PHILIPPINE RICE R&D HIGHLIGHTS 2012

MINDANAO RICE R&D (PHILRICE MIDSAYAP & PHILRICE AGUSAN)

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Minadanao Rice R&D

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Improvement of rice production in Mindanao is important for the country's rice self-sufficiency goal. Lower yields in Mindanao than in Luzon and Visayas have been attributed to unfavorable climatic condition and soil fertility constraints. The causes of low yields must be clearly understood and strategies to overcome the limitations should be evaluated and validated at farmers' fields where the problems exist.

Poor expression of the variety's yield potential is often associated with poor soil health but in Mindanao low solar radiation is believed to be one of the environmental constraints. On the other hand, pre-harvest losses of yield have been attributed to a number of factors including drought or excessive flooding and pest or disease infestation. The important tasks, however, include identification of the specific limitation, identification and evaluation of recommended practices, and how various stakeholders will exercise their roles in introducing the innovations and sustaining rice production.

Cloudiness associated with the very pronounced rainfall from November to April (Type III climate) is believed to be a major limitation to rice yield in the Caraga region and perhaps other rice growing areas in Mindanao. Some rice cultivars have been found with relatively good agronomic performance such as NSIC Rc122 (Angelica), NSIC Rc147 (PJ-7), NSIC Rc216 (Tubigan 17), and PSB Rc 18.

As such the Mindanao rice research and development agenda is geared toward the following objectives:

1. To identify inbred rice cultivars with superior traits contributing to high and stable yield under the adverse soil and climatic conditions in Mindanao.
2. To develop inbred rice varieties resistant to common pests and diseases in Mindanao.
3. To identify major soil-related constraints requiring adjustments of the recommended soil and nutrient management.
4. To identify integrated nutrient management practices for correcting site-specific soil limitation in the major irrigated lowland areas in Mindanao.
5. To identify integrated pest management practices for the control of major pests and diseases in major irrigated and rainfed lowland rice areas in Mindanao.

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I. Development of Rice Varieties Suited for Mindanao

Biotic and abiotic stresses are among the factors affecting rice production in Caraga region. Most important of the abiotic factors are low solar radiation, flooding, and soil-zinc deficiency. Using tolerant varieties is an efficient and sustainable management option to counter these problems. Genetic variability in tolerance to stresses exists which can be explained by various physiological mechanisms underlying certain adaptations to unfavorable conditions. These will serve as bases in varietal selection and development of improved rice varieties.

Evaluation of Breeding Lines for Pest Resistance

ES Perialde , C Flores, IML Bauzon, FPJ Tadle, and ARA Elicot

Breeding for pest resistance at PhilRice recognizes the contribution of host plant resistance as an important component of pest management systems. With new rice accessions from IRRI and PhilRice germplasm, new hope is set to identify new sources of resistance gene for rice tungro virus (RTV), bacterial leaf blight (BLB), blast, sheath blight (ShB), rice black bug (RBB) and white stem borer (WSB). Hence, the primary objective of this study is to screen and identify breeding materials with resistance to these major insect pests and diseases of rice.

Highlights:

- In DS 2012, a total of 192 advanced lines and 95 MYT lines were sown for evaluation to RTV, BLB, rice blast, RBB and WSB under field condition.

- For RTV resistance, only four lines exhibited intermediate reaction to rice tungro disease. The rest of the entries were susceptible.

- Of 95 MYT lines all entries were rated susceptible to rice tungro disease. However, 32 lines rated resistant to rice blast, 81 lines to WSB whiteheads and two RBB whiteheads, respectively (Table 1).

- At vegetative phase, majority of the MYT lines were rated resistant to WSB and RBB damage.

- Fifteen samples from upland ecosystem were collected to be characterized for their reaction to 25 monogenic lines.

Table 1. Reaction of different advance and MYT lines to major rice pests injuries. PhilRice Midsayap, DS 2012.

Major Pest	Pest/Disease Reaction			
	Resistant (R)	Moderately Resistant (MR)	Intermediate (I)	Susceptible (S)
Advance Lines (192)				
Tungro	0	0	4	183
WSB Deadhearts	19	21	20	61
RBB Deadhearts	0	0	68	0
MYT Lines (95)				
Tungro	0	0	0	95
Rice blast	32	0	14	49
BLB	0	0	82	13
Sheath blight	0	0	61	34
WSB Deadhearts	81	14	0	0
WSB Whiteheads	2	8	0	85
RBB Deadhearts	95	0	0	0
RBB Whiteheads	10	55	30	0

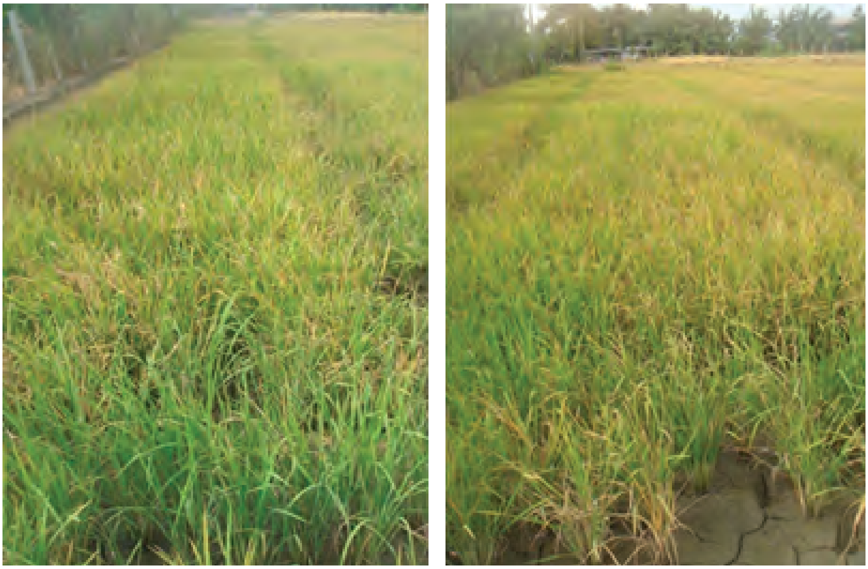

Figure. 1. Field set-up of a). tungro and RBB screening b). PhilRice Midsayap, Dry Season 2012.

- In 2012 WS, a total of 120 advanced lines were sown for evaluation to RTV, BLB, RBB, and WSB under field condition.

- For RTV resistance, only three lines exhibited intermediate reaction to rice tungro. The rest of the entries were susceptible.

- At vegetative phase, 19 entries were resistant to WSB deadheart, one intermediate and 100 moderately resistant. However, 41 entries rated intermediate to RBB deadheart and 71 entries were rated moderately resistant (Table 2). At reproductive phase, all entries were damage by RBB (bug burn) including Bacterial leaf blight set-ups due to early cut off of water supply for the rehabilitation of irrigation canals in the Midsayap area.

- Ten samples from upland ecosystem were collected to be characterized for their reaction to 25 monogenic lines.

Table. 2. Reaction of different advance lines against major pests of rice. PhilRice Midsayap, WS 2012.

Major Pest	Pest/Disease Reaction			
	Resistant (R)	Moderately Resistant (MR)	Intermediate (I)	Susceptible (S)
Tungro	0	0	3	117
WSB Deadhearts	19	100	1	0
RBB Deadhearts	0	71	41	8

Figure 2. Field set-up of Bacterial Leaf Blight (a), Sheath blight (b) and Insect pests (c) severely damage by RBB. WS 2012.
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- Among 14 entries in 2012 DS, PR36465H had obtained a higher yield of 5.09t/ha and had a better crop stand than Mestizo 1 (check variety) based on the farmers' preference evaluation. Furthermore, PR36519H, Mestizo 19 and SL18H had obtained a comparable yield to Mestizo 1 (check) of 4.77, 4.77, and 4.72t/ha, respectively.

Development of high yielding inbred lowland rice varieties tolerant to major biotic and abiotic stresses in Caraga region
HAJimenez and GF Estoy, Jr.

Rice variety development in PhilRiceAgusan focused its emphasis on location-specific adaptability. This aimed to develop and/or select more locally adapted rice cultivars possibly superior than the leading variety Angelicaand with more specific traits such as tolerance to low solar radiation, resistance to white stemborer, and tolerance to submergence. More varieties would mean more options to farmers, greater genetic diversity, increased productivity, profitability, and sustainability in rice farming.

Highlights:

- Twenty five (25) entries including five check varieties were evaluated for submergence trial in three testing sites (PhilRice Station; Kitcharao, Agusan del Norte & Trento, Agusan del Sur), while 28 entries including three check varieties were evaluated in Tagbongabong, RTR, Agusan del Norte with two treatments (with zinc and without zinc).

- Among the 25 test entries in submergence trial, 10 entries had an 80% and above survival rate: IR10F364 (97%), IR10F403 (97%), IR10F328 (94%), Rc18 Sub1 (92%), NSIC Rc194 (91%), IR10F187 (90%), PSB Rc68 (90%), IR10F365 (89%), IR10F202 (87%) and IR10F402 (81%). While check variety NSIC Rc122 had 10% and NSIC Rc222 has 11% survival rate. Based on phenotypic acceptability, three entries had an excellent (1) rating: IR10F364, IR10F202 and IR10F403. These three identified entries had better rating compared to the check variety NSIC Rc194 which had a poor rating. Yield samples are still on the process of drying the seeds. Zinc Def. Trial. We initially found out that among the entries, IR64 is very susceptible to zinc def, while PSB Rc82 and NSIC Rc222 have intermediate tolerance to zinc deficiency.

