PHILIPPINE RICE R&D HIGHLIGHTS 2012

Crop Protection Division

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Crop Protection Division

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Research goal of the Crop Protection Division (CPD) for 2012 focused on the development of technologies to help farmers improve their pest management decision-making toward rice self-sufficiency. CPD generated information for the development of safe, economical, environment-friendly, and sustainable pest management technologies. There are four CPD-based projects to address the above goal, namely: 1) Development of Decision Guides for Pest Management, 2) Ecological Engineering Towards a Sustainable Integrated Pest Management (IPM) Program in Rice and Rice-based Farming System, 3) Screening of Rice Advanced Lines for Resistance to Key Insect Pests and Diseases and 4) Monitoring and Profiling of Major Diseases. Researches for 2012 were directed on insect pests, diseases, and weedy rice including beneficial organisms in irrigated rice ecosystem.

Diversity of organisms in the ecosystem is favorable for a sustainable integrated pest management program. Population of beneficial organisms and arthropod diversity index were generally higher in the rice field of Palayamanan compared to other areas. Palayamanan served as refugia for beneficial organisms either as source of food, resting place, or for reproduction. Beneficial organisms like predators were observed even after harvest of the rice crop. These natural enemies were found in rice stubbles and weeds in bunds and field margins. The presence of perennial plants in field margins that persist within or between years could also serve as good shelter for natural enemies during off-season of rice production.
Weedy rice is an emerging pest in irrigated rice ecosystem especially in Iloilo. Rice fields in Occidental Mindoro and Aurora province were surveyed for biotypes of weedy rice. In the dry season, weedy rice was recorded in Occidental Mindoro and in Aurora during the wet season. Recorded weedy rice biotypes have either erect or horizontal leaves, with or without awns with red pericarp.

Whitebacked planthopper (WBPH) is becoming an important pest of rice in some parts of Asia particularly in China and Vietnam. They attributed this to wide-scale planting of hybrid rice in those countries. Results of our study on rice planthoppers showed that white-backed planthopper population was slightly higher in hybrid rice than in inbred rice. In inbred rice, the populations of brown planthopper (BPH) and WBPH were almost similar although there were times when the number per hill of BPH was higher than WBPH. However, field population was low and it was difficult to have a concrete conclusion. There was no shift in importance of these two species of planthopper based on our light trap catches inside the Central Experiment Station (CES) of PhilRice.

Host plant resistance is the most economically and environmentally sound pest management strategy. It is compatible with other management strategies like biological control. There was a continued collaboration between our researchers and plant breeders in the screening of rice varieties for resistance to major rice diseases and insect pests. Induced evaluation was conducted for blast in the screen house. Field evaluation for other major rice diseases including bakanae, blast, bacterial leaf streak, and tungro was conducted inside CES. Newly released rice varieties and recommended for planting were evaluated for various rice blast isolates maintained in the laboratory. Most of the varieties showed 100% resistant lesions to several blast isolates suggesting that these recommended varieties are still resistant to these blast isolates. These blast isolates were collected and isolated from various parts of the country. Screening for resistance for brown planthopper and green leafhopper (GLH) were conducted in the greenhouse while screening for resistance against stemborer was conducted in the field. Pest profiling was conducted in 15 municipalities served by NIA-UPRIIS 1 and 4. Most of the insect pests recorded were rice planthoppers and leafhoppers, rice bug, and stemborer. Only damage due to stemborer was expected to cause significant loss in yield. Among the rice diseases, sheath blight and false smut were recorded as emerging pests in the area. Research Plans of CPD for 2013 include studies on golden apple snail and on emerging pests like late season defoliators, sheath blight, and false smut diseases of rice.

I. Development of Decision Guides for Pest Management
VV Casimero

Assessment of the populations of brown planthopper (BPH) and whitebacked planthopper (WBPH) and natural enemies and possible shift in pest status of these planthoppers in a hybrid rice farming community
VV Casimero

Field problems have been becoming more complex through the years as new constraints emerge making pest management more difficult and challenging. The shift in the pest status of rice planthoppers is an example. Both brownplanthopper (BPH), Nilaparvatalugens, and whitebacked planthopper (WBPH), Sogatella furcifera, were previously considered as secondary pests in rice but became major pests due to ecological perturbations caused by insecticide applications. The BPH used to be more dominant over the WBPH but climate change and significant development in rice cultivation practices like intensive cultivation of hybrid rice, cropping system, over-application of fertilizers, and misuse of pesticides reversed the pest status of these species. This study aimed to determine temporal shifts in the pest status of BPH and WBPH and document farmers' pest management practices in hybrid and inbred rice farming communities.

