2015 National Rice R&D Highlights

- **BeRICEponsible Campaign**
- **Future Rice Program**
- **IRBAS**

Department of Agriculture
PHILRICE
PHILIPPINE RICE RESEARCH INSTITUTE

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A. Managing Rice Demand Through the Be RICEponsible Campaign

Program Leader: HV Antonio

Executive Summary

In order to help achieve rice self-sufficiency, increase in production should be complemented by managed consumption. Thus, the institute is still spearheading the Be RICEponsible campaign of the Department of Agriculture, which aims to enjoin all Filipinos in the achievement of rice self-sufficiency by encouraging them to be responsible rice consumers – RICEponsible, that's is.

During the year, the following projects were conducted in order to push for RICEponsible consumption.

Advocacy promotion

HV Antonio, MC Castano, AP Gomez, DGB Vendivil, and GM Rellegue

The Be RICEponsible campaign was promoted during 13 different festivals through presentations, song rendition, exhibit, and display of collaterals reaching thousands of consumers. It was also promoted in different mass media such as TV and radio. Specifically, there were about 10 TV interviews and 12 radio interviews that featured the campaign. Different print ads and news also came out in broadsheets and online, thereby increasing audience reach. Hundreds of thousands of globe, smart and sun subscribers were also sent text messages enjoining them to be RICEponsible in their own ways. Led billboards of AFP and MMDA in EDSA were also used to promote the campaign messages for three to six months, thereby reaching about half million vehicles a day. All these media exposure were done through partnership, and are thus, free; saving the government a great deal of money.

Events were also conducted to promote the campaign in PhilRice Central Office and in all branch stations. This includes the conduct of a forum and exhibit at the congress in order to get policy support, exhibits, contests, seminars, concerts, ceremonial harvesting, and the continuous exhibition at the National Museum and Mind Museum. The advocacy promotion peaked during the National Rice Awareness Month in November with the theme BROWN4goood (Be RICEponsible in your own way now 4 good) wherein all DA offices conducted their various activities. All government offices were also encouraged to display tarpaulin or streamers and participate through different activities. For the third year, the brown rice and rice mix days were also celebrated that enlisted the participation of

about 50 food establishments in Manila alone. Cooking contests featuring healthy rice, feeding programs, mall exhibits, and the simultaneous nationwide run4rice were also staged to promote the advocacy.

The campaign was also promoted through presentations in about 20 different meetings, conferences, and events both by DA, other government agencies, NGOs and private agencies. About 10 other exhibits and two marathons also featured the advocacy.
Finally, the search for RICEponsible champions was initiated with 34 contestants for Most RICEponsible schools; 15 for municipalities; and 10 for provinces and cities.

Promotion Through Partnership
HV Antonio, AP Gomez, and DGB Vendivil

The campaign was promoted through different means for free because of the partnerships forged for the Be RICEponsible campaign. In 2015, there were about 100 government, non-government, and private organizations actively promoting the campaign to the public through their different services to their different clienteles.

Among the Notable partnerships were with Mr. Piolo Pascual and Ms. Lucy Torres-Gomez who are serving as campaign ambassadors for free.

Lobbying for Policy Support
HV Antonio, AP Gomez, and DGB Vendivil

In addition to the about 50 existing provincial, city and municipal ordinances, additional local ordinances were institutionalized in 2015. These include three half cup of rice ordinances and three brown rice resolutions. On the other hand, some other three ordinances and five resolutions are still on-going deliberation.

Development and production of knowledge products, collaterals and other information sources
HV Antonio, AP Gomez, DGB Vendivil, and MM Prado

In order to promote the advocacy, different information and communication materials were produced for print, web, and audio-visual resources. Particularly, 3 video and radio ads featuring the campaign ambassadors were produced for free. Designs for 2 flyers, 6 t-shirt, 16 baller IDs, 8 stickers, keychain, 4 umbrella, 15 billboard, 2 fans, and 2 poster designs were given to DA offices and other partner agencies for production.

Various info ads were also designed for the web and social media. Finally, the Q&A for brown rice was also packaged for printing.

Research studies on Demand
HV Antonio, MC Castano, and DGB Vendivil

In order to find out the table wastage of rice in food establishments, a research in partnership with the Hotels and Restaurants Association of the Philippines was conducted. Results show that the wasted rice of each customer is nearly two tablespoons, or 10 grams of uncooked rice. The study further shows that the total rice wastage per week is 620.93 kilograms.

