field experiment was established to evaluate the performance of 70 rice entries which includes 20 check varieties and 50 test entries for drought tolerance.
- Agro-morphological data and yield and yield components were gathered.
- Data consolidation and analysis are still on-going.

Results:

- Results from the 2016WS setup showed that 54% of the entries (38 entries) had an average percentage germination of 25%-50%, 27% or 19 entries had an average percentage germination of >50%, and 19% or 13 entries of the entries had <25% germination rate. The lowest germination rate was 17% (RF 61- PR40029-B-14-B-2-2-2) while the highest was recorded from RF 52-PR39923-B-10-B-3-2 (83%).
- Most of the entries (44%) had a normal vegetative vigor, 20% appeared to be vigorous, 31% appeared to be less vigorous than normal. Only one entry (RF 56- PR40062-Chinois6-IVC2008DS 2-1-2) had an extra vigorous plant type. On the other hand, 3% of the entries appeared to be very weak and small.
- Most of the entries showed susceptibility to brown spot. Results of the phenotypic acceptability of the entries showed that 35% (24 entries) showed good phenotypic acceptability,

23% (16 entries) had poor phenotypic acceptability, 22% (15 entries) showed fair phenotypic acceptability. Only 16% (11 entries) showed an excellent acceptability while 4% (3 entries) was unacceptable.

- The average days to heading of the entries was 103 days after sowing (DAS), the minimum days to heading was 87 DAS (RF 2-PSB Rc10) while the maximum days to heading was at 112 DAS (RF 44- PR39955-B-3-2-2-2-6).

- The average days to maturity of the entries was 130 DAS, with a range of 116 DAS to 141 DAS.

- The average brown spot incidence was 25%. RF 61-PR40029-B-14-B-2-2-2 had the highest brown spot infestation (100%) with the average severity of 9%. Among the entries RF 28- PR39923-B-3-B-2-2 had the highest brown spot severity of 27%.

- Primary data were encoded and summarized but, processing and analysis of samples and other data are still on-going.

VI. Design and development of carbonized rice hull (CRH) insulated rice silo to reduce storage losses (REM-002-007)

LCTaguda, DPDal-uyen, CJMTado, MAUBaradi, BMCatudan, FPBongat, and SRBrena

Maintaining the viability of rice seeds for a longer period than the next planting season is a constant problem in the Philippines owing to environmental factors and pest infestation. Existing storage facilities of farmers cannot fully protect the seeds from insect pest and rodent damage, and unfavorable ambient conditions which encourage microbial and fungal proliferation. Hence a prototype of 1-ton capacity rice silo, insulated with CRH, was developed to reduce storage losses.

Activities:

- The prototype was loaded in July 2015 with NSIC Rc216 registered seeds harvested in April. It was installed outdoors to expose it to various weather conditions.

- Seed samples, from 12 equidistant sampling points 10cm away from the inner cylinder and 3 sampling points at the center, were obtained once a month. Samples were stratified into bottom, middle and top. Sampling continued until seed quality dropped below the standard.

- The seeds samples were tested for germination rate, moisture content, insect count, and insect damage. Seed vigor was likewise determined using accelerated aging test for 3 days and 5 days.

- Weather data on ambient temperature, relative humidity, solar index and rainfall during the observation period were obtained from the station FMON. These will be correlated with trend of viability variables observed.

- The features of the silo that need improvement had been identified.

Results:

- The silo maintained the viability of the stored NSIC Rc216 seeds for 10 months. Although all other viability variables were still within the acceptable range after 12 months of storage in the silo, germination rate dropped below 85% after 10 months. For 10 months, the germination rate ranged from 89.7 to 97.3% and moisture content stayed within 10.6 to 12.5%. Just over 100 weevils and 1.2% damaged seeds were recorded from each of the three 750g samples.

- In the seed vigor test, above the 85% cutoff level germination rate was maintained for 7 months in the 3-day accelerated aging test and for 2 months in the 5-day accelerated aging test.

- The design of the modified/improved silo has been drafted.

VII. Performance evaluation of a hydraulic ram pump for irrigating rice and rice-based crops in Ilocos (REM-002-008)
NDGanotisi, HPAbando Jr., and CJMTado

A hydraulic ram pump is a device that pushes water uphill using energy from falling water. It has simple and conveniently applied mechanism by which the weight of water is tapped to raise a portion of itself to a considerable height. The study aims to identify areas suitable for hydraulic ramp pump operation in Ilocos, evaluate the performance of a hydraulic ramp pump in the locality, and validate the use of HRP in irrigating rice and rice-based crops.

Activities:

- Using surplus materials at the station, a downdraft hydraulic ram pump was fabricated. The initial testing and evaluation of the performance of the machine was conducted using a simulated water drop from plastic tanks elevated 1.5m above the pump. The water from the tanks were conveyed to the ram pump by an irrigation hose.

- Three sites suitable for hydraulic ram pump operation were identified in Brgy. Estancia, Piddig, Brgy. Abaca, Bangui, and Brgy. Magnuang, Batac, Ilocos Norte. The three Barangays had creek where a ram pump can operate and servicing an estimated area of 15 to 20ha each site planted with rice during wet season and corn and vegetables during the dry season.

- Initial testing and evaluation using a simulated water drop through plastic tanks elevated at 2.0m above the pump was conducted at the station.

- Since the fabricated ram pump is less efficient in conveying water than a similar unit manufactured by the Alternative Indigenous Development Foundation Inc. in Bacolod City, a unit of 2″ hydraulic ram pump manufactured by the foundation was ordered. The pump will be tested in various location in Ilocos where suitable water source exists.

Results:

- In the on-station test, the tank was filled by a water pump and the water was allowed to drop at the installed ram pump conveyed by an irrigation hose. The discharge rate was gathered (Figure 12).

- Results showed that the ram pump produced an average output of 6,246li/day or 6.25m3/day at a discharge height of

3.5 to 7.5m above the pump (Table 9).

- Procured a 3″ hydraulic ram pump (Figure 13) from a manufacturer in Tayum, Abra where similar units are installed along the embarkment of the Abra River. The ram pump cost Php20,000.00 and ensembled that with Alternative Indigenous Development Foundation, Inc. (AIDFI) made ram pump costing Php30,000.00. Testing is still on-going.

Figure 12. Gathering discharge rate of the hydraulic ram pump, PhilRice-Batac, 2016.

Table 9. Discharge of a 2″ downdraft hydraulic ram pump at different heights and a constant waterdrop of 2m above the pump.