Field screening of promising rice lines against major rice pests for northern Mindanao
ZM Palo and GF Estoy, Jr

Since PhilRice Agusan will be conducting a rice breeding program, it is necessary to subject promising rice lines to field screening for pest reactions before they are recommended as a location-specific variety to avoid complication of pest problems in the area. Additionally, rice lines with desirable characteristics could be used as parents for the rice breeding program.

Highlights:

- Selected three rice lines that were good performers for four cropping seasons:
  IR 06 N 105
  IR 77724-8-2-3-2-2
  IR 79216-141-1-3-3

- Promising rice lines evaluated for one season only:
  PR 37688-1B-1-1-1-1; PR 38024-2B-2(FePR);
  IR 10A128; IR 08A128; IR 09N473; IR 04A 115

- Lines to be used as parents:
  IR 06 N 105
  IR 77724-8-2-3-2-2
  IR 79216-141-1-3-3

Development of Rainfed Lowland Varieties with Resistance to Tungro, Tolerant to Drought and Submergence
SE Abdula, JL Ondoy, DA Tabanao, and JM Niones (OSL)

In Mindanao, the common stresses in the rainfed environment are drought, submergence, water-logged and combination of these abiotic stresses coupled with biotic stresses like tungro and bacterial leaf blight (BLB). These stresses cause great impact in reducing rice production. Drought has been long recognized as the primary constraint to rainfed rice production. Yield losses at anthesis/flowering and seedling stages were more than double than yield loss caused by weeds. Breeding for rainfed in Midsayap focuses on increase yield, early maturity date, and drought/submergence tolerance with tungro and BLB resistance.

Highlights:

- Out of 151 F4 population, 108 entries were rated as resistant to both RTD and BLB and selected to comprise the F5 population. These lines will be subjected to different screenings (drought, submerged and pests) in the succeeding planting time.

- Evaluated 13 entries (submergence tolerant rice varieties and lines). Only seven entries were harvested, other entries were not harvested due to its long maturity date and they were infested by rice black bug.

- Six Raelines were seed increased as source of test materials.

Table 3. Entries for submergence on farm demo trial and Raelines that were harvested.

Submergence	Raelines
NSIC Rc194	Raeline 3
IR64	Raeline 4
ICRL-2008WS-153	Raeline 5
ICRL-2008WS-61	Raeline 7
ICRL-2008WS-90	Raeline 8
PR39397-7-153-145	Raeline 9
PR39397-7-153-203	

Adaptability Trial of Upland Promising Varieties, Traditional Cultivars and Elite Lines in Mindanao
SE Abdula, DA Tabanao, JL Ondoy

Most farmers in the upland areas grow rice generally tolerant to environment stresses but with yield potential lower than the modern varieties. This study was initiated to develop upland rice varieties with stable yield of three to four tons/ha, good grain, true selection adapted to a specific location, and to improve the productivity of the upland farmers by purifying promising traditional cultivars per region.

Highlights:

- Established adaptability trial in Dado, Alamada, North Cotabato with eight traditional cultivars and two approved variety, namely: Zambales, Azucena, Dinorado Colored 1, Kutibos white, Malay2, DRS53, UPLRi5, Dinorado Colored 2, DRS32, and NSIC Rc9. Generally, all test materials adapted well in the area.

- Established MET for upland in Sultan Kudarat State University (SKSU) SNA campus and Cotabato Foundation College of Science and Technology (CFCST) Arakan campus.

- In CFCST Arakan, three entries (IR 78877-181-B-1-4, IR 78937-B-3-B-B-1, and IR 78943-B-13-B-B-B) showed better yield performance with an average yield of 0.225, 0.2175 and 0.207 kg/plot, respectively.

- In SKSU-SNA campus, five entries (IR 78943-B-13-B-B-B, IR 82635-B-B-47-2, IR 78877-181-B-1-4, NSIC Rc192, Pokk/AC-24-M5R-10 AND UPL Ri5) showed good performance with an average yield of 2.625, 2.6, 2.4, 2.325, 2.25 and 2.125 kg/plot, respectively.

- IR 78943-B-13-B-B-B recorded the highest yield in SKSU-SNA location, while in CFCST, Arakan ranked third among the three highest yielding entries.

Development of Irrigated Lowland Varieties with Resistance to Tungro and Bacterial Leaf Blight

SE Abdula, JL Ondoy and DA Tabanao

Tungro and BLB are the major biotic constraints in many areas in irrigated lowlands in Mindanao. Breeding for resistance and high yielding varieties is very important and considered the best strategy in addressing these problems.

Highlights:

- From three 960 F3 entries, 946 entries were selected that comprised the F4 population. Of the 946 F4 population, 531, 389, and 26 entries were rated resistant, intermediate, and susceptible to RTD and BLB, respectively. Moreover, only 371 were selected (64%, 34% and 2%) that came from resistant, intermediate, and susceptible entries to comprise the F5 population (Fig.3).

- Twenty nine (29) Matatag series were seed increase to be used as test materials.

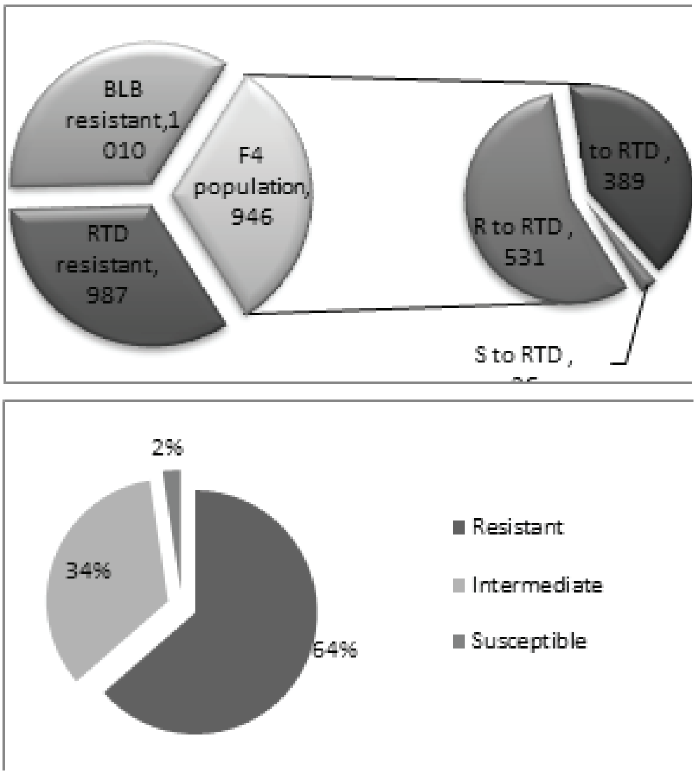


Figure 3. (A) A pie graph showing the F3 and F4 population's reaction to RTD and BLB. (B) Distribution of disease reaction on entries being advanced to next filial generation.

II. Development of Appropriate Diagnostic Tools and IPM Options for Mindanao Condition

GD Balleras

Rice insect pests are the major injurious rice pests in Northern Mindanao. It developed robust survival mechanisms along with the long ecological history of irrigated rice cultivation and complex rice agri-ecosystem biological interactions. In recent years, the population densities of rice insect pests associated yield losses and cost control have reached the highest recorded levels. This is attributed to the combination of a large-scale shift from diversified farming to continuous monoculture, the increased yield potential of new varieties and the development of high levels of resistance to insecticides. The ubiquity of insecticide use in rice production systems has posed limitations to the successful implementation of biological control. A focus of many pest conservation efforts has been to seed more selective pesticides, or to time the use of pesticides relative to crop growth stage, to minimize the negative impacts on natural enemies. Recently, increasing attention has been paid to conservation practices that seek to alter the quality of the natural enemies habitat. Insects with their rapid responses to agro-climatic changes and cultural management strategies are important factors to model crop-pest-natural enemies interactions under variable rice agro-ecosystem scenarios. Detailed work of insect pests-natural enemies interactions which is the prerequisite for development and improvement of rice major insect pests is of urgent concern.

Characterization of rice fields biophysical components and farmers' cultural management practices and assessment of the population dynamics of the WSB and its natural enemies

GD Balleras, MS Doverte, LJ Pedregosa, and VV Casimero

In Midsayap, North Cotabato, existing municipal reports have revealed changes on biophysical structure of agricultural areas such as accessible farm-to-market roads, increased number of on-farm households' settlements, widened National Irrigation Association (NIA) services, shifting cultivation, cutting of permanent crops and conversion of inland marsh to agricultural/residential and others. Such changes were perceived to have significant contribution to the ever-changing rice agro-ecosystem. Hence, the study focused in the documentation and assessment of biophysical and cultural management practices on WSB control. On-farm research and assessment of WSB population, damage, natural enemies' composition, and yield are carried out in 15 farmers' field. Data gathering was conducted at weekly interval thru direct counting and sweeping methods. Collected insects were brought to the laboratory for proper taxonomic identification.