Highlights:

- Ten hybrid and 10 inbred farms in Brgy. Mabini, Santo Domingo in Nueva Ecija were visually sampled during 2012 dry season (DS) to monitor populations of BPH, WBPH, and their natural enemies. SL-Agritech varieties (SL-8H, SL-9H, SL-18H) were planted in nine farms while LongPin 331 was established in one farm through transplanting method from January 4-12, 2012. PSB-released varieties were dominant in the inbred farms established also through transplanting method from January 4-13, 2012.

- BPH and WBPH were not observed at 30 days after transplanting (DAT) in both hybrid and inbred rice. Their early populations may have been either late or contained by their natural enemies dominated by coccinellids, damselflies, and spiders. Few green leafhoppers (GLH) were observed during this stage.

- At 45 DAT, populations of BPH and WBPH were very low (<1 individual/10 hills) probably due to the increasing numbers of coccinellids, damselflies, and spiders which were the dominant groups of natural enemies. At this stage, GLH mean population was 2.67 individuals/10 hills in hybrid rice and 3.22/hill in inbred rice.

- At 60 DAT, average number of WBPH in hybrid rice was 17/10 hills, almost double with that of the BPH at 10.08/10 hills. This implies that the WBPH was more dominant than the BPH. On the other hand, WBPH number (3.22/10 hills) in inbred rice was almost equal to the number of BPH (4.11/10 hills), suggesting no dominant species in inbreds.

- The number of BPH in hybrid rice (10.80/10 hills) at 60 DAT was more than twice compared to that in inbred rice (4.11/10 hills). For WBPH, the number in hybrid rice (17.00/10 hills) was five times more than the number in inbred rice (3.22/10 hills).

- Although the coccinellids, damselflies, and spiders remained dominant at 60 DAT, Cyrtorhinuslividipennis, an important natural enemy of BPH and WBPH appeared as populations of these planthopper species increased.

Survival of natural enemies during rice off-season.
GS Rillon

The off-season of rice production provides a harsh environmental condition to natural enemies due to limited availability of resources for natural enemies to seek refuge. The challenge is how to provide a system that will support the natural enemy population with resources such as food for adult natural enemies, alternative prey, shelter, and habitat between seasons. Furthermore, this process may be manipulated to encourage early season activity of natural enemies to increase their effectiveness.

Highlights:

- Many species of natural enemies were observed in the field even after harvest of rice crop. The natural enemies are composed of spiders such as Tetragnatha, Oxyopes, Pardosa, Callitricia, and other spiders. Other natural enemies Micraspis, Cyrtorhinus, Conocephalus, Metioche, and parasitoids were also found abundant (Figure 1).

- These natural enemies were found in rice stubbles and weeds in bunds and field margins. The common weed species observed in bunds during the off season of rice production include many species of broadleaves (Mimosa indica, Ludwigiaoctovalvis, Corchorus, Amaranthus, Cleome rutidosperma, Commelinadiffusa, Physalis, Phyllanthus, Malachra, Portulaca, Trianthema, Ipomeatriloba, Commelina, Ageratum conyzoides, Ecliptaprostata), grasses (Brachiariamutica, Cynodon, Echinochloaglabresecens, Echinochloacolona, Ischaemumrugosum, Dactyloctenum, Digitaria, Elusine) and sedges (Cyperusrotundus and Fimbristylis).

- During field monitoring, it was observed that farmers often cut vegetation in bunds during land preparation. Too early cutting of vegetation in bunds usually displaced natural enemies. When there is no vegetation in bunds, the natural enemies and their prey or host populations had to move out of the field. Hence, it is suggested that only partial cutting of weed cover must be done leaving enough vegetation as refuge for natural enemies. Another consideration is to cut and clean weeds in the bunds and nearby vegetation only after rice crop establishment. This can move many natural enemies from the bunds and field margins into the newly established rice fields so that they will be present in the early season of rice production and before pest population build-up.