Height (m)	Volume (ml)	Time (sec)	Discharge li/day	Discharge m^3/day
3.5	750	7	9,257	9.26
3.5	750	8	8,100	8.10
3.5	750	8	8,100	8.10
5.5	750	11	5,891	5.89
5.5	750	11	5,891	5.89
7.5	750	14	4,629	4.63
7.5	750	15	4,320	4.32
7.5	750	14	4,629	4.63

Figure 13. 3″ hydraulic ram pump procured from a manufacturer from Tayum, Abra.

VIII. Adaptability test and improvement of the manually-operated rice transplanter (REM-002-011)

LCTaguda, DPDal-uyen, MAUBaradi, and MGGalera

Rice production in the Philippines remains a labor-intensive endeavor, especially for small farmers. Moreover, the supply of hired farm labor is decreasing owing to the preference of the labor force for employment opportunities in urban centers and abroad, and their high level of education and literacy (Bautista, 2013). Transplanting is one of the most tedious labor in rice production. Mechanization would be the best solution. However, it has always been associated with big or engine-powered machinery. China had developed a manually-operated transplanter that use seedlings grown in traditional seedbeds at the recommended age. It is commercially available and the technical performance is promising. Hence, this study aims to test the adaptability of the machine in Ilocos conditions and make necessary improvements to suit local conditions.

Activities:

- Local suppliers of the transplanter were searched were non-existent. Hence, the machine was directly procured online from China.
- The performance of the machine was tested on station. The parameters gathered were number of missing hills, number of seedlings per hill and seeding rate per hectare.

Results:

- First testing and evaluation of the machine's performance used 20-day old root-washed seedlings raised following the PalayCheck recommendation. About 30 % missing hills were observed during the evaluation since the stalks of the seedlings were too thin for the machine. Further, seedling distance per hill depended on the expertise of the operator.
- Another batch of seeds were sown, the seeding rate reduced in half to produce seedlings with thicker stalks.
- Missing hills with seedlings established from modified dapog ranged from 25% to 35%, while seedlings established from ordinary seedbed was 30% to 40%. For optimum performance of the machine, 4 to 7 seedlings established from modified dapog or seedbed; this requires 50kg to 60 kg seeds per hectare.

- The seedling picking mechanism of the machine is currently being modified to regulate the number of seedlings planted per hill by the machine and to minimize missing hills.

IX. Optimal planting dates based on recent agro-climatic indices for rice and rice-based crops in the rainfed areas of Ilocos Region (CCP-003-003)

NDGanotisi and HPAbando Jr

As changing climate resulted to shifts in spatial and temporal distribution of hydrologic processes including the disruptions of rainfall patterns, planting window has been altered. Thus, a strategy to adapt to and manage risk in climate variability is to modify or adjust the planting calendar given the seasonal climate outlook. The study generally aims to determine the optimal planting date through rainfall analysis and by testing the agronomic and yield response of rice to different planting dates in rainfed areas in Ilocos Norte, Ilocos Sur and La Union. Specifically, it aims to characterize the agro-climatic patterns in selected rice and rice-based areas from available rainfall data, develop more precise planting calendars based on the agro-climatic characteristics, validate the updated planting dates, and determine the agronomic and yield performance of rainfed rice from the different planting dates. The study has two factors laid out in strip plot design, the schedule of planting at the horizontal strip and variety at the vertical strip, in 3 replications.

Activities:

- The daily rainfall data observed in PAGASA-Sinait from 1988 to 2015 were obtained from ogimet.com. The data were encoded and summarized were encoded, summarized and processed for the computation of probability values of the different agro-climatic indices.
- For the validation of planting schedule in Ilocos Norte, the field setup was established in a typical rainfed area in Tabug, City of Batac, Ilocos Norte. The first planting was done in the 4th week of May (May 27); second planting – 2nd week of June (June 10); third planting – 4th week of June (June 24); and fourth planting – 2nd week of July (July 8). Three varieties (PSB Rc82, NSIC Rc9 and Rc192) were dibbled using string guide following 20 x 25cm planting distance laid-out using the strip plot design in 3 replications.

Results:

- The processed rainfall values were plotted, together with the weekly calendar the DWHR, sunshine reliability (SR), rainfall probability, average weekly rainfall, number of rainy days, drought and excessive rainfall hazard.

- Results showed that January to April and November to December had more than 80% probability of drought hazard which indicates avoiding planting during these periods. July to August has more than 60% probability of excessive rainfall hazard (Figure 14).

- Starting from the 3rd week of May to 4th week of September, the DWHR has values below 70% probability. It indicates avoiding harvesting during these periods because the weather is so wet and the SR is below 50% which means drying is a problem (Figure 15).

- The growth stages of the early, medium and late maturing rice varieties were superimposed in the graph and based from criteria such as avoiding harvesting at DWHR lower than 70%, and avoiding excessive rainfall hazard during vegetative stage, the recommended planting dates were pinpointed.

- In the province of Ilocos Sur, the recommended planting dates in the rainfed areas are: 1) third to last week of May for late maturing varieties (≥127 DAP); 2) first to second week of June for medium maturing varieties (111 to 126 DAS), and 3) third to fourth week of June for early maturing varieties (≤110 DAS).

- The rainy season started in the third week of May with sporadic rainfall thereafter until an intense rainfall in the last week of August (Figure 16). However, at vegetative stage, the plants showed symptoms of browning and manifested drying followed by the dying of the plants and this was caused by bacterial pathogens attacking the roots of the plants. Bacterial pathogens slowly develop in continuously planted typical rainfed rice areas (IRRI). To compensate with the target loss, two validation setups will be conducted next season to validate the recommended planting dates in Ilocos Norte, in different site, and Ilocos Sur.

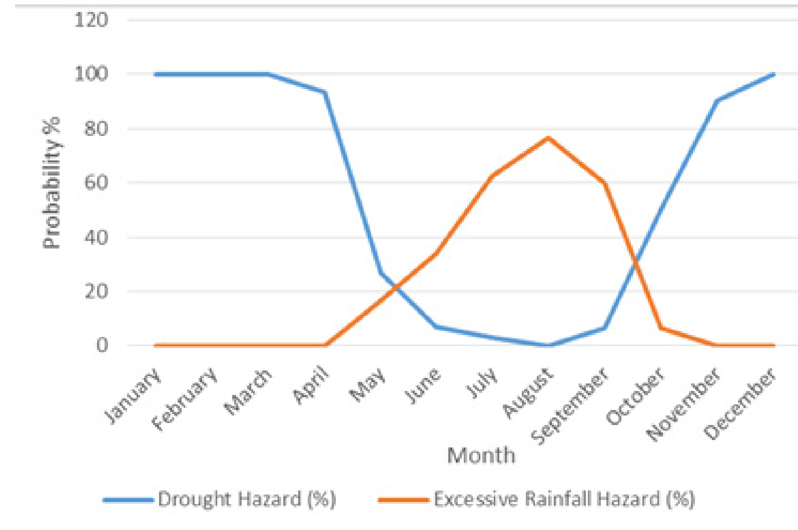


Figure 14. Drought and excessive rainfall hazard based from 28 years (1983 to 2015) monthly rainfall data from PAGASA, Sinait, Ilocos Sur.