A study on the efficiency of the implementation of the half cup of rice in Cebu City was also conducted. Results of the study showed that out of the 22 food establishments only 15 (68%) are aware of the half-cup ordinance and are thereby implementing it. But out of the 15 who said that they are already serving half-cup rice, only 6.7% included the half-cup of rice in their menus. Some 13%, on the other hand, are still waiting for their new menu to come while the rest will still discuss the matter to their head office. Similarly, only 13% made efforts to inform their customers about it. The rest (87%) are only serving half cup rice when requested by customers. When the food establishments were asked for their reasons for not fully complying with the ordinance, 15 food establishments (68%) said they are not informed of the other rules because they were not given a copy of the ordinance while the rest (32%) said that they are not aware of the ordinance at all.

The baseline data for RICEponsible Champions was also gathered to get the impact of in-house campaigns to the awareness and behavior of consumers in each local institution.

B. FutureRice Program

Program Leader: RF Barroga

I. Rice Innovation Center

Project Leader: RF Barroga

The rice farming industry abounds with many potential innovations and technologies harnessed with different promotional strategies for upstream and downstream communication. However, these developments are often promoted and adopted separately, leaving out the advantages of creating a rice farm or rice-based business in which the components creates synergy and therefore increasing profitability, sustainability and productivity. Thus, this project aims to create a demonstration of a rice farm with an efficient integration of various smart farming practices and components and encourage farmers and rice stakeholders to adopt the same or improved integration

Knowledge Management on Clean GPS

JLZA Libed and RF Barroga

This study collects information on the application of Clean GPS technologies from farm innovations on natural farming practices to advanced tools and techniques. It also includes collection of success stories on agritourism and agripreneurship in the Philippines.

Highlights:

- Published 100 copies of the book "Agritourism Farms of the Philippines" featuring nine (9) farms from Luzon and Mindanao.
- Visited and documented five (5) successful farms to be featured in the second volume of the agritourism book: Penalosa Farms, Rosa Farms, Saret Organic Farmville, RM Cares Organic Farming Training Center, LAC Farms, CLSU Hydroponics and Aquaponics.

Figure 1. A) Agritourism book (version 1), B) Farm visit to CLSU Hydroponics, and C) Farm visit to Penalosa Farm.

Use and application of appropriate farm machinery for farm operations
RF Barroga and MRO Anora

Highlights:

This study promotes the use of farm machineries through demonstration by giving emphasis on its practicality in providing aid to our farmers in the different operations in the field.

This 2015, FutureRice has demonstrated the use of the following machinery during the DS and WS Lakbay Palay, AgRiDOC training, internship of agriculture students (April-May), during visits of different farming communities and media personnel:

- Combine harvester
- Mechanical transplanter
- Riding type leveler
- Rotary weeder

Figure 2. A) Combine harvester demo, B) Combine harvester demo (AgriDOC), and C) Riding-type leveler demo (AgriDOC).

Use and application of clean energy systems for farm operations
RF Barroga and MRO Anora

Highlights:

This study demonstrates the use of clean energy systems in different farm operations to showcase its long-term benefits. Its target beneficiaries are cooperatives and farming communities that can collectively acquire these systems.

The following clean energy systems were acquired and showcased at the farm:

- 1 kw solar powered water pump (AGFUND)
- Biogas digester (PHILSCAT and REMD)
- Bioethanol-powered water pump (REMD)

Figure 3. A) Solar powered water pump, B) Biogas digester, and C) Bioethanol powered water pump.

II. Development of Model Farm for Future Farming Scenarios

Project Leader: RF Barroga

Demonstration of Rice and Rice-Based Farming Innovation

MROAnora and RF Barroga

The objective of the study was mainly to demonstrate and test rice and rice based farming innovations. It was divided into three (3) categories which includes high tech farming, natural farming and new cropping innovations.