- Another aspect is looking at the species of weeds that are really in conserving natural enemies in the field during fallow period. As grasses could serve as hosts of rice insect pests and as alternate hosts of some diseases, broadleaf weeds could provide the alternative host, flowers as source of pollen or nectar, as well as microhabitat for natural enemies during non-rice periods.

- The presence of perennial plants in field margins that persist within or between years could also serve as good shelter for natural enemies during off-season of rice production.

Figure 1. Many spiders and coccinellids were found in bunds.

Survey and characterization of weedy rice biotypes in Central and Southern Luzon
EC Martin

The study focused on determining the distribution and extent of weedy rice infestation in Central and Southern Luzon. It also determined the morphological and other agronomic characteristics of weedy rice biotypes present in those areas through survey. During ripening stage, different rice field areas of San Jose, Occidental, Mindoro were surveyed for possible occurrence of weedy rice. Type of rice establishment, number of panicles/plant and number of hills/m of weedy rice present were recorded. Collections of samples were also conducted for morphological characterization in the laboratory.

Highlights:

- The 2012 DS survey results in six villages in San Jose, Occidental Mindoro show that biotypes of weedy rice present have either erect or horizontal flag leaves.

- Biotypes present have a mixture of medium to long awns or without awns, and possessed light yellow to dark brown hull with red pericarp.

- Wet season results show that there were four biotypes of weedy rice present in six barangays of Aurora.

- All biotypes present have horizontal flag leaves, short to long awns with red pericaps.

Farmers' Knowledge and Practices on Weedy Rice: A comparison among affected areas in Iloilo, Philippines
EC Martin, IR Tanzo, and BS Chauhan

Weedy rice is a serious threat in direct-seeded rice as it competes with cultivated rice, decreases crop yield, reduces market value of harvested crop due to contamination, and where cost of control can be expensive. A survey was conducted in February 2012 in the municipalities of Dingle and Barotac Nuevo in Iloilo to study the knowledge and practices of rice farmers on weedy rice. The chosen sites were the most weedy rice (WR)-infested municipalities in the province. Two villages were purposely selected for each municipality: one village represented the most affected (MA) area by WR while the other was the second most affected (SMA) and adjacent village to the MA. For Dingle, the MA village was Sinibaan and the SMA village was San Matias. For Barotac Nuevo, the MA village was Talisay and the SMA village was Agcuyawan. A total of 90 farmers were randomly surveyed.

Highlights:

- Farmer respondents were in their mid-fifties. The youngest respondent was 25 years old and the oldest was 82 years old. There were a bit more female respondents (53%) as compared to men (47%). The respondents had an average of10 years of educational experience or had at least reached high school.

- The respondents from the MA village were dependent on farmer/exchange seeds (70%). For the SMA village, more than half (52%) of the farmers used certified seeds, followed by farmer/exchange seeds (38%).

- Knowledge of farmers on the attributes of WR that needed to be corrected were: WR is not a weed but a type of rice; WR always has awns; WR does not consume more fertilizer; flag leaves of WR are always drooping; and WR grains are all color red.

- Knowledge of farmers on the management or control of WR that needed to be corrected included: rotary weeder/cultivation does not reduce WR; early flooding has an effect on WR infestation; deep plowing will not reduce WR; and clearing field or irrigation canals does not limit infestation.

- Knowledge of farmers on the problems or effects of WR that needed to be corrected included: weedy rice mixture does not have an effect on the milling cost; weedy rice does not reduce the market value of the harvested rice; and weedy rice does not affect the yield of cultivated rice.

- Majority (82%) of the farmers from the MA village depended on rouging to manage WR. Farmer's from the SMA village depended on rouging (37%), transplanting (23%), and thorough land preparation (20%). Farmers from both areas did not depend on/use herbicides because they think that (1) herbicides were not effective for WR, (2) there were no herbicides yet for WR, and (3) herbicides were for weeds only.