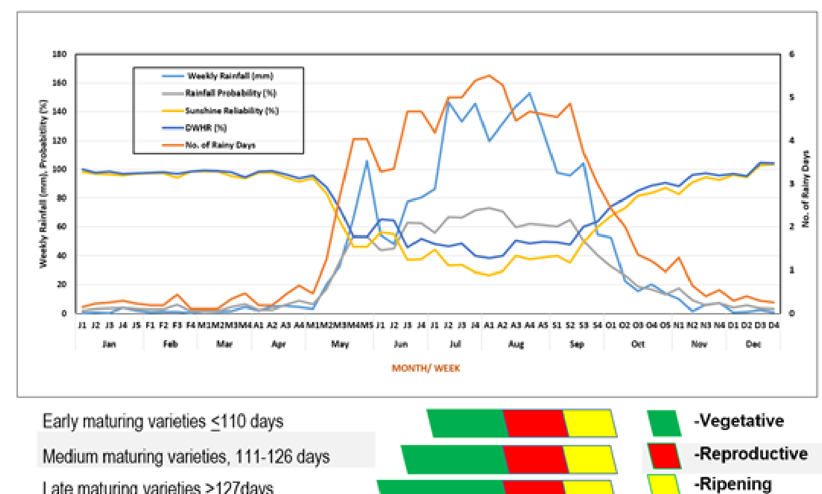


Figure 15. Agro-climatic indices derived from the daily rainfall data at PAGASA, Sinait, Ilocos Sure for the period 1988 to 2015 and recommended planting calendar for rice in the rainded areas.

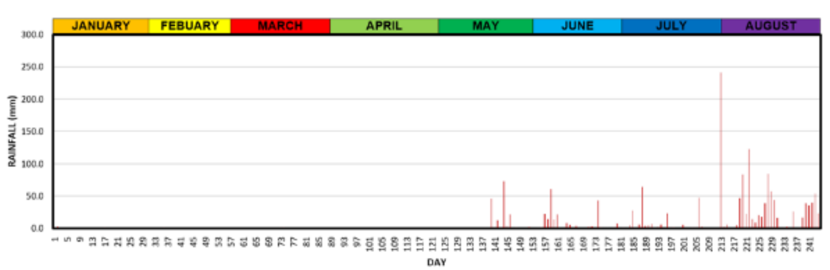


Figure 16. Daily rainfall amount during the growth period of the rice crop.

X. Harnessing wind and solar energy for crop irrigation in Ilocos Region (FFE-004-005)

MGGalera, CTDangcil, NDGanotisi, MLOQuigao, MAUBaradi, MJCRegalado, and ATBelonio

With the increasing burden on natural oils and coal for production of energy, wind power and other sources of renewable energy offer an efficient alternative. With the strong institutional support from Philippine Renewable Energy Act and the National Renewable Energy Program, tapping these resources are promising. Hence, a hybrid wind-solar pump system was installed at the station's experimental farm for capacity and output evaluation.

Activities:

- Different types of pumps were tested for water discharge and energy consumption.
- The area that the pump system can irrigate for an entire season by type of crop was estimated.

Results:

- Three pumps were tested, 0.5 hp submersible, 1.5 hp top-mounted, and 12VDC pump with potential pump discharges of 9.22, 5.67, and 6.40 m3/day, respectively (Table 10). Investment costs for using the three different pumps were PhP100,560, PhP138,560, PhP85,160 for the 0.5 hp, 1.5 hp, and 12VDC, respectively.
- Testing of the system showed that the 0.5hp water pump consumes 28 amperes per hour but pumping should be sustained up to 10 hours only to limit within 50% battery discharge for longer life.
- The hybrid wind-solar has an average 53A daily charging capacity, taking 5 to 6 days to fully recharge the battery from 50% depletion. Considering the 0.5hp, the pump has 9.22m^3/day that could irrigate roughly 1,900m^2 or 700m^2 of tomato or rice crop with an average water requirement of 4.83 and 13.31mm/day, respectively. For longer battery life, pumping should be sustained up to 10 hours only to limit within 50% battery discharge.
- To use the pumped water efficiently, the pump system was coupled with the low-cost drip irrigation system to irrigate rice-based crops.

- The system is already operational and was evaluated for irrigation of rice (400m^2) during 2016WS.

Table 10. Performance data of the Hybrid Wind-Solar System using different water pumps.

Table 10. Performance data the Hybrid Wind-Solar System using different water pumps.

Parameter	0.5 Hp	1.5Hp	132W, 12VDC
Battery capacity, Ah	600		400
Water table, m	3.50	3.50	3.50
Ampere charging/day, A/day	53		
Average Ampere usage, A	28.0	80.0	9.8
Total time to operate, hrs	12.61	4.41	25.82
Days to replenish the 50% depleted battery charge	5.66	5.66	3.77
Daily discharge, m^3/day	9.22	5.67	6.40
Total discharge every year, m^3	3,365.62	2,069.12	2,337.27
No. of days to operate in a year*	64.48	64.48	96.73
Investment cost, PhP	100,560.00	138,560.00	85,160.00

*assuming the system runs 100% of the total number of cycle (charging-discharging) in a year

XI. Pre-harvest and post-harvest management for aromatic and organic rice (HVP-002-005)

MAUBaradi, MCQuimbo, JMSolero, MSCabrera, MFAMagno, RGAncheta, CTDangcil, MVRomero, RTCruz, and MJCRegalado

In addition to the usual Palaycheck System Key Check 1 (seed quality) to Key Check 7 (pest management), the recently-improved Key Check 8 (harvest management) and the proposed Key Check 9 (postharvest management) was initially validated for aromatic, non-aromatic, organically-grown and inorganically-grown rice genotypes. The validation was conducted in San Nicolas, Ilocos Norte during the 2016 dry season (DS) and wet season (WS). The setup was established using the three varieties (Burdagol-Laguna Type, Gal-ong, PSB Rc82) subjected to inorganic (LCC-based 1) and organic (chicken manure) fertilizer treatments. Experiments were conducted to determine the effects of harvesting time, frequency of stirring during sundrying, and type of storage on the yield and grain quality of aromatic and organic rice.