Highlights:

1. High Tech Farming

   a. Nutrient Management App- (ASPPD-AOVCapistrano & JJEAungon, FRP- MROAnora & RFBarroga)

   - Demonstration of decision support tools Rice Crop Manager and Minus One Element Technique App. A randomized complete block design with four replications was established for RCM, MOET App, and Farmer's practice. The study focused on the net income of farmers can get using the apps.
   - Results in wet season 2015 was not included as rice plant was hit by successive Typhoons during flowering and early grain stage.
   - In Dry season 2015, MOET App had the highest yield at 3.8 t/ha followed by farmer's practice at 3.42t/ha and RCM at 3.26t/ha.
   - In terms of savings in fertilizer use, using MOET app gave a savings of P195 over RCM app, and P3,100 over farmer's practice.
   - While MOET app produced the highest yield and savings in the cost of fertilizer, the differences were

not statistically significant.
- There is strong correlation between the high incidence of whitehead (about 43-45%) and decreased yield.
- Further evaluation of the apps is therefore recommended.

b. Hybrid Demonstration Using RCM- MROAnora, RFBarroga

- Three (3) hybrid varieties from private entity were established to demonstrate its yield performance using Rice Crop Manager (RCM). Hybrid Mestizo 19 should be included in the demonstration however availability of seeds restricts the researchers options instead an inbred variety was established to serve as a comparison.
- Damage brought by Typhoon Kabayan and Lando hindered the researchers to gather and analyze data statistically.
- Yield data showed that inbred variety NSIC Rc214 had the highest yield of 8.73t/ha while hybrid Pioneer PHB77 had 8.08t/ha followed by SL-8 at 6.91t/ha and Arize at 6.31t/ha.
- Inbred NSIC Rc214 had shown a 0.65t/ha increased in yield compared to Pioneer PHB77.
- Grain weight of inbred NSIC Rc214 was heavier compared to hybrid varieties.
- Data on Pioneer indicated that it had the highest number of spikelet per panicle compared to other hybrid and inbred varieties.
- Higher panicle and spikelet number were observed in the SL-8 Hybrid.
- Arize had the highest percentage of filled spikelet at 66%, a 10 to 25% larger compared to other varieties.

2. Natural Farming

a. Organic Rice Farming- EFJavier, XXGStoDomingo

- Two (2) set-up of organic rice farming had been established in two (2) different environment. First, the use of water management technique known as alternate wetting and drying (AWD). Second is the submerged environment.
- In the first set-up, rice straw and chicken manure were applied during land preparation (14 days before transplanting) and incorporate azolla as topdress at 30 DAT and panicle initiation.

The second set-up, vermicompost was applied a week before transplanting and incorporate azolla in the same time period also. Variety used is inbred PsB Rc82.

- Initial results of the study showed that under submerged condition, PsB Rc82 had the highest yield on the set-up Rice Straw + Chicken Manure at 4.22t/ha while vermicompost set-up had a 4.06 t/ha only. On the contrary, vermicompost set-up in AWD environment yielded .06t/ha higher compared to rice straw + chicken manure set-up.

b. Natural Farming- Habitat Manipulation: Evelyn M. Valdez & Gertrudo S. Arida

Reduced Tillage: Julian C. Macadamia, Ruben B. Miranda

- Habitat Manipulation (HB) and Reduced Tillage Technology (RTT) have been established in dry season using Hybrid variety NSIC Rc202 (M19) and Inbred NSIC Rc222 in wet season 2015. A control set-up served as a comparison for these technologies.
- In dry season 2015, conventional farming had the greater yield per hectare at 4.42t/ha compared to HB at 3.24t/ha and RT at 2.66t/ha. Lower yield return was attributed to the high incidence of whitehead ranging from 30 to 40%.
- Conventional Farming had the largest expense in fertilizer, land preparation and pesticide application as compared to HB and RTT.
- HB spent the lowest in the use of pesticide especially herbicide.
- RTT had the lowest yield return at only 2.66t/ha compared to 4.4t/ha of conventional. Lower expense in land preparation of RTT reduced its overall cost. Oppositely, RTT in wet season had the highest yield per hectare at 5.05t/ha compared to CF at 4.8 t/ha and HB at 4.2t/ha.