Highlights:

Description of study sites and management practices employed

- Farmers were clustered into three based on dominant vegetation cover and insect pest management practices (Table 4). A total of four combinations of insect pest control management were documented and identified in three clusters. These are the farmers' common practices employed in restraining insect pests while conserving natural enemies abundance.

- Cluster 1 farmers' practice integrated pest management (IPM). They make use of Economic Threshold Level (ETL) as the major tool to properly time pest control practices particularly, application of synthetic commercial chemicals. They have developed their own chemical management practices using stem borer adult – based application. A farmer who practiced this strategy applied insecticide very early in the morning near street light farms or near household farms to target the stemborer adult harboring rice field. The practice of diverse rice field through planting of vegetable along dikes and planting of leguminous crops at follow period improve the microclimate of natural enemies which resulted to enhance natural enemies' assemblages. These strategies are commonly observed to farmers' belonging in Cluster 2. Also, they employ the use of Indigenous Knowledge (IK) practices (e.g. hanging of unfermented coconut milk and placing of coconut husks and branches of trees) in combination of chemical (e.g. need-based application of synthetic pesticide). On the other hand cluster 3, practice – proper level of soil to avoid low-lying patches and alternate flooding and draining of irrigation water enhances the degree of control of stem borers (Table 4).

New record on occurrence of PSB, SSB, and WSB species

- The presence of PSB (Sesamia inferens, Walker), SSB (Chilo suppressalis, Walker), and WSB (Scirpophaga innotata, Walker) species in all the study sites was recorded. Both species mostly observed during the reproductive stage of the rice plant. The occurrence of the three stem borer species could be associated in the vegetation cover structure and diverse farm management practices employed by farmers.

- Among stem borer species – Scirpophaga innotata got the highest average individual counts ranges from 11-20 adult per cluster.

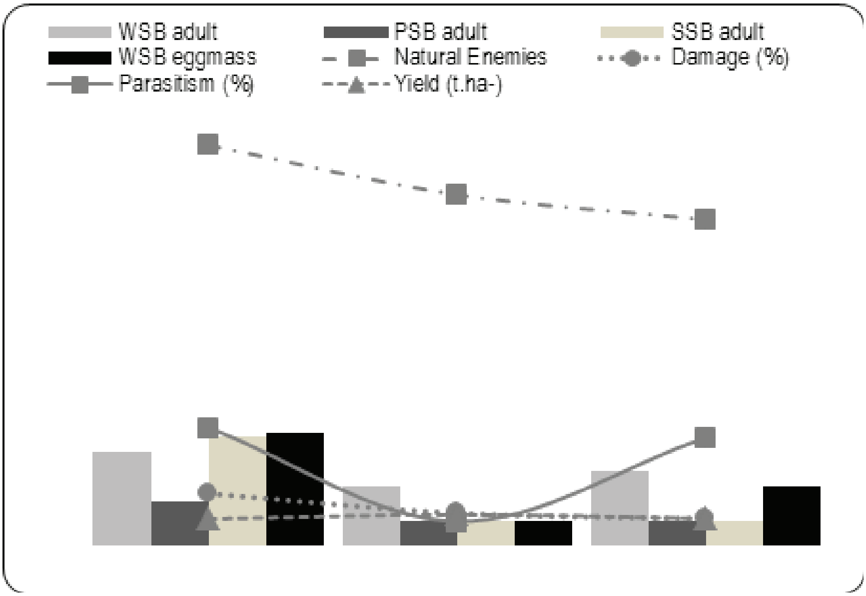
- In Cluster 1, an average of 27% and 18% egg mass parasitism were caused by Telenomus sp. and Tetrastichus sp. The low percent egg parasitism maybe due to the poor searching behaviour of both parasitoids during the reproductive phase of the crop.

- Among predators family belonging to Miridae, Coccinellidae, Linyphiidae, and Coenagroinidae were most observed and preying on different stages of stemborer. With the composition of beneficial organisms SB damage only ranged from 6% to 11%, thus, yield were comparable among others. Cluster 2 numerically produced the highest yield of 6t/ha, however a difference of 0.8t/ha varies among clusters. Yield difference maybe influence by several factors, including stemborer density (1 egg mass per hill) and damage (6% - 11% damage infestation), beneficial organisms' composition and abundance, poor searching behaviour of parasitoids, associated vegetation cover and cultural management practices employed by farmers (Figure 5).

Table 4. Defined farmers' rice stemborer control strategies in identified clusters in Midsayap, North Cotabato. 2012 DS.

CLUSTER	VEGETATION COVER	FARMERS'MANAGEMENT PRACTICES
1	Irrigated Lowland Rice Field + Coconut + Banana + Grassland + Vegetables	CC + BC + CuC
2	Rainfed Rice Field + Irrigated Lowland Rice Field + Coconut + Mango + Forest + Corn + Banana + Vegetable + Grassland	BC + IKC + BoC + CC
3	Swamp + Inland Marsh + Irrigated Lowland Rice Field	CuC + BC + BoC + CC

Figure 4. Different stemborer species – a-b) Pink stemborer adult and larva (Sesamia inferens, Walker), c-d) Striped stemborer adult and larva (Chilo suppressalis, Walker), and e-f) rice White stemborer adult and larva (Scirpophaga innotata, Walker)observed in different clusters with varied vegetation cover and management control strategies in Midsayap, North Cotabato. 2012 DS.



Note:
Cluster 1 (C1) = Irrigated Lowland Rice Field + Coconut + Banana + Grassland + Vegetables; CC + BC + CuC
Cluster 2 (C2) = Rainfed Rice Field + Irrigated Lowland Rice Field + Coconut + Mango + Forest + Corn + Banana + Vegetable +Grassland; BC + IKC + BoC + CC Cluster 3 (C3) = Swamp + Inland Marsh + Irrigated Lowland Rice Field; CuC + BC+ BoC+ CC

Figure 5. Insect pest and natural enemies population, % parasitism, % damage, and yield (mt. ha-) in different clusters in Midsayap, North Cotabato. 2012 DS.

Combined effects of different crop establishment and harvest methods on the populations of white stemborer and its natural enemies
GDBalleras, MSDoverte, LJPedregosa, and VVCasimero

The severe infestation of white stem borer forced farmers to rely mainly on chemical pest control methods. Identification of cost-effective combination of crop establishment and harvest methods is imperative to mitigate WSB economic damage. This study evaluated the combined effects of two crop establishment and three harvest methods on WSB and its associated natural enemies' populations. Data and field observations were initiated thru direct counting and sweeping methods at weekly interval, 2012 DS. Collected samples were brought to the laboratory for correct taxonomic identification.

Highlights:

Natural enemies associated with egg, larvae and adult growth stage of white stem borer at different rice growth stages

- Three species of stem borer namely, white stem borer (Scirpophaga innotata, Walker), striped stem borer (Chilo suppressalis, Walker), and pink stem borer (Sesamia inferens, Walker) were noted during on-field monitoring. Among species, Scirpophaga innotata was most dominant and consistent all throughout the rice growth stages. Other species- Chilo suppressalis and Sesamia inferens occurs irregularly. Their occurrence was only observed at grain filling stages of rice plant (Figure 5).

- Higher average individual counts of WSB adult (29), SSB (2) and PSB (2) for every 10 sweeps per sampling were recorded from seedling to maturity stage in direct seeded fields. Individual counts declined when plants reached the reproductive phase. Only, WSB egg mass (34) per 1m2 was recorded. However, average individual counts of WSB adult (18), SSB (1), and PSB (0) per 10 sweeps were observed in transplanted fields throughout the rice stages. Minimal counts of WSB egg mass was also noted. In general, direct seeded fields appeared more attractive to stem borer than transplanted fields. A range of two to six WSB adults per sampling and one to two egg masses per square meter were recorded from anthesis to harvest. Seeding density, plant canopy, method of crop establishment could have influenced the density and occurrence of stem borer species (Tables 5&6).

- More predators and parasitoids were recorded in transplanted fields than in direct seeded fields. Predators mostly spiders belonging to Family Linyphiidae and Lycosidae, and Coccinellidae. These prey on both adult and larvae of stemborers. Most of the parasitoids recorded were Braconidae (Stenobracon nicevillei) and Ichneumonidae (Temelucha philippinensis and Xanthopimpla flavolineata) (Figure 6).

- Deadheart and whitehead damage was more observed in direct seeded fields (5% to 7%) than transplanted fields (1% to 3%). Therefore, transplanted fields attained its yield potential (6t/ha) maybe due to stemborer incidence, sparse infestation, and robust number of beneficial organisms. (Figure 6).

Assessment of stemborer larvae and pupae at different rice stubble heights

- Presence of stemborer larvae and pupae were recorded in different cutting heights of rice stubble. A remarkable number of stemborer larva and pupa were recorded on 27cm to 32cm stubble heights than 15cm to 20cm and 21cm to 26cm, respectively. Results revealed that stem borer larva and pupa counts increase with stubble cutting height. On the other hand, infested stubbles planted in dry land soil condition produced more number of aestivating larvae than saturated soil condition, thus more larvae reached its juvennile adult stage. The initial findings may indicate that dry land soil condition after harvest favors stem borer larva to undergo aestivation.