Activities:

- Harvesting, drying, and storage experimental setups were established during DS and WS 2016 in San Nicolas, Ilocos Norte to develop and/or verify postharvest management for aromatic and organic rice.

- Effects of harvesting time (25, 30, and 35 days after flowering [DAF]), frequency of stirring during sundrying (stirring every 0.5, 1, 2, 4 hours) and type of storage (sack, un-insulated storage bin, insulated storage bin) on the yield and grain quality of aromatic and organic rice were investigated.

Results:

- In the 2016 DS setups, the yield levels of the different varieties, both for inorganic and organic rice, were not significantly affected by harvesting time. However, these were significantly different during the 2016 WS.

- The yield of the varieties during WS from the inorganic setup was higher when harvested at 25 to 30 DAF. However, it significantly dropped when harvested at 35 DAF. In the organic setup, yield was higher when harvested at 25 DAF and significantly reduced when harvested beyond that (Tables 11 to 14).

- For the drying experiment, stirring every 30 minutes gave the shortest time to dry the paddy rice to 14% moisture content (MC) and showed the lowest variations in MC among all treatments (Figures 17 through 20).

- The storage experiment was established in November using the 2016 WS harvest from the field experiment.

- Samples of the 2016 WS harvest were already brought to the Rice Chemistry and Food Science Division for grain quality evaluation.

Table 11. Yield of the varieties of inorganic rice as affected by the harvesting time during 2016 DS.

Harvesting Time (DAF)	Yield (t/ha)		
	Burdagol Laguna-Type	*Gal ong*	PSB Rc82
25	6.50	1.65	5.42
30	6.99	1.16	5.20
35	6.82	0.90	4.18
Mean	6.77 a	1.24 c	4.94 b
Significance			
Harvesting time (A)	ns		
Variety (B)	***		
A x B	ns		

*ns - not significant; *** - significant at 0.1% level of significance*
Means followed by common letter are not significantly different from each other at 5% level using LSD

Table 12. Yield of the varieties for inorganic rice as affected by harvesting time during 2016 WS.

Harvesting Time (DAF)	Yield (t/ha)			
	Burdagol Laguna-Type	*Gal ong*	PSB Rc82	Mean
25	4.15	2.89	5.79	4.28 a
30	4.43	2.09	6.02	4.18 a
35	3.90	1.58	5.28	3.59 b
Mean	4.16 a	2.19 c	5.70 a	
Significance				
Harvesting time (A)	*			
Variety (B)	***			
A x B	ns			

*ns - not significant; *** - significant at 0.1% level of significance*
Means followed by common letter are not significantly different from each other at 5% level using LSD

Table 13. Yield of the varieties for organic rice as affected by harvesting time during 2016 DS.

Table 13. Yield of the varieties for organic rice as affected by harvesting time during 2016 DS.

Harvesting Time (DAF)	Yield (t/ha)		
	Burdagol Laguna-Type	*Gal ong*	PSB Rc82
25	6.05	1.94	3.82
30	5.49	2.29	3.47
35	5.77	_	3.31
Mean	5.77 a	2.12 c	3.53 b
Significance			
Harvesting time (A)	ns		
Variety (B)	***		
A x B	ns		

*ns - not significant; *** - significant at 0.1% level of significance*
Means followed by common letter are not significantly different from each other at 5% level using LSD

Table 14. Yield of the varieties for organic rice a affected by harvesting time during 2016 WS.

Table 14. Yield of the varieties for organic rice as affected by harvesting time during 2016 WS.

Harvesting Time (DAF)	Yield (t/ha)			
	Burdagol Laguna-Type	*Gal ong*	PSB Rc82	Mean
25	3.64	2.94	6.43	4.34 a
30	3.05	2.69	4.22	3.32 b
35	3.07	1.00	4.41	2.83 c
Mean	3.25 b	2.21 b	5.02 a	
Significance				
Harvesting time (A)	**			
Variety (B)	***			
A x B	**			

*ns - not significant; *** - significant at 0.1% level of significance*
Means followed by common letter are not significantly different from each other at 5% level using LSD

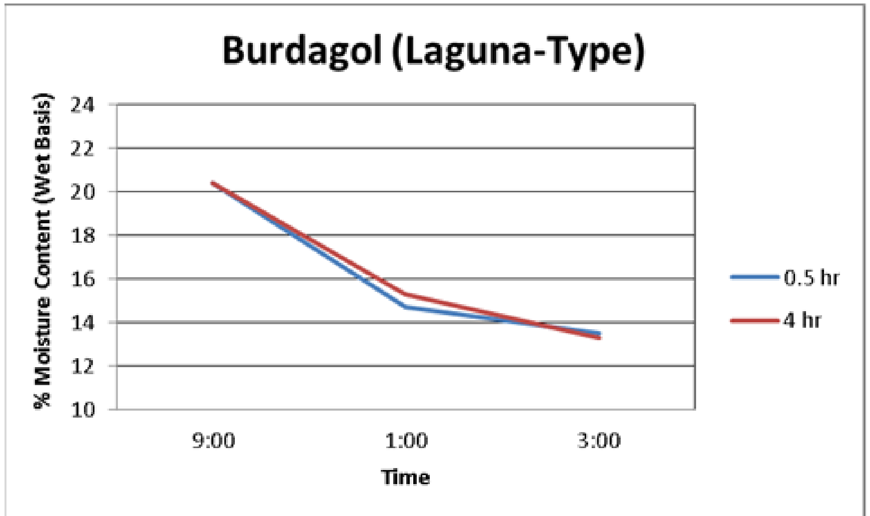


Figure 17. Moisture reduction (%) in Burdagol Laguna-Type as affected by the frequency of stirring.

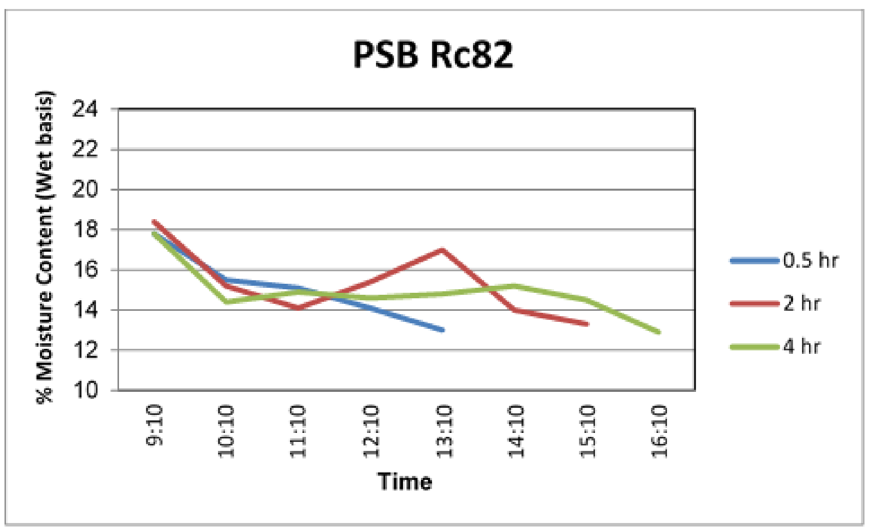


Figure 18. Moisture reduction (%) in PSB Rc82 as affected by the frequency of stirring.