3. Cropping Management Innovations - MROAnora, RFBarroga

a. Soil Conditioner (Compostar)

A field check was conducted to identify if there is a significant difference in yield using soil conditioner branded as composter. A Randomized complete block design with four replications were established. Inbred NSIC Rc160 served as a test plant for the study. The first set-up is the controlled variable and the second one is the treated variable where compostar is incorporated in the final harrowing/levelling at

a rate of 5000 kilos per hectare. Initial results of the study showed that soil conditioner set-up had a significantly higher number of tiller per sqm at 42tillers and 36tillers for the control set-up. However, yield and yield component analysis is not statistically significant. Compostar had a yield of 5.16t/ha while control is 5.64t/ha.

b. Bio-Fertilizer (Hakate)

Using Inbred NSIC Rc222, two (2) set ups were established to check the effect of biofertilizer (Hakate) in increasing rice yield. Hakate served as foliar fertilizer of the rice plant in a 50:50 ratio with synthetic fertilizer (recommendation suggested by Hakate Technician). Hakate set-up was 0.48t/ha lower compared to control set-up yielded at 4.68t/ha. Though yield component analysis is not significant, it was observed that Hakate had a higher panicle and spikelet number produced. But its filled spikelet and grain weight is lower compared to control set-up. One possible reason is the reduced amount of N-fertilizer Applied in Hakate Experiment. Another trial will be conducted in dry season 2016 with different ratio of synthetic ratio and hakate applied.

c. Green Manure - EFJavier, AJ Espiritu

Green manure will served as an input in organic rice production. Two types of green manure were established last dry season 2015. Six sesbania spp and nine Aeschynomene were planted in the farm. Agronomic data were gathered to check the growth and performance of varieties planted. Initial results showed that there were two sesbania that have showed better crop stand in terms of branching and leafiness and one (1) aeschynome with good growth compared to others.

4. Other Field Demonstration

- Demonstrated five (5) Korean varieties and seven (7) aromatic rice
- Showcased Rice Farming with Azolla in the Paddy
- Seed Increased of Traditional Varieties was demonstrated in the farm through the Genetic Resource Division
- Production of tomato and pepper were showcased in the farm.
- Three (3) large beds of floating garden were displayed.

Economics of Rice and Rice-Based Farming System
MROAnora and RFBarroga

The study aimed to determine the profitability of selected technologies demonstrated. Cost and Return Analysis of Habitat Manipulation (HB), Reduced Tillage Technology (RTT) and Conventional Farming were the main focus of the study.

Highlights:

- Yield per hectare in dry season 2015 is lower as compared to wet season because of the high incidence of stemborer infestation in PhilRice CES and even in the nearby communities. Incidence was beyond the economic threshold level.

- In dry and wet season 2015, highest cost of production were observed in CF, followed by HB and RTT. This is due to higher expense in land preparation compared to RTT and use of herbicide compared to HB.

- CF recorded the lowest cost per kilogram produced in dry season at 11.85Php compared to HB at 16.18 Php and RTT at 18.56 Php. This is due to lower yield return of HB and RTT.

- In wet season 2015, NSIC Rc222 yielded the highest at RTT (5.05t/ha) followed by CF at 4.84 t/ha and HB at 4.23ts/ha. Same in dry season 2015, total expense was highest at CF, for higher land preparation and pesticide expense, followed by RTT and lowest at HB.

III. Advocacy and Capacity Building of Rice Farming Communities

Project Leader: RF Barroga

To share new knowledge about clean, green, practical and smart farming entails an effective participatory communication among rice stakeholders and farming communities. The key messages must be as effective as the communication media used to gain significant impact to the intended participants. Thus, this project focuses on engaging the community in its communication efforts divided into three different studies.

Courseware development for the rice academy
JLZA Libed and RF Barroga

- This study is in collaboration with the training program of Project IPaD of AgRiDOC. FutureRice hosts their rice boot camp as well as their vegetable production area. In 2015, there were two (2) batches of AgRiDOC trainees that graduated – one for each planting season. Integrated also in the program of Project IPaD is the training for out-of-school youth of barangays Maligaya and Mabini.

- The Project IPaD also holds Agikapihan sessions at the FutureRice farm where farmers are invited to discuss their best practices, and solutions to some of the common problems in rice plant care. The FutureRice team assists in organizing these events and takes care of the Rice Crop Manager processing where farmers are given recommendations for better nutrient management.

- A season-long training for out-of-school youth of Brgy. Maligaya was also conducted during the wet season. Proper machinery use, nutrient management, hands-on experience and high-tech farm technologies are among the smart farming practices included in the training.

- Under this study is also the construction of the Farmer's eCenter, Information center, two (2) learning sheds and restrooms (funded by Project IPaD) which will be used for providing services to farmers such as holding seminars and trainings.