Figure 5. Different rice stemborer species emerged-observed in direct seeded and transplanted sampled plants under dry and saturated soil condition in screen house observation.

Table 5. Presence or absence of stemborer throughout the rice growth and development under transplanted field. 2012 DS.

Stemborer life cycle stage	Rice growth and developmental stages						
	Seeding to seedling			…	Grain filling to maturity		
	WSB	SSB	PSB		WSB	SSB	PSB
Eggmass	16**	-	-		19**	-	-
Larvae	9*	-	-		21*	-	-
Pupae	8 *	-	-		6*	-	-
adult	19**	-	-		7**	2**	2**

Note:
* = 3 damage hill dissected for SB larva and pupa observation
** = 10 hills visually counted for SB adult and egg mass
- = absent or no sample was collected

Table 6. Presence or absence of stemborer throughout the rice growth and development under transplanted field. 2012 DS.

Stemborer life cycle stage	Rice growth and developmental stages						
	Seeding to seedling			…	Grain filling to maturity		
	WSB	SSB	PSB		WSB	SSB	PSB
Eggmass	1	-	-		18	-	-
Larvae	11	5	-		34	10	-
Pupae	8	-	-		5	-	3
adult	8	-	-		10	1	-

Note:
* = 3 damage hill dissected for SB larva and pupa observation
** = 10 hills visually counted for SB adult and egg mass
- = absent or no sample was collected

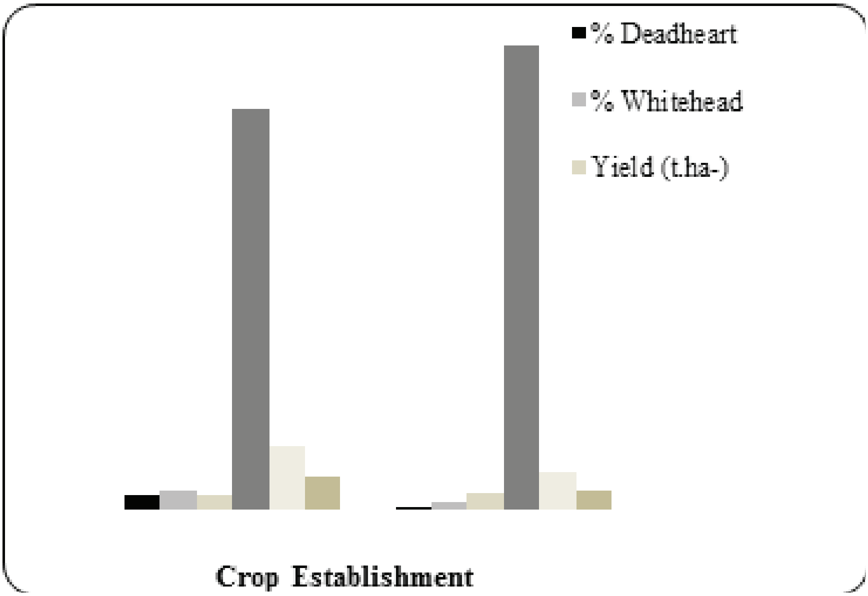


Figure 6. Rice stemborer species and its associated natural enemies, stemborer eggmass, damage, and yield in transplanted and direct seeded rice fields in identified barangays in Midsayap, North Cotabato. 2012 DS.

Seasonal variation in the population dynamics of Rice Black Bug (RBB) and White Stemborer (WSB) at different schedules of planting time in Midsayap

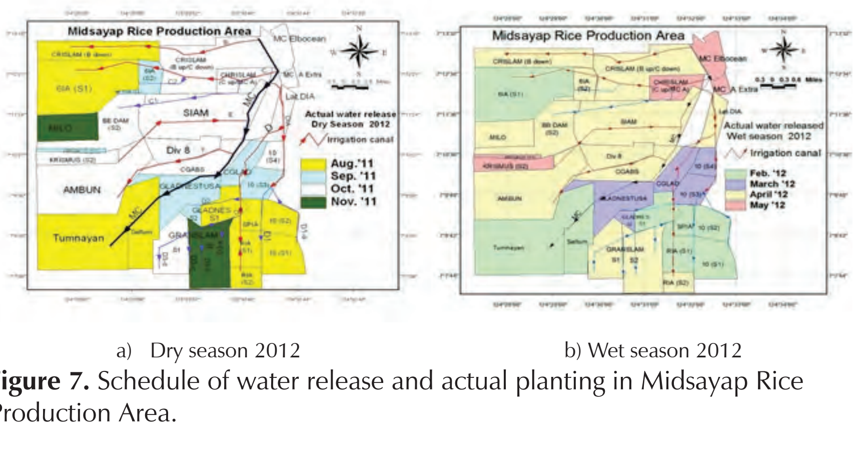
FPJ Tadle and PLP Sabes

Planting time in Midsayap varies every planting season. Farmers consider RBB and WSB as their major pest problems. Presently, the effects of scheduled planting time in the seasonal variation of the population dynamics of RBB and WSB in Midsayap are not yet fully established. This study aimed to determine the effect of scheduled planting time in the seasonal variation on the population of RBB and WSB during the 2012 DS and 2012 WS. Field sampling was done at 15 sampling field per sampling site at 10 hills per field. Sampling starts at maximum tillering, booting, and soft dough stage. Digital waypoints of the sampling sites were gathered using the Garmin GPS V, and plotted through Arcview GIS 3.3 software to mapped-out the abundance of RBB and WSB in relation to different planting time. A total of five sampling sites with 75 sampling fields were identified in four planting schedule in Midsayap rice production area. Farmer's management practices, inputs and other predictor factors were obtained to establish the occurrence and variation of RBB and WSB in different planting schedule.

Highlights:

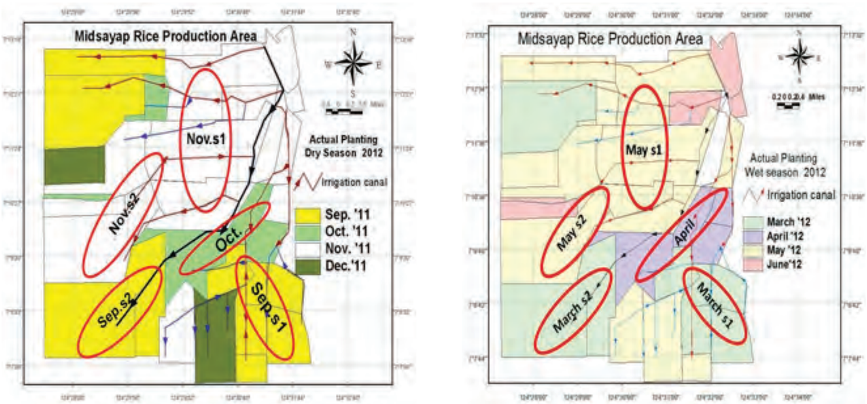
Characterization of study sites in Midsayap Rice Production Area

- In the DS, planting started from September to December 2011; while in WS, actual water released starts from February to May 2012 (Figure 7). Most of the IAs planted one month after the release of irrigation waters. Water divisions encircled are the sampling sites with 15 farmers fields, which also represents one planting time/ schedule (Figure 8).



a) Dry season 2012 b) Wet season 2012

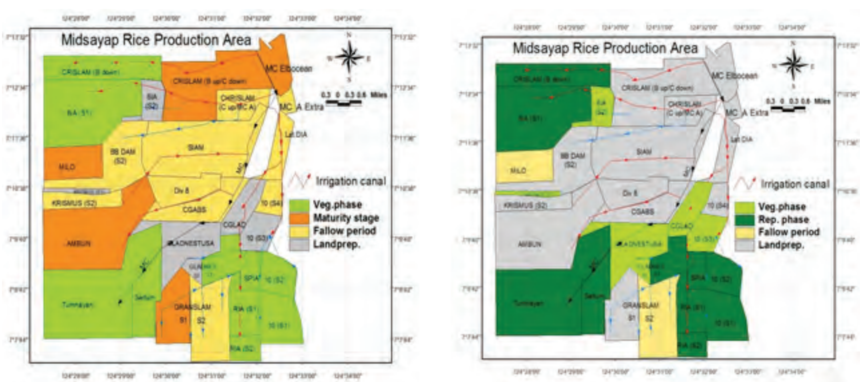
Figure 7. Schedule of water release and actual planting in Midsayap Rice Production Area.



a) Dry season 2012 b) Wet season 2012

Figure 8. Sampling sites in different water divisions in Midsayap Rice Production Area.