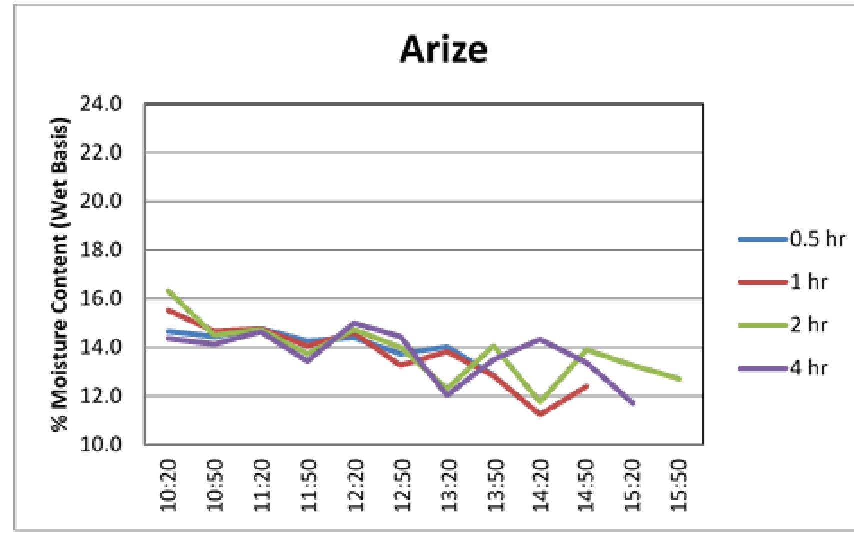


Figure 19. Moisture reduction (%) in Arize as affected by the frequency of stirring. Ambient temperature (31.8°C), relative humidity (55.8%), and grain temperature (36.1 °C).

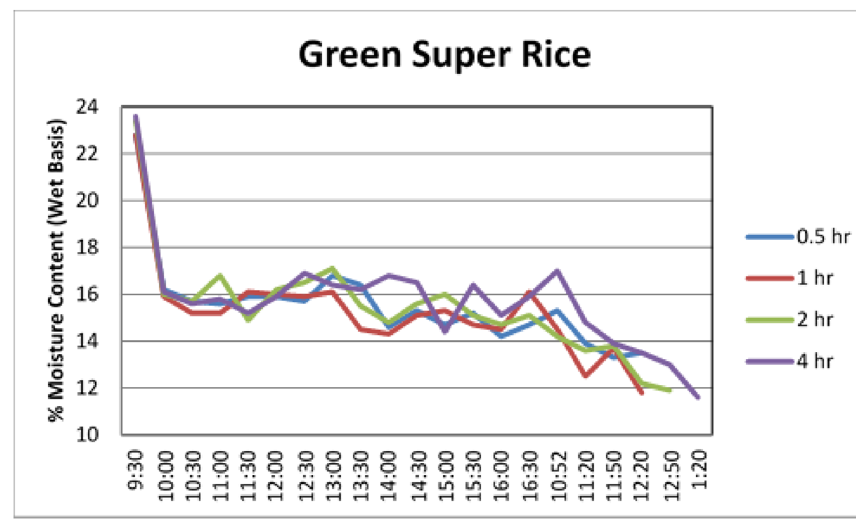


Figure 20. Moisture reduction (%) in Green Super Rice (GSR) as affected by the frequency of stirring. Ambient temperature (33.3°C), relative humidity (50.6%), and grain temperature (36.4°C).

XII. Accelerating the development and adoption of Next Generation (Next-Gen) rice varieties for the major ecosystems in the Philippines (173B-Y2-RTF-002)

ESAvellanosa and JCYabes

The NextGen rice project is an initiative under the Food Staples Sufficiency Program (FSSP) of the Philippine Department of Agriculture (DA). It is being implemented jointly by PhilRice and the International Rice Research Institute (IRRI). NextGen aims to use recent advances in plant breeding, such as molecular biology, stratified multi-environmental testing (MET), and improved computational power to make the country's rice breeding program more efficient. The use of modern breeding tools and other attendant technologies will help make the next generation of high-yielding and climate change-resilient varieties available within a shorter period.

Activities:

- In 2016 DS meetings with the focal persons from DA-RFOs of Region 1 and CAR for the NextGen experimental setups were conducted to plan for the upcoming activities, including site validation, monitoring and assessment during the season.

- Along with the focal persons and researchers involved in the studies, validation and assessment of the 26 sites in Benguet, Ilocos Norte, Ilocos Sur, La Union and Pangasinan were conducted (Figure 13). These include the sites for Participatory Varietal Selection-Researcher-Managed (PVS-RM), Techno-Demo/Certified Seed Production, National Rice Cooperative Testing (hybrid and inbred rice elections), and Multi-Location Adapted Trial (MAT).

- With the assistance of the assigned researchers in each site, the Monitoring Information Sheet was accomplished and sent back to the focal persons for consolidation and submission to the Lead Monitors. Some of the relevant data gathered include type of test crops planted, overall performance of test entries, weed management, and pest and disease control in the experimental setup. Other info gathered were common problems encountered and common varieties planted by farmers in the vicinity.

- In 2016 WS meetings with the focal persons from DA-RFOs of Region 1 and CAR for the NextGen experimental setups were conducted to plan for the upcoming activities, including site validation, monitoring and assessment during the season.

- Validation and assessment of the 18 sites in Ilocos Norte, Ilocos Sur, La Union and Pangasinan were conducted for Participatory Varietal Selection-Researcher-Managed (PVS-RM) for hybrid, drought, submergence and inbred rice selections.

Results:

- The experimental setup for cool-elevated topography at Benguet State University (BSU) was in its reproductive to maturity stage during the assessment. In Region 1, some of the setups were already harvested during the visit; however, an interview and dialogue with the farmer cooperators of these harvested setups were conducted.