- In summary, farmers' knowledge of weedy rice did not differ much from both villages. Both had almost the same trends as to what they think were true and false about weedy rice. The only significant difference was farmers from SMA villages knew that WR is a weed in rice which may possibly contribute as to why they are not the most affected village (another factor may be the use of certified seeds by the farmers from SMA villages). The need to correct these perceptions is important or else management of WR will be difficult and its infestation may even worsen.

Integrated weedy rice management in direct seeded rice in Iloilo
EC Martin

The adoption of direct seeding culture makes weedy rice infestation one of the most serious and costly problem of rice growers in Iloilo Province. This was because majority of farmers do not know the importance of thorough land preparation and use of clean seeds. With the rapid increase in the number of fields infested with weedy rice and the infestation becoming more severe compared to the last decade, this weed is a serious threat in rice fields. Aggressive and concerted effort to educate extension workers and farmers about the impact of weedy rice must be done. Weed control measures to mitigate the spread of weedy rice have to be developed and adapted with farmers. The effectiveness of weed control strategy, however, depends not only on the control measures employed but also upon knowing the basic information on the biology and characteristics of the weed.
This activity focused on increasing efficiency of rice production by testing and adapting a promising integrated weedy rice management (IWRM) method in farmers' field in Iloilo province. It also aimed to document farmers' current weedy rice management practices, perceptions, and information sources in relation to direct-seeded rice as well as to understand the sources of weedy rice infestation in farmers' field.

Highlights:

- 100 farmers including extension workers from Dingle and Barotac Nuevo were invited to attend the "Appreciation Seminar on Rice Production with Emphasis on Weedy Rice Management"

- Brochures, leaflets, and video about weedy rice and its management were developed

- On-farm trials were also conducted in Barotac Nuevo, Iloilo.

Distribution, occurrence, and survival frequencies of herbicide resistant weeds

LM Juliano and EC Martin

Weeds are major biotic constraint to rice production. The onset of herbicide resistant Echinochloa spp. already confirmed in direct seeded areas of Nueva Ecija and Iloilo (Juliano et al, 2010) further hinders farmers to increase yield due to complex herbicide resistance management issues. The 10-20% savings from crop loss due to weeds could add 0.3 - 0.6 t/ha in rice yield, equating to more income for farmers. The International Survey on Herbicide Resistant Weeds (http://www.weedscience.org) recorded321 species (185 biotypes) of resistant weeds in over 290,000 fields worldwide.. In rice, researchers observed more than 30 weed species that have evolved resistance to herbicides in all rice growing areas (Valverde and Itoh 2001). In the Philippines, herbicide resistance research on weeds associated with rice was documented in the 1980s. After the work of Sy and Mercado (1983) and Migo et al (1986) on Sphenocleazeylanica, no studies on herbicide resistance were further reported.

The shift from transplanted rice to direct seeded rice has enabled grass weeds to dominate. Intensive monocropping in direct seeded areas prompted farmers to use herbicides as their frontline defense against weeds. In fact, average usage of an effective herbicide is eight years like in the case of butachlor+propanil (Juliano 2006, unpublished). Thus, there is a high probability that weeds have developed resistance to herbicides since resistance can develop in four to ten years prior to herbicide application. Farmers have been reporting several weed species that are no longer controlled by the recommended rates of herbicides, thus, increasing their application number and herbicide dose.
This scenario implies the need to determine the extent of herbicide resistant weeds in rice producing areas. The information gathered will further provide necessary inputs to farm management initiatives especially with herbicide resistance management.

Highlights:

- Collection of materials was done in Sta. Barbara and Asingan towns in Pangasinan. Four samples of Echinochloa crusgalli and two samples of Echinochloa glabrescens were collected from two villages. The survey involved a total of 10 hectares. In Tarlac, the municipalities of La Paz and Concepcion were surveyed and three populations of Echinochloa crusgalli were collected. Total area surveyed was six hectares. In both provinces, the dominant herbicides included butachlor, pretilachlor, and bispyribacsodium. The samples collected were initially pre-germinated in petri dishes, however, low germination was achieved. Screening and dose response assays will be conducted later.