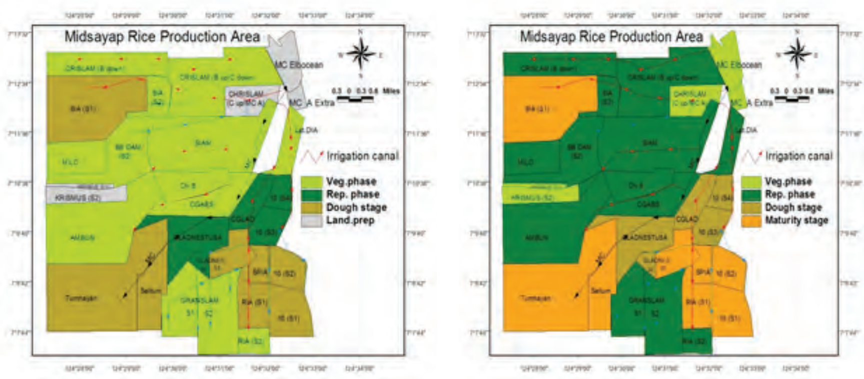
- It took four months to plant all irrigated rice fields of Midsayap during DS and WS planting. Figures 9 and 10 showed the actual scenario of the Midsayap rice production area, which indicates the presence of different crop stages (asynchronous planting).



a) September 2011 b) October 2011

Figure 9. Crop stages of rice at different planting schedules, Dry season 2012

- Release of irrigation water for 2013 DS was cut-off due to rehabilitation of irrigation canals. Most of the farmers have left their fields untilled, but some farmers' planted mungbean and watermelon.



a) May 2011 b) June 2011

Figure 10. Crop stages of rice at different planting schedules, Wet season 2012

Farmers' rice production inputs and practices

- Across sampling sites, about 37.3% of the farmers practiced transplanting method, while 62.7% followed the direct seeding method. Moreover, almost 93% of the farmers who planted in March 1 used transplanting method.

- The amount of Nitrogen application ranged from 46.1 to 87.0kg/ha. However, phosphorus (P) and potassium (K) application was minimal.

- Most of the farmer-cooperators apply pesticides four to five times per season. Across sites, common practice of farmers to mix different insecticides with different active ingredients calling these a "cocktails".

Population dynamics of RBB and WSB in different planting time in Midsayap

- During the DS, September planting had the highest RBB population in the field (4 to 10 bugs per hill). On the other hand, March and May planting has greater number of RBB during WS. In general, RBB field population was too low to inflict damage.

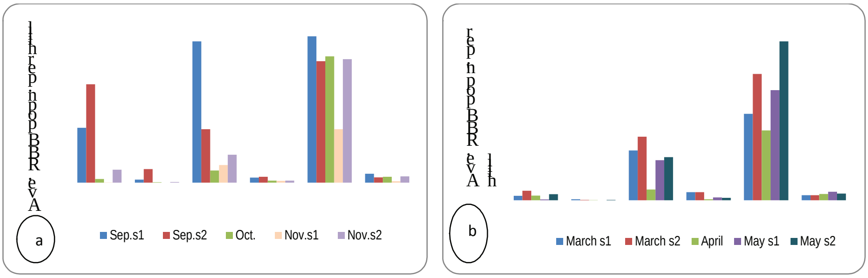


Figure 11. RBB population in different phases of the crop, (a) DS and (b) 2012 WS

- Across seasons, the prevalent infestation of WSB suffered farmers' seasons after seasons. In DS, mean damage ranges from 5% to 24%, while in WS, mean ranges from 3% to 12% (Figure 12). Moreover, November and May planting noted high incidence of WSB, and these are the late planted areas.

- Rodents' infestation was also noted as manifested by the damage counted in the field. However, incidence did not differ significantly.

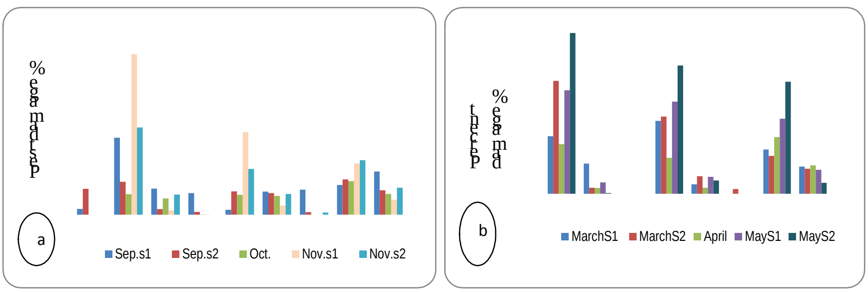


Figure 12. Pest damage observed in different planting schedules, (a) DS and (b) WS 2012

- At fallow period, general trend of RBB population was noted across sites, those areas planted late had greater number of RBB counted in the field compared to those areas planted first. Moreover, DS population per square meter ranged from 148.5/m2 to 219.4/m2, and from 292.92/m2 to 502.90/m2 in WS (Figure 13). Apparently, RBB populations built up towards maturity to fallow period. This observation means that the population of RBB in the stubbles will be a possible source of pest for the next cropping season.

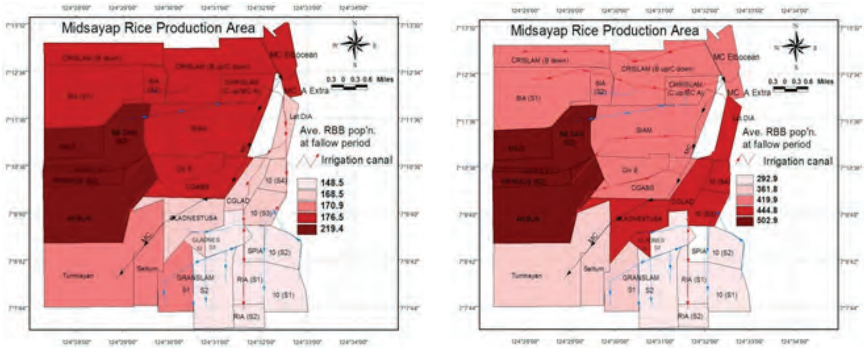


Figure 13. RBB population at stubbles in different planting time in Midsayap Rice Production Area.

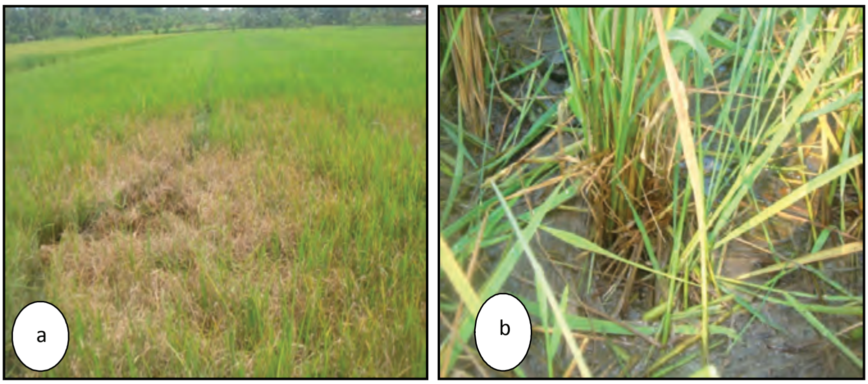


Figure 14. RBB damage (bugburn) at reproductive phase in September planting (a), Rodent infestation in November planting (b). DS 2012

Figure 15. Sampling sites in Barangay Polongoguen Midsayap North Cotabato

Microbial inoculants for plant and soil health

OH Abdulkadil, PS Torreña, ASO Elicot and IML Bauzon

Rice blast caused by Pyricularia grisea is a common disease in upland ecosystem but at present, it is also very common in irrigated lowland. Symptoms usually observed in the panicle and neck part of rice, thus farmers popularly call it as “neck rot”. The disease is now widely distributed in Mindanao. In Banay-banay, Davao Oriental, rice farmers experienced more than 50% yield loss because of the disease.

Another major disease in irrigated lowland is bacterial leaf blight (BLB) caused by Xanthomonas oryzae pv. oryzae. Hybrid and some inbred varieties were susceptible to BLB. This disease is very prevalent during wet season.

Both diseases are seedborne that passed a threat in rice seed production. These diseases have become pressing problems to farmers, yet the best management strategies against them have not been fully developed. The use of fungicidal spray or seed treatment is bounded by cost and threat to environment sustainability, while host resistance has so far been only partly successful. The use of biological control agents regulate the causal organisms has now been eyed to be a good, efficient, and sustainable means of managing these diseases. Thus, this study was conducted to evaluate and determine the efficacy of microbial inoculants under screenhouse and natural field condition against rice pathogens/diseases.

Highlights:

- Four microbial inoculants, FPJ-B+K, FAA, Vermitea were tested as preventive measures against Pyricularia grisea causing rice blast and IMO-FR + FFJ against Xanthomonas oryzae pv.oryzae causing bacterial leaf blight under screenhouse condition. Benlate and Streptomycin were used as chemical check and sterile distilled water (SDW) as control treatment.

- Results revealed that FAA and Vermitea were resistant (R) against Pyricularia grisea which were comparable to the chemical check (Benlate). FPJ-B+K was found intermediate reaction and SDW was susceptible.

- IMO-FR + FFJ was found resistant (R) againts Xanthomonas oryzae pv.oryzae and comparable to the chemical check (Streptomycin).

- WS 2012 (May-October cropping) Indigenous microorganism from fermented rice in combination with fermented fruit juice (IMO-FR+FFJ) was further tested against bacterial leaf blight under field condition, arranged in randomized complete block design (RCBD) with four replications at PhilRice experiment station. One liter of microbial inoculants per 16L of water was sprayed to the test, Kocide was used as chemical check (2tbsp/16L of water) and sterile distilled water as control treatments.

- Severity infection of bacterial leaf blight was lower as affected by the application of IMO-FR+FFJ and numerically comparable with plants applied with chemical. However, statistical analysis revealed that there was no significant difference among treatments.