- The experimental setup in BSU (Figure 21) had the lowest over-all performance among all sites owing to severe bacterial blight infection, consequently affecting the yield of the test entries. The experimental setup in BSU had the lowest over-all performance among all sites owing to severe bacterial blight infection, consequently affecting the yield of the test entries. Since the adjacent field was practicing organic farming, chemical management of pest and disease was not allowed within the area.

- In 2016 WS with the assistance of their respective focal persons, researchers and cooperators involved the monitoring team successfully validated, monitored and assessed the 18 PVS setups for irrigated inbred, submerged, hybrid and drought conducted in Region I scheduled in four days as shown in Table 15.

- During the validation and assessment, the monitoring team observed the test entries, documented the setups and accomplished the PVS forms. Moreover, the monitoring team, focal persons, researchers and farmer cooperators had chances to discuss the problems encountered and their concerns during the conduct of the study.

- Statuses of the test entries majority were matured, soft to hard dough and few heading stages. Common pests and diseases observed in all the sites were slight to moderate hopper burn infestation in some entries causing stunted and grassy growth, slight to moderate brown spot and bacterial blight infection. On the other hand, only test materials in Cayambanan, Manaoag PVS submergence-inbred are on their maximum tillering stage.

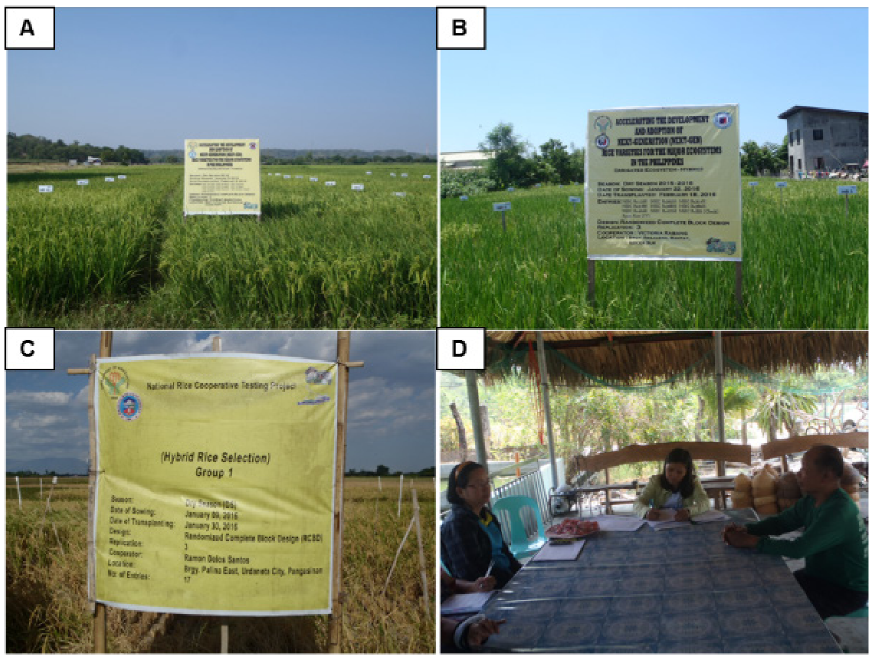


Figure 21. NextGen experimental sites visited in Region 1: A) Catuguing, San Nicolas, Ilocos Norte; B) Balaleng, Bantay, Ilocos Sur; and C) Palina East, Urdaneta City, Pangasinan. D) Interview with Mr. Angel Padron - a farmer cooperator practicing organic farming in Bacarra, Ilocos Norte.

Table 15. PVS sites for 2016 WS NextGen Project implementation in Region I.

Destination	Ecosystem	Sites
Ilocos Norte		
San Marcos,San Nicolas	PVS-irrigated,Inbred	1
Lagui-Sail ,Laoag City	PVS-irrigated,Hybrid	1
Nagsanga,Pasuquin	PVS-drought	1
Ilocos Sur		
Sagpat, Bantay	PVS-irrigated,Inbred	1
Balaleng, Bantay	PVS-irrigated,hybrid	1
Bato, Cabugao	PVS-drought	1
La Union		
Alcala, Luna	PVS-irrigated,Inbred	1
Ubbog, Bangar	PVS-irrigated,hybrid	1
Magsiping, Luna	PVS-irrigated,hybrid	1
San Martin, Bacnotan	PVS drought-hybrid	1
San Blass, Bangar	PVS Submerged	1
Leet, Sta Barbara	PVS-irrigated,Inbred	1
Cabanbanan, Manaoag	PVS-irrigated,Inbred	1
Pagal, San Carlos City	PVS rainfed/drought -inbred	1
Guesang,Mangaldan	PVS rainfed/drought -inbred	1
Cayambanan, Manaoag	PVS submergence-inbred	1
Leet, Sta Barbara	PVS irrigated-hybrid	1
Cabanbanan, Manaoag	PVS irrigated-hybrid	1

XIII. Production of plant materials for compositional analysis and for other biosafety tests of Golden Rice event GR2-E under confined test conditions in the Philippines (586-RTF-003)

AYAlibuyog, SVPojas, DBRebongII, RLOrdonio, RRSuralta, RMBoncodin and VNVillegas

Vitamin A deficiency (VAD) is a major nutritional problem affecting millions of people, particularly children and women in the developing world. Rice as the major staple food crop for more than half of the world's populations is a poor supplier of essential micronutrients and does not contain any beta-carotene. Golden Rice is a new type of rice that contains beta-carotene. Leading nutrition and agricultural research organizations are working together to evaluate Golden Rice as a potential tool to reduce VAD in the Philippines and in other rice-consuming countries. All activities were monitored by the local IBC team, BPI representatives and other monitors to ensure that the protocols and guidelines for confined field tests were observed.

Activities:

- CFT 1 was conducted during the 2015 WS and CFT 2 during 2016 DS. GR2-E PSB Rc82 and PSB Rc82 wild type were laid out in Randomized Complete Block Design (RCBD) with three replications. Proactive pesticide spraying was done to prevent and control insect pest infestation.

- After the CFT trials, completion report was DOST-BC. Application for Multi-location Trials (MLTs) using GR2-E PSB Rc82 was also done.

Results:

- Two seasons (wet and dry) of Confined Field Test (CFT) were conducted from June 2015 to March 2016 at PhilRice Batac, Tabug, City of Batac, Ilocos Norte to produce paddy grains, rice straw, and derived bran that were used for compositional analysis and other studies required to complete the safety assessment of GR2E rice.