Resistance of popular rice varieties to Magnaporthegrisea Herbert Barr., the rice blast fungus from different rice growing areas in the Philippines
FA Dela Peña and L Sumabat

It has been observed in previous studies that race-specific resistance to rice blast pathogen could not yield durable resistance. More so, Philippine rice varieties have different disease reaction to the rice blast fungus depending on the location. This study used existing rice blast fungal isolates collected in different rice growing areas in the Philippines to analyze the resistance of popular rice varieties. This is to determine which varieties are suitable in specific areas to minimize the incidence of the rice blast disease, thus, maximize rice productivity.

Highlights:

- Rice varieties and their reactions to different blast isolates were presented in Table 1. In the inoculation of LI1 which was isolated from irrigated rice (NSIC Rc216) in Luzon, there was reddening of the leaves, ranging from yellow to reddish color. The manifested lesions were not prominent as there was burning of leaf tips. Generally, etiolation was observed which may be due to the under optimized light condition. Susceptibility was observed in some varieties though not the very typical symptoms. The blast isolate, DI12 isolated in irrigated rice in the Visayas showed significant manifestation of symptom and reaction. All others did not give any reaction to the rice varieties tested.

- Rice varieties NSIC Rc122, Rc158, Rc172, Rc280 and PSB Rc14 showed 100% resistant lesions, NSIC Rc128, Rc216, and Rc212 showed 90% resistant lesions, NSIC Rc21SR and NSIC Rc274 showed 60% resistant lesions while NSIC Rc214 showed 90% susceptible lesions, NSIC Rc148, Rc152, and PSB Rc82 showed 80% susceptible lesions in reaction to the blast isolate.

Table 1. Summary of the disease reactions of the different blast isolates as inoculated in the popular rice varieties (2012)

Rice Variety	Blast Isolate													
	LI1	DI12	D14	DI15	DI20	DI21	DI22	DI23	DI24	DI25	DI26	DI27	DI28	DI29
NSIC Rc128	S	9R;1S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc148	-	2R;8S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc160	-	2R;5S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc214	-	1R;9S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc138	S	1R;1S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc122	-	10R	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc152	S	2R;8S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc144	-	1R;2S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc222	S	8R;2S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc216	-	9R;1S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc158	S	10R	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc212	-	9R;1S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc172	-	10R	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc154	S	2R	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc146	-	8R;2S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc238	-	5R;5S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc240	-	5R;5S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc280	-	10R	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc21SR	-	6R;4S	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc274	-	6R;4S	-	-	-	-	-	-	-	-	-	-	-	-
PSB Rc82	-	2R;8S	-	-	-	-	-	-	-	-	-	-	-	-
PSB Rc14	S	10R	-	-	-	-	-	-	-	-	-	-	-	-

"-" signifies no disease reaction at 7 days after inoculation with conidia count 105spores/ml.

Management of common rice paddy eel (CRPE) (Monopterusalbus) under Philippine rice ecosystem
LV Marquez, EC Martin, and FA Dela Peña

Common rice paddy eel (CRPE) was reported to affect rice cropping in Nueva Ecija, Negros provinces, and Isabela. Eel bore holes in rice levees result in water loss due to seepage. Problems on poor water retention further cause poor weed and nutrient management. Moreover, draining is also a dilemma during ripening stage because water will enter in the same holes when neighboring farmers irrigate their fields. Farmers' practice of controlling CRPE includes physical hunting using electrofishing method, covering holes, spraying mulloscicide, and application of systemic insecticide. Some farmers also claim that CRPE could be caught using a series of hooks and baits left overnight along rice levees.

This study determined the effectiveness of combined physical, botanical, and chemical control methods against CRPE, assessed the extent of damage that CRPE implicated to rice, characterized rice field infested with CRPE, and compared and described biology of species of eel in different study sites.

Highlights:

- Based on farmers' interview, CRPE were reported in five towns of Nueva Ecija; three towns in Bataan; two towns each in Isabela and Nueva Viscaya; and one town each in Ifugao, Cagayan, Pampanga, and Pangasinan. CRPE weight sampling was done in

Maragol, Munoz, NuevaEcija. Ninety samples were caught thru electrofishing. Minimum weight is 2.6g and maximum weight is 169.1g.

- The efficacy of boton, tobacco trimmings, and tea seed as management for CREP in rice will be tested in screenhouse in 2013 DS.
- Focus group discussion (FGD) with farmers affected with eel will also be done in 2013.