- Similar results were obtained from the actual grain yield (t/ha). Plants applied with IMO-FR+FFJ has the higher grain yield (3.01t/ha) compared with plants applied with chemical (2.78t/ha) and plants applied with sterile distilled water (2.52t/ha), respectively. However, statistical results revealed that no significant differences among treatments were noted.

Evaluation of rice-duck farming system in managing pest
ES Perialde and AR Favillar

Farmers grow rice and raise ducks in the same piece of land. The ducks will range within the confines of farmer's field serving as biological control by feeding on the destructive golden apple snail population. This practice reduces the need for mulloscicide application as much as 100%. The ducks will also feed on or drive away insect pests and either consume or trample the weeds resulting in substantial reduction on the use of insecticide and herbicide (Escobin, 2007). Moreover, the manure of ducks serves as organic fertilizer for rice hence, resulting in considerable savings on the cost of inorganic fertilizer.

Study on the evaluation of rice- duck farming system is important to assess the different practices of rice-duck farmers and determine the number of ducklings employed in the field that significantly reduce the population of insect pest and weeds. It also assessed the population of natural enemies in field herded by ducklings and effect of ducklings in rice crops including soil.

Highlights:

- On 2012 DS, Rice Black Bug (RBB) average population was observed low on plots herded with high number of ducklings (200 heads/ha) ranging from 0.63% to 6.67% at 30 to 75 days after transplanting (DAT) compared to lower number of ducklings (150 heads/ha) ranging from 0.71% to 11.04%.

- At 30 DAT, low average population of adult Golden Apple Snail (GAS) was observed on plots herded with high number of ducklings (3.12/m2) than low number of ducklings (3.32/m2) .

- In terms of yield and net income, plots herded with high number of ducklings gave high yield with 2.86t/ha and net income of P51,205.00.

- On 2012 WS, plots herded with high number of ducklings observed low mean average population of RBB (200 heads/ha) ranging from 1.04% to 3.32% compared to lower number of ducklings ranging from 1.72% to 4.40%.

- At 30 DAT, low average population of GAS was observed on plots herded with high number of ducklings (1.72/m2) than low number of ducklings (2.8/m2).

- High yield was obtained on plots herded with high number of ducklings with 3.99t/ha and net income of P65,060.00.

Utilization of rice waste materials as substrate for enhance vermicomposting production

ES Perialde, RS Escabarte, Jr. and JO Balleras

Organic farming is practiced by farmers nowadays because it is considered as healthiest way of growing food crops. It is an emerging farming system that most of the farmers observed not only in the Philippines but even overseas. Organically grown food crops are increasing in market demand. Organic fertilizer has likewise increased in use as imported commercial fertilizer have been increasing its prices.

Vermicasting, also known as vermicomposting, is one of the organic fertilizers that revives the soil fertility level and brings back life to soil environment, improves soil texture, and enriches water holding capacity. In addition, it is environment-friendly since earthworms feed on anything that is biodegradable and aids the disposal problem. No imported inputs required given that worms are now locally available and the materials for feeding are abundant in the locality particularly rice wastes, dried fruit leaves, scrap papers, and other farm wastes materials.

This study evaluated the different rice wastes and other farm and animal wastes as substrate for vermicomposting that produce high percentage of adult and young worms and also high content of NPK and organic matter.

Highlights:

- Adult worm was produced high on rice straw with kitchen waste+duck dung mixtures with 53.33% at 30 days after release, followed by rice straw with dried fruit leaves+duck dung with 35.53%, rice straw with carbonized rice hull+duck dung with 20%.

- In terms of young worm, rice straw with scrap papers+duck dung produced 29.68% at 30 days after release, followed by rice straw+kitchen wastes+duck dung with 18.5%.

- Harvested vermicompose ranging from 29.30 to 33.10 kilograms 30 after days after stocking of vermi worm.

- Results of analysis show that rice straw with grass clippings + duck dung gave high Nitrogen content (1.46%), rice straw with kitchen wastes + duck dung gave high Phosphorous content (2.85%), while rice straw with carbonized rice hull gave high content of Potassium (0.51%), and high organic matter was observed on rice straw with carbonized rice hull and kitchen wastes and duck dung (22.72%). However, all substrate combinations had pH ranging from 7.3% to 7.5%.

Figure 16. a). Experimental set-up, b). ready to harvest substrate and c). harvesting and segregation of adult and young vermiworm.

Evaluation and utilization of indigenous botanicals for storage insect pest management

RL Tabudlong and GF Estoy, Jr.

The disadvantages of continued use of pesticides lead to the discovery of alternate pest control. The use of plants with pesticidal properties (botanicals) could be the answer to this need. Botanicals are used in many ways to manage pests since they are relatively safe. Therefore, a sound management system should be developed for rice with emphasis on the use of botanicals.

Highlights:

- Banti-banti a botanical used for storage pest management
- Banti-banti botanical plant extract (leaves and stems) was the best combination.
- 100 grams plant extract plus 1,000 ml water is effective against storage insect pests
- Soaking (12 hours) the plastic sack with botanicals and completely drying it showed significant results than spraying method

Enhancement of beneficial organisms through soil amendment applications in Caraga region
AA Ortiz and GF Estoy, Jr.

Plant nutritional problems are corrected by the use of inorganic or organic amendments. Rice farmers generally misuse them because they lack enough information on its advantages or disadvantages. Studies on natural cycles such as soil food web have been found to be an excellent indicator of soil ecosystem health. Soil food web aids in efficient nutrient cycling and the biological suppression of plant pathogens and parasites.

Several studies have detailed the benefits of soil amendments but none have focused on rice in Caraga region. This study was designed to help rice farmers understand the role of soil amendments in the soil food web system.

Highlights:

- Spiders, mirid bugs, wasps, Coccinileds, Conocephalus, Micraspis and Ophionea were dominant natural enemies in all crop stages. Plot applied with poultry litter showed more natural enemies observed in all treatments. Highest yield obtained in plots applied with poultry litter (5.05t/ha) followed by rice straw (5.00t/ha) but not significantly different from plots applied with saw dust (4.83t/ha) and wood chips (4.75t/ha).

- Five microorganisms were isolated and need to be identified. Soil samples are still incubated for microbial growth.

Microbial Control Agents for the Control of Rice White Stemborer and Other Emerging Insect Pests Problems in Mindanao
BM Tabudlong and GF Estoy, Jr.

Microbial control is the use of microorganisms to reduce pest population below damaging level. By their more or less specific nature, microbial agents are likely to cause much less harm if any to beneficial organisms than chemical pesticides. Fungi are the most common group of microbial agents that are already commercially produced in other countries. The attribute that makes fungi as an ideal biological insecticide is due to broad host range, high virulence, safety to non-target organisms, compatibility with some pesticides, ease of production with locally available materials, and application without using costly equipment. Microbial control agents are naturally occurring biological control agents, hence, they are environmentally safe.

Highlights:

- Seven genera of fungal microbial agents affecting the rice insect pests on selected rice growing areas in Mindanao are listed including the following: Batkoa and Zoophthora of the Order Entomophthorales and Beauveria, Hirsutella, Metarhizium, Nomuraea and Paecilomyces of the Hyphomycetes.

- Mortality of the brown planthopper exposed to 1x108 conidia/mL suspension of M. anisopliae (85.00%) significantly higher compared to the insects exposed to B. bassiana (57.50%) and Paecilomyces sp. (40.00%) suspension at 10 days post treatment in the screen house.
- Application of fungal microbial agents of M. anisopliaeandB. bassianaandPaecilomyces sp. decreased the whitehead damage due to white stemborer (WSB) in two cropping seasons in the field.

- Damage was significantly lower on the rice plants applied with Metarhizium (22.30%) and Beauveria (20.88%) compared to Paecilomyces sp. (27.79%) and control (32.53%) in the first season while only 2.04% to 2.76% was recorded when applied with any of fungal suspension compared in the control (7.43%) in the second season.

III. Development of Appropriate ICM Diagnostic Tools and and Decision Support System for Different Rice Ecosystems in Mindanao
CA Mabayag

A technology-driven attainment of food self-sufficiency and security is the goal and policy of Philippine government. From a production level of 9.23 M mt in 1990, palay output increased to 13.27 M mt in 2002 and 16.24 M mt in 2007. However, production level must be increased to 21.6 M mt to achieve 100% self-sufficiency in the next five years. The challenge for the rice R&D is to increase the yield of farmers to about four to five additional bags per year. This will be in the form of new varieties with superior plant productivity traits and quality, better crop management and integration, adaption strategies to changing production environment and climate and other program support and product interventions.

Improvement of diagnostic method and correction of soil fertility constraints to yield of irrigated lowland rice in Mindanao
DL Escañan and GA Nemeño

Correction of multi-nutrient deficiencies involving micronutrients is more difficult than the correction of N, P, and K limitations only. It is also important to develop quick guides and practical decision tools for managing micronutrient supply in a sustained basis. A quick soil or plant test that could indicate the likelihood of response to application of the micronutrient should be developed.

Highlights:

- Out of multiples samples, sites with very low P and K were selected and physic-chemically characterized. Bulk soil samples collected were used as media in determining appropriate soil levels of P and K to obtain optimum yield (6 to 7t/ha) using varying fertilizer rates.