- This study also works on the development of learning materials for farmers such as the brochures for guide in organic rice farming, Rice Crop Manager and also the different Clean GPS technologies and practices applied in FutureRice farm for DS and WS.

Figure 4. A) AgriDOC in rice boot camp, B) Barangay Maligay out-of-school-youth training, and C) AgriDOC Agrikapihan at Future Rice farm.

Promotion and campaign of Clean GPS farming technologies
JLZA Libed and RF Barroga

This study promotes the different Clean GPS farming technologies and practices applied in FutureRice farm. It utilizes both the traditional media and social media and increasing public awareness.

Highlights:

- Strengthened its presence in social media generating approximately 1,000 likes on Facebook; Posted Clean GPS techniques and updates on farm development.

- Maximized free media exposures as studies and technologies housed at the farm were featured in the following platforms and programs to reach a broader audience:

a. TV: PTV4, UNTV, Biyahe ni Drew;
b. Radio: DZAS, 95.1;
c. Newspaper: Philippine Star, Manila Times
d. Online News: Rappler, GMA News Online

- Conducted guided tours around the FutureRice farm and educated farm visitors about the showcased innovations and technologies aided by educational and promotional materials produced such as billboards, streamers, signages, and brochures.

- The FutureRice name and logo was registered in Intellectual Property Office

Figure 5. A) Billboard along Intan road, B) Rappler feature, and C) Biyahe ni Drew feature (GMA News TV).

Communication and social change issues in the use of Clean GPS
JLZA Libed and RF Barroga

Highlights:

This study focused on the development and pretesting of Rice Crop Manager campaign messages. The data gathering approaches were survey and focused group discussion participated by RCM focal persons in DA offices and PhilRice branch station staff. The campaign message that will be most favored in the study will be used in promoting this technology in the next planting season.

- There were three (3) options for campaign messages that were conceptualized based on the attributes that embodies Rice Crop Manager as a technology for rice farmers: "Konsulta Na!", "Swak 'to!", and "PalaySure".

- According to the gathered data from the survey conducted, the most important characteristic of RCM that needs to be highlighted in this campaign is its accurate recommendation for fertilizer management while the most important component in promoting this technology is its message or slogan followed by the endorser or person representing RCM. Moreover, seminars, trainings and print ads are the most effective way of promoting this technology to farmers.

- Furthermore, the "Swak 'to is also the most preferred campaign message according to the survey, followed by "Konsulta Na!" and "PalaySure". "Swak 'to!" was favored for its clarity, appeal, catchiness and the association of the cartoon image with the one on the actual RCM website/app.

Figure 6. Sample RCM promotional material.

Development of Rice Agritourism
JLZA Libed and RF Barroga

Highlights:
This study focuses on developing the FutureRice farm as the first rice-based agritourism farm in the Philippines. This basically emphasizes the possibility of creating other means of income aside from crop production through creatively attracting tourists and branching out into other agriculture-based income-generating opportunities.

- Among the attractions that were showcased this year is kayaking. PhilRice employees, Lakbay Palay visitors and other guests have enjoyed kayaking in the water impounding system of FutureRice while appreciating the view of rice crops surrounding the area. The kayakers were equipped with life vests.

- One of the major attractions this year was the rice straw sculptures made by interns from De La Salle-Araneta University, as part of their OJT program at FutureRice. There were 4 sculptures that were exhibited. This activity was also executed to reinforce the campaign against rice straw burning. To further promote this cause, there was a social media contest held to increase awareness and engage the target audience especially the youth.

- A major highlight for the agritourism component of the program is the rice paddy art in wet season 2015. The rice paddy art featuring the image of Dr. Jose Rizal used the varieties NSIC Rc222 and purple rice. This project was in collaboration with GRD. This caught the attention of several media outfits. The goal of this project is to encourage the rice farmers to get more creative in order to make their fields

more interesting which will eventually make way for more opportunities.

- FutureRice also held a tree-planting activity in September which was participated by PhilRice employees.
- Safety signages and farm labels were also installed.

Figure 7. A) Kayaking at the water impounding system, B) Tree planting, C) Rice paddy art, and D) Field tour.

IV. Farm Automation Thru the Use of ICTs

Project Leader: RF Barroga

Information and Communications Technology (ICT) is a versatile tool that can be adopted in different sectors including Agriculture. This project aims at showcasing different forms of ICTs applicable to rice-based farming systems.