- The test materials used in two growing seasons consists of GR2E PSB Rc82 and its near-isogenic recurrent parental line PSB Rc82. Aside from producing the different plant materials, important agronomic data were gathered and analyzed to confirm that GR2E PSB Rc82 was agronomically equivalent to its recurrent parent.

- In 2015 wet season (WS) CFT, 12.98 kilograms paddy grains of GR2E PSB Rc82 and 14.16 kilograms paddy grains of the recurrent parent were produced. In 2016 dry season (DS) CFT, 12.38 kilograms paddy grains of GR2E PSB Rc82 and 12.48 kilograms paddy grains of the recurrent parent were produced.

- Agro-morphological characteristics of GR2-E PSB Rc82 and its recurrent parent were compared using t-test and LSD. Results showed that the mean results of the agro-morphological characteristics of GR2-E PSB Rc82 were comparable to its recurrent parent. In 2016 DS, GR2-E have shorter grain length and lower spikelet fertility compared to its recurrent parent.

- Generally, the plants had good crop stand with manageable level of insect pests and diseases during the two growing seasons. Brown plant hoppers, white-backed plant hoppers, and green leafhoppers were present, but GLH did not cause any tungro disease since there was no incidence observed in the area. Spraying of pesticides was done to control such pests.

XIV. Value chain analysis of rice in the Philippines (204-RTF-022)

BMCatudan, and ABMataia et al.

Rice is one of the most important crops in the Philippines being the staple food of the majority of its population and a source of income to a long chain of stakeholders on the demand and the supply side of the market. A wide price margin, however, exists between farmgate and retail prices which can be interpreted as inefficiency in the rice value chain. Considering the many players involved in performing numerous functions in the rice value chain, it is important to understand how rice moves from the producer to the consumer and how the chain can be improved to benefit the players in the value chain, especially the small farmers and consumers. A nationwide survey in 20 major rice producing provinces was conducted in 2015 covering each player in the value chain. The survey results were processed to come up with provincial, island and national level analyses.

Activities:

- Survey returns from Cagayan, Camarines Sur, North Cotabato and Sultan Kudarat of palay traders (8), rice millers (6), rice wholesalers and rice retailers (7) were encoded in the Access program.

- Before encoding, the entries for the buying and selling price per kg of palay (fresh and dry) and milled rice (wholesale and retail) were calculated according to grade or classification and level in the value chain.

- Procurement, processing, and disposal/marketing costs were likewise calculated to come up with per unit costs. Volume procured and disposed were counterchecked with consideration of shrinkage, losses, and processing recovery.

- Distances from source to destination for procurement and disposal were verified or determined (for respondents who did not provide the info) through use of available distance calculators from the internet. Interests paid in kind were calculated to reflect percent per month.

- References and pertinent documents to prepare the Business Enablers section of the study were consolidated. The write-up of the section is to be submitted to the external consultant by mid-December.

Results:

- The results presented below are general analysis from the 21 surveys returns of palay traders, rice millers, rice wholesalers and rice retailers.

- Rice is generally classified as ordinary, long-grain and fancy. Premium price of PhP0.50 to 2.00/kg was afforded to long-grain and fancy rice. Rc160 is very popular as fancy rice.

- Buyers of fresh palay from farmers had two schemes in deducting prices of those below standard quality – reduced per kg price or reseko (deducting a specific kg/sack). Fresh palay was classified as sariwa (base price reference), super sariwa, wet, very wet and dripping wet. Additional deductions in price are allocated for short-grain, bold, green, husky and spotted palay.

- Loans were often provided to farmers by traders to ensure supply of procured palay at harvest time. Millers usually financed these loans through their traders and likewise provided capital to the latter for palay procurement. Loans of farmers were paid in kind. Interest was collected either as palay equivalent or by reducing the price per kg.

- The rice supply chain in Cagayan, Camarines Sur, North Cotabato and Sultan Kudarat involved 3 to 8 actors from farmers to consumers (Figure 22). Some actors played multiple roles. Some rice millers acted as wholesalers and retailers. A few traders had their palay procurement custom-milled then disposed them wholesale to agents or rice retailers.

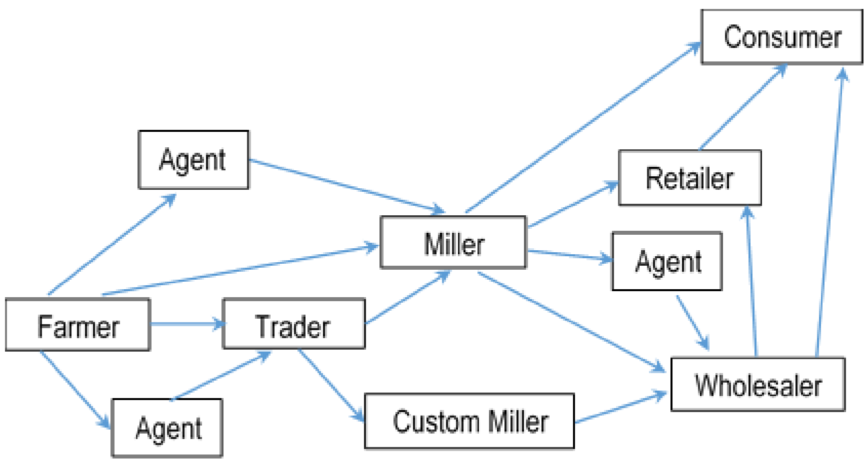


Figure 22. Rice Supply Chain.