- Aside from N, P and K, S, Zn, and Cu were found to be the most limiting soil nutrients in Regions 12 and Caraga, which exist singly or in combination.

- Nutrient management studies showed that application of NPK (53-30-60 kg/ha) fertilizer only produced the highest yield (4.92t/ha), which is 15% to 19% higher compared with unfertilized and foliar fertilizer alone. In addition to NPK, application of either foliar fertilizer and or soil applied ZnSO4 at 20kg/ha, improved 1,000-grain weight, but yield did not increased significantly, which could be due to 10% to 15% WSB damage.

Improvement of nutrient management for yield maximization of irrigated lowland rice in Mindanao
DL Escañan and GA Nemeño

Scientific knowledge is available that could greatly improve the nutrient output of rice farming like PalayCheck® System for irrigated rice. Most of the recommendation in PalayCheck® however, are reactionary or symptom/damage-based, economic capacity-based and most importantly for environmental safety. In addition, some farmers' cultural management practices were just based on yield response or experience from previous cropping season. Although, more rice technologies were developed, continuously improved and promoted to our rice farmers to increase and sustain their productivity and minimize production costs.

Highlights:

- NSIC Rc222 & Rc224 attained highest yield of 5-6 t ha-1 when applied with MOET-based fertilizer (90-0-30-24-20 kg ha-1NPKSZn for sandy soils planted at 15x15 cm. But target yield was not achieved, which could due to very early harvesting resulting in low % filled grains.

- In areas with Type II climatic condition and multi-nutrient deficient calcareous soils, closer planting distance (15x15cm) gives significantly higher yield (5-8.5 t ha-1) during very WS compared with regular planting distance (20x20cm).

- Further evaluation to ameliorate yield-limiting factors still on going to reduce gap between target yield and actual yield achieved with different nutrient and crop management practices.

Evaluation of INM practices for sustainable production of upland rice in Mindanao

DL Escañan and GA Nemeño

Many upland farmers' plant local rice and improved varieties that do not respond well to improved management practices, but these are well adapted to their environments and produce grains that only meet local needs. Hence, for us to face the new challenge of achieving rice self-sufficiency, there is a pressing need to thoroughly understand the crop environment of upland rice. This is to explain the variability in grain yield and find ways to increase production particularly in developing nutrient management options.

Highlights:

- Documented upland rice farmers' practices in Sen. Ninoy Aquino, Sultan Kudarat; Wao, Lanao del Sur; Arakan, North Cotabato; and Socorro, Surigao del Norte representing different soils and agro-climatic conditions. Yield-limiting factors identified were soil acidity and low soil fertility (low OM), low fertilizer application, low population density, and drought.

Evaluation of INM practices for sustainable yield of rainfed lowland rice in Mindanao

MF Soledad, Jr. and FL Varquez

Rainfed areas in Mindanao are diverse under different climatic zones, soil types, sequential crops grown, and management practices due to social, cultural, and educational background of the farmers. Hence, this study was conducted to identify soil nutrient limitations under different aggravating factors so that nutrient management will improve, and that yields of rice and sequential crops will also increase.

Highlights:

- Three SubP sites identified and characterized. These were in Mainit and Alegria, Surigao del Norte along Mainit Lake, and Consuelo, Bunawan, Agusan del Sur along Agusan marsh.

- With the use of MOET, N, K, and Zn were found to be the most limiting soil nutrients.

- Introduced NSIC Rc194 and Rc158 in these SubP areas. Across locations and nutrient management strategies, Rc194 obtained yield ranging from 3 to 4.1t/ha in January to June CS, while Rc158 got 5.5 to 5.6t/ha.

- Preliminary trial showed that farmers' fertilizer practice (mainly foliar) gave significant yield advantage by 26.8% in Rc194 and 2.7% in Rc158 compared with MOET-based soil applied fertilizer. Further verification is still necessary.

Identification of soil fertility constraints to yield of lowland rice in saline-prone areas in Mindanao
MF Soledad, Jr. and FL Varquez

To augment rice production and income of rice farmers, nutrient management for rice in saline areas must be improved. In Caraga, being a coastal region, large saline or salt-affected lands are planted or occasionally planted to rice. Farmers in these areas are also generally engaged in other sources of livelihood but flooded rice will almost always be planted during the wet season despite limited production.

Highlights:

- Inspected and validated 23 SalP farmers' field located in Maug and Banza, Butuan City; Buenavista, Agusan del Norte; Surigao City; Claver and Gigaquit, Surigao del Norte; Bislig City; and Lanuza, Tago, Lianga, and Hinatuan in Surigao del Sur. Majority of sites have Type 2 climate while the two sites have Type 4, which resembles Type 2 climate. Farmers' crop management practices were documented.

- Both MOET and lab tests showed that N and P were the most the limiting nutrients.

- Two saline varieties (NSIC Rc184 and Rc190) were compared with three farmer-preferred varieties (PSB Rc14, Rc18, and Rc82). In Lanuza, Surigao del Sur, highest yielder was Rc18 (6.8t/ha) while in Maug, Butuan City, Rc190 got 4.7t/ha.

- Further testing and evaluation in the proposed 15 sites with different nutrient management in selected sites is still needed.

Determination of soil fertility status of major rice growing areas in Caraga Region using Minus-One Element Technique (MOET)
SM Paculba and CA Mabayag

One aspect in rice production where cost can be reduced is on nutrient management, particularly on the use of inorganic fertilizer. It could in a way of cutting nutrient management cost and optimizing the fertilizer-use efficiency by applying the right kind of inorganic fertilizer at the right time. But this requires appropriate and effective tools that could aide farmers in decision-making. Thus, PhilRice developed a reliable, low-cost, and easy alternative technique for diagnosing nutrient limitation called the Minus-One Element Technique (MOET) in determining the fertility status of the soil. Farmers who tested and utilized the technology have positive feedback on the results, enabling them to recognize how a specific nutrient deficiency look like, and thus, apply fertilizer based on what is limiting in the soil.

Highlights:

- With the use of MOET in Agusan del Sur, N is the most common limiting nutrient in all sites (95%), followed by P and K with 43% and 44% of the sampling sites, respectively. Sulfur, Zn, and Cu deficiencies were observed in 15%, 4%, and 3%, respectively.

- Limiting nutrients observed in different combinations i.e., N alone (24%), NK (21%), NP (15%), NPK (13%), NS (4%), NKS (4%), and NPS (3%).

Development of decision aids for PalayCheck System: Plant Potassium
MF Soledad, Jr. and FL Varquez

No decision-aid tool has been developed to determine potassium (K) requirement during cropping season. Hidden hunger due to K may occur anytime during the cropping but if it does occur in the reproductive stage, and if remained undetected, grain yield will decrease because of limitation on grain filling. Decision aid for K management during cropping season will make farmers become more confident of their implementation of nutrient management program for high crop yield. Since K can still be applied as needed during cropping, a quick test for crop's K status could facilitate decision to apply K fertilizer at critical period in the reproductive stage.

Highlights:

- Four sites identified to be K-deficient using MOET were further characterized in the lab. Lab results confirmed that K levels ranged from very low to medium, with OM content of medium to adequate and pH ranged from 4.8 to 5.7 (acidic).

- A declining trend of K soil levels was noted from 30 DAT to heading. Before, PI was determined to be the most critical stage of K application. Optimum K rate could not yet fully establish due to erratic pattern. It still needs further understanding of K dynamics, particularly in soils with high Ca and Mg.

Identification of micronutrient deficiency/toxicity indicators and development of quick remediation techniques

RL Sobrevilla and CA Mabayag

Correct identification of nutrient deficiency or toxicity symptoms is quite difficult and inconsistent due to complex interaction of biotic and abiotic factors in a specific location. Hence, this study was conducted to identify effective techniques and indicators in diagnosing micro nutrient deficiency/toxicity symptoms and develop quick but effective remedial measures to manage or correct plant disorders. Specifically, this study aims to: 1) assess and document common micro nutrient deficiency symptoms commonly observed in Caraga Region and important indicators (based on soil, plant, and water charateristics); 2) characterize the morpho-anatomical features of rice plants exhibiting micro nutrientsdeficiency/toxicty symptoms, which could be used as reliable indicators; and 3) develop/identify, test, and evaluate amelioration techniques to correct micronutrient deficiency for location-specific recommendation.

Highlights:

- With the use of MOET, N, P, and K were the most common limiting nutrients identified in Agusan del Sur where intensive survey was done in May-Aug 2012. While S and micronutrients such as Zn and Cu were not commonly observed, these limiting nutrients exist in different combinations, i.e. NK, NP, NS, NPK, NPKS, and NPKSZn. In Agusan del Norte, MOET setups in LSTD sites showed that NK and S were the most limiting. More intensive soil tests will be done in the next season.

- Physicochemical characterization is still being done of soils collected from areas with K, S, Zn and Cu deficiencies. Familiarized unique responses of 20 varieties/lines to soil limiting nutrients, and noted their symptoms which can be used as indicators.

- Foliar spray with 2% ZnSO4 applied at 14 and 30 DAT showed promising result in correcting S deficiency and improved grain yield but still needs further verification . Testing and evaluation of potassium nitrate to correct N & K deficiencies will be done later.