Specifically:

- Promote and deploy existing ICT products and services ready for farmer use.
- Customize industry-based ICTs to fit in the agriculture system.
- Support development of advanced ICTs ready for agriculture research and product development (robotics, sensing, image & sound processing, intelligent system, etc.).
- Generate business startup ideas for ICT students, professionals and companies.

Development of an Electronic Farm Management App (FRP-005-001)

NL Caballong and RF Barroga

This study aims to design apps and models that will support economical precision crop production and intelligent farm enterprise management to enhance farmers' agripreneurial capability:

- Organized farm operations records.
- Matched cropping practices to plant status.
- Precise and site-specific input application.
- Strategic planning.
- Adaptation to climate change.
- Co-related farm data and information.
- Link to agriculture knowledge and information services.

Highlights:

- Developed AgriDOC App Google Map powered farm management interface. This app is used in managing the very basic layer of a farm, its physical land. It helps in creating farm and plot object duplicate in the real world to the digital dimension. It also provides rapid calculation of approximate area and elevation of the objects.

- Developed AgriDOC App farm task management app. Another layer involved in farm management are the activities and tasks done on farm, specifically crop production. This app allows users to plan and monitor tasks and activities for certain crop production cycle. It also provides special views for farm resource objects (personnel, supplies and materials and equipment).

- Installed network connectivity and CCTV at FutureRice Farm. Network connectivity is the basic necessity on executing automation on farm. This serves as connecting platform for all the instrumentations and devices that may be installed on farm. One of these devices are CCTV cameras.

- Won two research poster presentation awards - 3rd place at FCSSP 2015, 2nd place at Rice RnD Conference 2015.

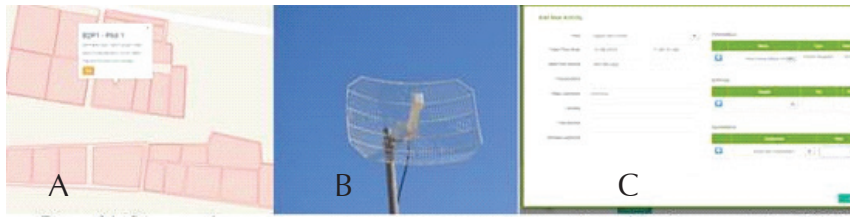

Figure 8. A) AgriDOC app Google Map-powered farm management interface B) Wireless point-to-point antenna connected to the Futurefarm area, and C) AgriDOC farmmanagement app interface.

Development of UAV-based Remote Sensing Platform for Rice RnD
NL Caballong and RF Barroga

Unmanned Aerial Vehicles (UAVs) are light weight aircraft that can carry different kinds of sensing payloads. These sensing devices can program to gather data and images from above while the UAV flies over rice fields and other plains. Then, the data and images collected will be processed using dedicated software into different forms of digital maps.

This study sponsors the establishment of application of UAVs, image processing and sensing systems in Rice RnD by:

- Providing training on drone flight navigation to interested users.

- Developing sensing system for different kind of research setups.
- Assisting researchers for the acquisition of their own drone.
- Complying with government rules and regulations regarding the legal use UAVs.
- Giving technical support.

Highlights:

- Worked on the specification and acquisition of equipment and materials needed for the establishment of UAV service for PhilRice researches. 2 units fixed wing UAVs and 1 unit quadcopter were acquired.
- Conducted two Droneshops, introducing the different uses of UAVs in agriculture, then gathering several proposals on the use of UAVs for:
  a. Crop health monitoring
  b. Agronomic data gathering
  c. Biotic and abiotic stress assessment
  d. Field mapping
- Concept proof - UAV imagery provides researchers and stakeholders better view of the farm to help them with the results of their experiments, make certain measurements, and make more sound decisions. One of the basic benefits of using UAV imagery is rapid measurement of damaged area is the plot. An example measures extent of damage at a rat infected area.

Figure 9. A) Droneshop conducted at PhilRice-CES (2015) and B) Visual comparison of Palayabangan Challenge plots.

Demonstration of Automated Water Management Technologies
NL Caballong, JL De Dios, AC Arocena and HD Cayaban

Water management as an essential key in rice farming can be assisted remotely through open-source electronics platform. This study showcases prototypes dedicated for efficient and effective water management of rice-based farming systems.