II. Ecological Engineering Towards a Sustainable Integrated Pest Management (IPM) Program in Rice and Rice-based Farming System
GS Arida

Impact of Palayamanan field on conservation biological control in rice and rice-based system
GS Arida, LV Marquez, BS Punzal and J Settele

Palayamanan, an integrated farming system (crops, livestock and aquaculture), could provide an ideal situation for ecological engineering. Initial results of my study (Arida et. al,, 2006) at the Central Experiment Station (CES) PhilRice on movement and colonization of beneficial organisms showed that predators and parasitoids of rice stemborer and hopper eggs tend to colonize non-rice habitat during fallow periods. It is possible that Palayamanan serves as refuge to beneficial organisms that can provide a sustainable IPM in surrounding areas with large rice monoculture. Sustainable IPM means less input for farmers and reduction of hazards to humans and the environment. Hence, the impact of Palayamanan on conservation biological control was being investigated. The study determined population density of key insect pests and its natural enemies in vegetable area, rice field inside the Palayamanan, and fields outside the Palayamanan.

Highlights:

- During the 2012 DS, populations of rice panthoppers, Nilaparvata lugens and Sogatella furcifera and the green leafhoppers, Nephottetix spp. were higher in plots away from Palayamanan compared to rice field inside the Palayamanan. Catches of the above rice hoppers in pan traps, sticky traps, sweep net, and suction device were almost double in the rice field away from Palayamanan.

- Population of predators using the different sampling devices was higher in the rice monoculture than in Palayamanan (PAL) area. This was attributed to the lower population of prey in the Palayaman area as shown by the low number of plant and leafhoppers. Predators were mostly spiders represented by Pardosa pseudoannulata, Callitricia sp., Atypena, Araneus, and coccinolid bettle, Micraspis crocea. A femina and the long-legged fly Dolichopus sp. andMedetera sp. were also collected in high population density. Other predators included Solenopsis sp. Conocephalus longipennis, Cyrtorhinus levidipenni sand Micronecta sp.

- Number of parasitoids recorded from various sampling devices was also higher in the Palayamanan area compared with the rice monoculture.

- Damage due to stemborer was lower in the Palayamanan rice field compared to rice monoculture in both seasons. Damage during the wet season was very low with less than 2% whitehead in both fields.

- Population of arthropods in the wet season showed no significant differences in all the fields sampled. However Conocephalus longipennis, an important predator of stemborer egg mass, was recorded in high numbers in the Palayamanan fields. Most of the natural enemies recorded were from sweep net sampling. Suction device caught most of the planthoppers.

- The vegetable area in the Palayamanan served as refugia for beneficial organisms especially during fallow periods as shown in the number of natural enemies collected and the percentage of parasitism recorded on field exposed eggs of planthoppers and stemborers.

III. Screening of Rice Materials for Insect Pest and Disease Resistance
JP Rillon

Evaluation of rice lines for resistance to major diseases
JP Rillon and MSV Duca

Rice diseases pose a major threat to rice production. Developing rice varieties resistant to major rice diseases is the most economically and environmentally sound management approach in breeding program. Disease resistance is the best control but often is not available or brakes down after varietal release. It also requires constant effort to improve and maintain. Diseases cause significant yield and quality reductions resulting in farmers' income loss. The role of disease screening is important in identifying rice lines that will show resistance to the major rice diseases. Rice lines resistant to the major diseases can be used as new varieties. There will be a need for continuous screening for disease resistance nationwide due to disease resistance breakdown from one year to the next, often with devastating results.

Highlights:

- For induced evaluation, 32 monogenic lines were evaluated for resistance to blast in different stations. All monogenic lines were susceptible to blast in PhilRice CES and VSU. In other stations, six lines were found resistant in PhilRice Midsayap, 15 lines in PhilRice Isabela, 28 lines in CVIARC, and two lines in BIARC.

- Under natural field condition, 750 multi-environment trial rice selections were evaluated for the prevailing rice diseases during the season. Majority of the test entries show resistance to bakanae, bacterial leaf streak, bacterial leaf blight, rice tungro virus, and other prevailing rice diseases. Only MET5001, MET50010, MET5011, MET5013, MET5020, MET5024, MET5030, MET7006, MET7077, MAT5243, and MET 3038 showed intermediate reaction to sheath blight.