Abbreviations and acronymns

ABA – Abscicic acid
Ac – anther culture
AC – amylose content
AESA – Agro-ecosystems Analysis
AEW – agricultural extension workers
AG – anaerobic germination
AIS – Agricultural Information System
ANOVA – analysis of variance
AON – advance observation nursery
AT – agricultural technologist
AYT – advanced yield trial
BCA – biological control agent
BLB – bacterial leaf blight
BLS – bacterial leaf streak
BPH – brown planthopper
Bo - boron
BR – brown rice
BSWM – Bureau of Soils and Water Management
Ca - Calcium
CARP – Comprehensive Agrarian Reform Program
cav – cavan, usually 50 kg
CBFM – community-based forestry management
CLSU – Central Luzon State University
cm – centimeter
CMS – cystoplasmic male sterile
CP – protein content
CRH – carbonized rice hull
CTRHC – continuous-type rice hull carbonizer
CT – conventional tillage
Cu – copper
DA – Department of Agriculture
DA-RFU – Department of Agriculture-Regional Field Units
DAE – days after emergence
DAS – days after seeding
DAT – days after transplanting
DBMS – database management system
DDTK – disease diagnostic tool kit
DENR – Department of Environment and Natural Resources
DH L– double haploid lines
DRR – drought recovery rate
DS – dry season
DSA - diversity and stress adaptation
DSR – direct seeded rice
DUST – distinctness, uniformity and stability trial
DWSR – direct wet-seeded rice
EGS – early generation screening
EH – early heading
EMBI – effective microorganism-based inoculant
EPI – early panicle initiation
ET – early tillering
FAO – Food and Agriculture Organization
Fe – Iron
FFA – free fatty acid
FFP – farmer's fertilizer practice
FFS – farmers' field school
FGD – focus group discussion
FI – farmer innovator
FSSP – Food Staples Self-sufficiency Plan
g – gram
GAS – golden apple snail
GC – gel consistency
GIS – geographic information system
GHG – greenhouse gas
GLH – green leafhopper
GPS – global positioning system
GQ – grain quality
GUI – graphical user interface
GWS – genomwide selection
GYT – general yield trial
h – hour
ha – hectare
HIP - high inorganic phosphate
HPL – hybrid parental line
I - intermediate
ICIS – International Crop Information System
ICT – information and communication technology
IMO – indigenous microorganism
IF – inorganic fertilizer
INGER - International Network for Genetic Evaluation of Rice
IP – insect pest
IPDTK – insect pest diagnostic tool kit
IPM – Integrated Pest Management
IRRI – International Rice Research Institute
IVC – in vitro culture
IVM – in vitro mutagenesis
IWM – integrated weed management
JICA – Japan International Cooperation Agency
K – potassium
kg – kilogram
KP – knowledge product
KSL – knowledge sharing and learning
LCC – leaf color chart
LDIS – low-cost drip irrigation system
LeD – leaf drying
LeR – leaf rolling
lpa – low phytic acid
LGU – local government unit
LSTD – location specific technology development
m – meter
MAS – marker-assisted selection
MAT – Multi-Adaption Trial
MC – moisture content
MDDST – modified dry direct seeding technique
MET – multi-environment trial
MFE – male fertile environment
MLM – mixed-effects linear model
Mg – magnesium
Mn – Manganese
MDDST – Modified Dry Direct Seeding Technique
MOET – minus one element technique
MR – moderately resistant
MRT – Mobile Rice TeknoKlinik
MSE – male-sterile environment
MT – minimum tillage
mtha^{-1} - metric ton per hectare
MYT – multi-location yield trials
N – nitrogen
NAFC – National Agricultural and Fishery Council
NBS – narrow brown spot
NCT – National Cooperative Testing
NFA – National Food Authority
NGO – non-government organization
NE – natural enemies
NIL – near isogenic line
NM – Nutrient Manager
NOPT – Nutrient Omission Plot Technique
NR – new reagent
NSIC – National Seed Industry Council
NSQCS – National Seed Quality Control Services
OF – organic fertilizer
OFT – on-farm trial
OM – organic matter
ON – observational nursery
OPAg – Office of Provincial Agriculturist
OpAPA – Open Academy for Philippine Agriculture
P – phosphorus
PA – phytic acid
PCR – Polymerase chain reaction
PDW – plant dry weight
PF – participating farmer
PFS – PalayCheck field school
PhilRice – Philippine Rice Research Institute
PhilSCAT – Philippine-Sino Center for Agricultural Technology
PHilMech – Philippine Center for Postharvest Development and Mechanization
PCA – principal component analysis
PI – panicle initiation
PN – pedigree nursery
PRKB – Pinoy Rice Knowledge Bank
PTD – participatory technology development
PYT – preliminary yield trial
QTL – quantitative trait loci
R - resistant
RBB – rice black bug
RCBD – randomized complete block design
RDI – regulated deficit irrigation
RF – rainfed
RP – resource person
RPM – revolution per minute
RQCS – Rice Quality Classification Software
RS4D – Rice Science for Development
RSO – rice sufficiency officer
RFL – Rainfed lowland
RTV – rice tungro virus
RTWG – Rice Technical Working Group
S – sulfur
SACLOB – Sealed Storage Enclosure for Rice Seeds
SALT – Sloping Agricultural Land Technology
SB – sheath blight
SFR – small farm reservoir
SME – small-medium enterprise
SMS – short message service
SN – source nursery
SSNM – site-specific nutrient management
SSR – simple sequence repeat
STK – soil test kit
STR – sequence tandem repeat
SV – seedling vigor
t – ton
TCN – testcross nursery
TCP – technical cooperation project
TGMS – thermo-sensitive genetic male sterile
TN – testcross nursery
TOT – training of trainers
TPR – transplanted rice
TRV – traditional variety
TSS – total soluble solid
UEM – ultra-early maturing
UPLB – University of the Philippines Los Baños
VSU – Visayas State University
WBPH – white-backed planthopper
WEPP – water erosion prediction project
WHC – water holding capacity
WHO – World Health Organization
WS – wet season
WT – weed tolerance
YA – yield advantage
Zn – zinc
ZT – zero tillage

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Department of Agriculture
Philippine Rice Research Institute

PhilRice Central Experiment Station; Maligaya, Science City of Muñoz, 3119 Nueva Ecija
Tel: (44) 456-0277 • Direct line/Telefax: (44) 456-0112 • Email: prri.mail@philrice.gov.ph
PhilRice Text Center: 0920-911-1398 • Websites: www.philrice.gov.ph; www.pinoyrice.com

BRANCH STATIONS:

PhilRice Agusan, Basilisa, RTRomualdez, 8611 Agusan del Norte;
Telefax: (85) 343-0768; Tel: 343-0534; 343-0778; Email: agusan.station@philrice.gov.ph
PhilRice Batac, MMSU Campus, Batac City, 2906 Ilocos Norte;
Telefax: (77) 772- 0654; 670-1867; Tel: 667-1508; Email: batac.station@philrice.gov.ph
PhilRice Bicol, Batang, Ligao City, 4504 Albay; Tel: (52) 284-4860; Mobile: 0918-946-7439 ;
Email: bicol.station@philrice.gov.ph
PhilRice Isabela, Malasin, San Mateo, 3318 Isabela; Mobile: 0908-895-7796; 0915-765-2105;
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@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 Negros, Cansilayan, Murcia, 6129 Negros Occidental;
Mobile: 0932-850-1531; 0915-349-0142; Email: negros.station@philrice.gov.ph
PhilRice Field Office, CMU Campus, Maramag, 8714 Bukidnon;
Mobile: 0916-367-6086; 0909-822-9813
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: 0908-104-0855
Samar Satellite Station, UEP Campus, Catarman, 6400 Northern Samar; Mobile: 0948-800-5284