Highlights:

- Demonstrated the water level monitoring prototype model being developed at PhilRice Information Systems Division lead by Mr. Jovino L. De Dios. This device is a component of a bigger system, Field Water Monitoring and Control System. It uses Raspberry-Pi as the processing unit, ultrasonic sensor as the water level sensor and solar energy to provide electricity.

Figure 10. A) Components of the water level monitoring prototype model and B) Water level monitoring interface.

Demonstration of Advanced Land Levelling Technologies (FRP-005-003-2)
RF Barroga and NL Caballong

A well-leveled field has lots of benefits including:

- Efficient farm input application
- Improved water use efficiency
- Improved crop establishment
- Reduction of weed problems
- Improved uniformity of crop maturity
- Decreasing the time taken to complete task
- Reducing the amount of water required before and during land preparation

Laser and GPS technologies are some of the ICTs that can be used to level fields. This study re-activates the PhilRice laser land leveling equipment and showcase in actual operation.

Highlights:

- Through the help of PhilRice management, the PhilRice laser land leveler system was re-activated. Different equipment and implement were retrieved and are now being repaired.

- Some PhilRice personnel have undergone training at IRRI. The purpose is to expand understanding on different uses of land levelling and gain skills in actual levelling of land using laser leveler.

Figure 11. A) PhilRice laser leveler implements ready for re-activation and B) laser leveling process.

Demonstration of Weather Monitoring System for Agricultural Use
NL Caballong, MJP Ancheta, J Tallada and RF Barroga

PhilRice own several Automatic Weather Stations (AWS) used for research purposes. This study aims to extend the weather data captured and become useful to the surrounding community by developing a local weather service using AWS as data source, and develop a web-based monitoring app for ASTI-PhilRice weather stations.

- A working unit of Field Monitoring Station (FMON) was installed at FutureRice Farm. This device is capable of collecting weather parameters such as, air temperature, humidity, pressure, soil temperature, moisture, wind speed, direction, UV index and solar radiation. This FMON is part of a bigger network of weather stations managed by DOST-ASTI.

- Developed the web-based monitoring app. DOST-ASTI provides interface for viewing data gathered by FMONs but they also provide APIs to developers who wants to customize their own app. We developed our own viewing interface for PhilRice FMONs.

Figure 12. A) Installation of automatic weather station and B) Weather monitoring interface of PhilRice FMONs.

Figure 13. A) Pest and disease ID app implementation process and B) Rice plant disease identification through classification of microorganisms using fuzzy neural network from TUP-Manila.

C. Development And Establishment Of Palayamanan Plus-Nucleus Estate Strategy (PALAYAMANAN PLUS-NUESTRA) Palayamanan Plus; IRBAS

RGCorales, JMRivera, SE Santiago, PDO Roman and GA Bantolino

Innovative farming systems and management approaches have been developed recently that are consciously being organized to balance and optimize farm output, economic returns, environmental footprint, and social welfare, to improve the economic performance and productivity, and to prevent and mitigate the potential negative effects on natural resources.

In recent years, PhilRice actively promoted the Palayamanan System, a diversified integrated rice-based farming system directed towards farm diversification to increase farm productivity and profitability to address food security and economic instability of farm families.

The Palayamanan System is now upgraded into the Palayamanan Plus-Nucleus Estate Strategy (Palayamanan Plus Nuestra) - a model that consolidates small farm holders into a large-scale intensified rice-based production system directed towards increasing income and profitability in the rice environments through purposive integration and diversification of certain farming components to achieve higher level of intensification and allow higher crop productivity, enhanced resource use efficiency, and value-adding. The nucleus estate strategy (NUESTRA) provide the support services such as technology, capacity enhancement activities, custom services, enterprise development, financing and market access to the consolidated small farm holders as contract growers. The Palayamanan Plus-NUESTRA will spin-off rural agribusinesses or industries that can create employment and income-generating opportunities in the rice farming communities thus it can also be a poverty and unemployment reduction strategy.

PhilRice stations are strategically located in major rice producing areas and has a considerable rice and rice-based areas to be considered as a large scale production cluster that form as a nucleus that will spin-off the agribusiness activities with the surrounding rice communities.

The project components were crop production component (rice & cash crops), livestock production component (Duck & Chicken), mushroom production component and vermicomposting.

The project aimed to assess the productivity and profitability of the different project components and to fine-tune the concept into a working model before it will be expanded to the rice farming communities.