Centralized screening for resistance to insect pests
GDC Santiago

Breeding is a long term project and priorities may change over time. A new selection may well need to be tested in a range of environments, affected by different factors and grown under several cultural techniques. In most breeding programs, there are successive stages of testing: seedlings are initially screened and only the most promising lines go on to further testing. Most of the important sources of resistance to major insect pests have been incorporated into lines that have improved plant types.

Focusing on a system to facilitate screening for resistance will hasten the development of a new variety and will save on resources. The main objective of this study was to characterize and compare the reactions of different entries/selections to major insect pests to avoid recommending selections that are highly susceptible.

Highlights:

- Most of the important sources of resistance to major insect pests have been incorporated into lines that have improved plant types. Some lines were considered promising enough to be named varieties while others have proved to be good parents in the new crosses.

- Under natural field condition, 618 entries were planted late in CPD area to coincide with the peak of stemborer population. A total of 2283 entries planted regularly in PBBD area were also evaluated during 2012 DS. Generally, low stemborer pressure was observed at vegetative and reproductive stages in regularly planted area. However, damage rating in late planted entries during the reproductive stage had 30.17% damage rating on susceptible check during the season.

- Under the screenhouse condition, out of 550 entries evaluated during DS 2012, 59.09% had intermediate reactions to BPH and 51.09% had intermediate reactions to GLH.

- During WS 2012, under natural field condition, 640 entries were also planted late in CPD area on August 15, 2012. The same trend of damage was observed during the season with a much lower percent damage on susceptible check with 6.13% whiteheads on TN1, hence, evaluation obtained was not valid.

- Under the screenhouse condition, the same number of entries was evaluated. Out of 640 entries, 8.28% had moderately resistant (MR) and 38.91% had intermediate reaction to BPH. For GLH, results showed that 7.50% had MR and majority (49.22%) had susceptible reaction to GLH.

IV. Monitoring and Profiling of Major Diseases

FA dela Peña

Spatial and temporal pest dynamics in rice production systems of Nueva Ecija (UPRIIS 1&4)

FA dela Peña, LV Marquez, LG Sumabat (Jan to Jun 2012), and MCE Pascual (Sep 2012 to present)

Within any geographic area where pest management is to be improved or adapted to agricultural changes, there is a need for characterization to define constraints to crop production and rice is no exception. The rice crop is an abode to a large community of organisms which can be beneficial or detrimental. Detrimental insects or the so-called insect pests occur in all the rice environments and are considered important constraints in rice production. Pest population is dynamic over time and space. Circumstantial evidence shows that the shift to modern rice cultivation and crop intensification affects the occurrence of insect pests and incidence of diseases in the rice ecosystem. Change in density and composition of pests has dramatically caused the pest population to fluctuate within the cropping season, within the year, or over a period of time and can cause tremendous yield reduction. No matter how high-yielding a variety could be when it is beset with pest problems, sustainability in rice yields and profitability in rice production could never be attained.

Clear understanding of the complex interactions between the pest and beneficial organisms at the macro-scale level and the farmer's farm practices and technologies being adapted are of utmost importance in developing a strategic pest management scheme. This can be done through proper identification of the pest, estimate the population density present in the field, and determine if significant yield loss could occur with the given pest population. Hence, the knowledge on the profile of pests and natural enemies in a particular area is necessary for an effective pest management program.

This study aimed to identify the pest risk factors in rice production to assist farmers in decision-making on the best pest management option at certain situation. The study had the following objectives: to monitor the population/incidence of pests, their level of occurrence, and the extent of damage they cause in rice at the farm community level in rice areas served by National Irrigation System – Upper Pampanga River Integrated Irrigation System 1 & 4 (NIA-UPRIIS 1 & 4). 2); to determine the relationship between pests and yield levels in the study sites; and to develop a GIS map of pest distribution in the study sites.

Highlights:

Site Identification and Mapping, 2012 DS

There were 15 municipalities served by NIA-UPRIIS 1 and 4 in the map provided. There were 350 points marked in the lines formed from north to south and from east to west in rice growing areas that are served by NIA-UPRIIS 1 and 4. However, during the site visit for the identification of study sites, it was revealed that only 12 municipalities are covered by the 80 points that are served by the said divisions of the irrigation system. The study sites were screened and were well coordinated with the municipal agriculturist staffers and farm owners. Using the GPS, the study sites were plotted in arcview software for the preparation of database and map for NIA-UPRIIS 1 and 4.

Pest Monitoring, 2012 WS

- Twenty six sampling sites from the 79 target sites were monitored for the first visit during the wet season. Rice crop in 53 sampling sites were already harvested.

- Crop stages of rice during the visit were from seedling to hard dough.

- Dominant natural enemies were Cyrtorhinussp., non-web spiders, coccinelid, Ophioneasp., Tetragnathasp., and Pardosa with means ranging from 0.3 to 5.7, 0.2 to 2.8, 0.2 to 1.9, 0.1 to 0.5, 0.1 to 1.5 and 0.2 to 1.2, respectively, per hill counting.

- Most numbered insect pests were Nephotettix sp., Sogatella furcifera, Recilia dorsalis, and Leptocorisa oratorius with means ranging from 0.1 to 2.9, 0.1 to 0.7, 0.1 to 0.7, and 0.1 to 1.8, respectively, per hill counting.

- Whitehead caused by Scirpophaga incertulas was observed to have significant injury on the reproductive phase of rice with means ranging from 0.2 to 11.9% damage per hill counting.

- Sheath blight caused by Rhizoctonia solani has also been observed to be high with means ranging from 1.5 to 49.3% per hill counting.

- False smut caused by Ustilaginoideavirens has been recorded to have an occurrence with means ranging from 1.1 to 6.2 % per hill counting.

- Occurrence of weed was very minimal and expected not to cause significant damage on main crop.

Monitoring the shift in population of brown planthopper (Nilaparvatalugens) and whitebacked planthopper (Sogatellafurcifera) in PhilRice CES

GC Santiago, EM Valdez and CE Constantino

The remarkable increase in rice production is largely dependent on the development of new rice varieties. However, this has resulted in new pest problem. Initial observations indicted that there are times when population of population of the whitebacked planthoppers (Sogatellafurcifera) is higher than the brown planthoppers (Nilaparvatalugens) in fields planted with popular high yielding varieties of rice. This study aimed to document such occurrence.

Lighttrapping to monitor population of hoppers in CES started on March 9, 2011 and weekly thereafter. The installed JICA light trap with electronic light bulb was put on for five hours at night and collection of insect was done the following morning and was brought in the laboratory for sorting, identification, and counting.

Highlights:

- Collected hoppers during DS 2012 (Jan-June 2012) showed a total of 1,228 brown planthopper (BPH), 278 whitebacked planthopper (WBPH), 2,187 green leafhopper (GLH), and 2,092 zigzag leafhopper (ZLH). Highest collection was obtained during March and GLH was the highest during the season.

- During the wet season (WS 2012), a total of 741 BPH, 172 WBPH, 16,380 GLH, and 926 ZLH were collected and counted during the season. Highest collection was obtained during September and GLH was the highest and the least was the WBPH. One year data from our light trap indicated that majority of the time, the population of BPH is still higher than WBPH.

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

PHILRICE

PHILIPPINE RICE RESEARCH INSTITUTE

We are a chartered government corporate entity under the Department of Agriculture. We were created through Executive Order 1061 on 5 November 1985 (as amended) to help develop high-yielding, cost-reducing, and environment-friendly technologies so farmers can produce enough rice for all Filipinos.

We accomplish this mission through research and development work in our central and seven branch stations, coordinating with a network that comprises 58 agencies and 70 seed centers strategically located nationwide. To help farmers achieve holistic development, we will pursue the following goals in 2010-2020: attaining and sustaining rice self-sufficiency; reducing poverty and malnutrition; and achieving competitiveness through agricultural science and technology.

We have the following certifications: ISO 9001:2008 (Quality Management), ISO 14001:2004 (Environmental Management), and OHSAS 18001:2007 (Occupational Health and Safety Assessment Series).

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