Highlights:

1. Rice and Cash Crop Production Component.
RG Corales and GA Bantonilo

- In 2015DS, the 1.0ha area of IRBAS was planted with Korean rice varieties Dasanbyeo (1,056kg), Saegyeginmi (1,132kg), Hangangchal 1,257kg), Taebaegbyeo (299kg).

- Other crops planted during the 2015DS were corn, mungbean and garlic. The yield of first crop corn in 2,000m^2 area was 738kg fresh green corn while the second crop produced 1,185kg. In a corn+mungbean cropping system after rice produced 378kg green corn + 27.75kg mungbean seeds in a 1,000m^2 area. Garlic-corn+mungbean cropping system (1000 m2) 170.02kg garlic, 91kg green corn and the mungbean was plowed under as green manure.

- In 2015WS, the IRBAS rice area was expanded to 4.25ha for seed production. During the season, 17,811 kg foundation seeds was produced valued at PhP1,387,440.00. The rice paddies were also planted with string beans (100 linear meter) with a yield of 77.5kg, bush beans (100Lm) 50.2kg and Okra (72Lm) 1.75kg.

2. Sorjan Production System Component.
PDO Roman and RG Corales

- Three Sorjan production models were developed and evaluated. The Vegetable + Fish Sorjan model has a total area of 1235m^2 with 8 raised beds @ 3m x 30m dimension. The pond area is 515m^2 and the bund dimension is 106Lm x 0.5m wide. The raised beds were planted with vegetables such as kangkong, pechay, eggplant, hot pepper, string beans, bush beans, mustard, lettuce, tomato, okra and amaranth. Tilapia was released in the pond and the bunds were planted with okra. The total income obtained in 2015 was around PhP34,000.00. The income attained was quite low because the soil in the raised beds are still in the process of conditioning and the fish released were lost because of heavy rains in the wet season.

- The Rice + Vegetable + Fish Sorjan model toal area of 1,000m2 with 4 raised vegetable beds @ 1.5m x 45m, 2 rice beds @ 3m x 45m. The pond area is 320m^2 and the bund area is 140Lm 0.5m wide. The vegetables planted were kangkong, jute, string beans, bush beans, sponge gourd, bitter

gourd, okra and squash. The income from the vegetables was around PhP14,000.00. Income from rice is PhP1,400 and tilapia PhP420. The total income was PhP16,027.000.

- The Vegetable + Gabi + Fish sorjan model with a total area of 1,160m^2, 6 raised vegetable beds with area ranges from 21 to 51m^2, gabi area 431m^2, pond area of 430m^2 and dike area of 69Lm. The vegetables planted were eggplant, kangkong, bush beans, ampalaya and okra with an income of 3,484.00. The gabi was not yet harvested and the fish was harvested by poachers.

3. Livestock Production Component.
JM Rivera and RG Corales

- The livestock component composed of duck and chicken production. There were 547 heads of mallard ducks grown during the first semester intended for egg production, however due to some issues regarding the procurement of feeds which affected the ducks, we had decided to dispose the ducks.

4. Mushroom Production Component.
SE Santiago and RG Corales

- The major activity in the mushroom production component is the production of oyster mushroom (Pleurotus florida). Around 29,900 fruiting bags of oyster mushroom were produced in 2015. Around 5,800 fruiting bags was sold at PhP20.00/bag with a value of around P116,000.00. Fresh mushroom produced was 1,400kg priced at PhP160.00/kg valued at PhP224,000.00. Grain spawn sold was 567 bags with a value PhP85,000.00 (PhP150.00/bag).

- Milky mushroom (Calocybe indica) was also produced. The 109 milky mushroom logs produced 40.5kg fresh mushroom valued at PhP8,120.00.

- There are 92 bottles pure culture and 18 bottles sub-culture of oyster, milky, Ganoderma, and straw mushroom being maintained.

- In addition to mushroom, 400 bags of carbonized rice hull (CRH) were produced as a by-product during pasteurization of mushroom fruiting bags. The CRH was used as soil conditioner in our vegetable production and some are sold at PhP30.00/bag.

5. Vermicomposting Component.
SE Santiago and RG Corales

- The vermicomposting component was not yet operational due to the delayed construction of the facilities. Non-the-less we produce more than 3,000kg in 2015. The vermicompost we produced was used in our vegetable production.

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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