Determination of nutrient use efficiency and yield potential of rice varieties/promising lines adapted to Caraga region
RL Sobrevilla and CA Mabayag

To effectively develop and select suitable varieties with more specific traits such as tolerance to low solar radiation, tolerance to soil-related issues with high nutrient use efficiency, and tolerance to water logging must first be identified and characterized. Thus, this study aims to: 1) evaluate and select rice varieties and promising rice lines with tolerance to agro-meteorological stresses i.e., multi-nutrient deficient soils, waterlogged areas; 2) characterize the morpho-agronomic characters of rice varieties/lines that confer their tolerance to soil-related issues as indicated by their high nutrient-use efficiency; 3) determine the yield potential of these rice lines in areas with soil-related problems with varying nutrient management; and 4) identify promising lines for location-specific or national recommedation (in case of lines).

Major findings and accomplishments:

- Across variety, highest yield was obtained with pure inorganic fertilizer (5.65t/ha), followed by those fertilized with 50-50 organic and inorganic (5.12t/ha), and lowest yield (4.7t/ha) from those applied with pure organic fertilizer only.

- With just pure organic fertilizer, PSB Rc14, Rc82, NSIC Rc216, Rc222, and Rc18 obtained target yield of 5t/ha or more. Among the lines, IR06A150 and IR06A144 were the top yielders with 6.2 and 5.0t/ha, respectively. High yield despite minimal nutrients indicates high NUE that could explain their good performance and high yield despite minimal fertilization in the farmers' fields. Generally, majority of varieties had increased in yield when applied with inorganic fertilizers either with 50% only or 100% of the rate.

- Rapid growth at vegetative stage i.e. high tillering and tolerance to soil-related issues that usually caused yellowing and drying of leaves at vegetative stage are important plant characters but still needs further testing and evaluation.

Improving Rice Yield in Caraga Region: The effect of plant spacing and fertilizer application on the and nutrient-use efficiency and yield of selected varieties under low solar radiation
RL Sobrevilla and CA Mabayag

Several advanced rice production technologies have been developed and tested under Caraga Region, yet rice yield would hardly increase, even in areas with apparently fertile soils due to high organic matter. Studies on nutrient management showed that no matter how much inorganic fertilizer were applied, yield would not remarkably increase. However, there are few exceptional areas where rice crops are performing well and responsive to nutrient management. Thus, farmers are getting high yield up to 7t/ha, i.e. some areas in Agusan del Sur and Surigao del Sur.

Highlights:

- Wider plant spacing (12x40 cm) gives the highest yield of 6.35t/ha across varieties and nutrient management.

- In the first season, the organically fertilized crops obtained comparable yields with the unfertilized rice crops (4.26 vs. 4.52t/ha, respectively for NSIC Rc160) and (4.04 vs. 4.03t/ha, respectively for PSB Rc18). Similar trend was noted in the second cropping season across varieties and planting distance but at higher yield levels. However, NSIC Rc160 had better yields (5.7t/ha) when not fertilized compared with organically fertilized (5.5t/ha).

Development of Sulfur deficiency management options for intensively-cropped irrigated lowland rice areas in Caraga Region
RL Sobrevilla and CA Mabayag

Usually, sulfur (S) is abundantly present in both soils and atmosphere. Thus, S deficiency is not commonly observed, particularly in the rice fields. However, owing to intensive rice cropping system using high yield varieties that need higher rates of nutrients, burning of straw, and utilization of high grade fertilizers that do not contain sulfur, the nutrient reserve in the soil may have generally been depleted. Unlike other macro elements such as N, P and K, S is not commonly applied. When they are added with other nutrients in the fertilizer formulation, the rate is relatively low. Besides, the decreasing use of S-containing pesticides and better control of emission from industrial and domestic fuel burning has hastened S depletion, resulting in severe S deficiency in crops.

Highlights:

- Two S-containing fertilizers were identified (Ammonium Sulfate and ZnSO4) and tested to correct S deficiency. Different modes, timings, and rates of application were tested (i.e. ZnSO4 and ammonium sulfate applied as basal and foliar spray).

- Foliar application of 2% Zinc sulfate (ZnSO4) and Ammonium Sulfate (AmoSul) at 14 and 30 DAS significantly improved crop growth in terms leaf color and tiller number compared with the unsprayed plants. Basal application of ZnSO4 at 20kg/ha and AmoSul showed a similar result.

- Among S treatment, root dipping with 2% ZnSO4 for two hours before transplanting was found consistently effective regardless of N-source, either urea or AmoSul, which gave the highest yield of 8.11t/ha and 8.14t/ha, respectively.

Plant Health Clinic: A One-Stop-Info Shop (OSIS) for Rice in Caraga Region

SM Paculba and GA Nemeño

PhilRice is commonly visited by rice stakeholders like rice farmers, Agricultural Extension Workers (AEWs), Non- Government Organizations (NGOs), policy makers (from local and national government offices) among others. Thus, "Plant health clinic: A one stop–info shop (OSIS)" needs to be established. Through the OSIS, we can provide technical support and access to all available information on rice and rice-based farming system. In addition, this unique shopping center enables rice farmers and other clients to meet various rice experts for technical assistance through personal or virtual conversation. They could also view samples of insects, diseases, and plant disorders to verify their observations in their fields, or have specimen to compare with to help them diagnose plant disorders or identify problem-causing organisms. This way, farmers' technical capacity and skills will be improved in handling issues and challenges in the field and identify best options in solving them.

Major findings and accomplishments:

- Displayed reading materials on rice and rice-based technologies such as books, brochures, technology bulletins, magazines, rice R&D highlights, and newsletters. Farmers and visitors can view and/or read it anytime or request a copy of it at a very minimal cost.

- Showcased posters of matured technologies for rice and rice-based farming systems. Different maps of Caraga Region showing the major rice growing areas, soil types, and climate types were also displayed.

- Displayed CDs of videos and power point presentation of rice technologies. This is usually shown during discussion/visit of the farmers and other visitors based on their needs/problems encountered in the field.

Field Assessment and Management of Bacterial Leaf Blight, Xanthomomasoryzaepv. oryzae, in Caraga Region
CA Burdeos and EH Batay-an

Crop loss assessment studies revealed that bacterial leaf blight (BLB) reduces grain yield to varying levels, depending on the stage of the crop, degree of cultivar susceptibility and to a great extent the conduciveness of the environment in which it occurs. Yield reduction may range from 20% to 80% depending on the crop stage when infection occurs. Yield is affected due to the reduction of the plants' photosynthetic capacity as a result of reduced leaf area index. The lesions on the leaves significantly reduce the leaf area required for photosynthetic activity.

In Mindanao, particularly in Caraga Region where the climate has no pronounced dry season and rainfall is evenly distributed throughout the year, incidence of BLB infection is very high particularly to susceptible variety. It is hoped that through this activity, information gathered will be useful in designing management strategy against the disease to achieve a more sustainable and profitable farming systems of our rice farmers in Caraga Region.

Highlights:

- BLB infection was assessed in the four provinces of Caraga Region. BLB infection was highest in Surigao del Norte, followed by Agusan del Norte, Agusan del Sur, and Surigao del Sur, respectively. Highest BLB infection was observed during the first cropping season (January to June 2012) with 63.85% and 36.15% during the second season (July to December 2012).

- NSIC Rc128 has the highest BLB infection with 26.57% suggesting that this variety is susceptible to BLB while PSB Rc82 has the lowest infection with 2.96% indicating that this variety is moderately resistant to BLB under farmer's field condition.

Field Response of Upland Rice Varieties to Varying Levels of Vermicast in Caraga Region
CA Burdeos and EH Batay-an

To achieve rice self-sufficiency, production must be pursued within a sustainable framework, one that meets the country's current food demand and yet protects the environment. The use of organic fertilizers, such as composts, either alone or in combination with inorganic fertilizers, is one of the measures to promote sustainable crop production. With successive application of composts, soil organic matter is enriched and the physical, chemical, and biological properties of the soil are improved and more importantly the environment is often benefited. One of the organic amendments is the use of vermicompost.

Highlights:

- Two upland rice varieties (Dinorado and UPLRi5) served as the main plot while fertilizer level served as the sub plot. Generally, higher pest population was observed in UPLRi5 than the traditional upland rice variety Dinorado. In both varieties, plots applied with inorganic fertilizer alone obtained the lowest pest population while highest in plots applied with 1t/ha vermicompost.

- In both varieties, population of coccinellid beetle obtained the highest number collected by sweep net, followed by wasps, spiders and damselflies. Lowest natural enemies were collected in the inorganic fertilizer treatments while higher in vermicast treatments.

Insect Pests, Diseases and Natural Enemies Associated with Upland Rice in Caraga Region
CA Burdeos and EH Batay-an

Productivity constraints in many upland rice regions are climate and soil related. However, in Caraga Region where the climate has no pronounced dry and wet season and rainfall is evenly distributed throughout the year, insect pests and diseases favor their proliferation and survival. Thus, it is appropriate at this stage to look into insect pests and diseases and their natural enemies associated with upland rice particularly in Caraga Region. Information gathered from this study will serve as the basis for developing a management strategy against these pests towards increasing productivity of upland rice farmers.

Highlights:

- Six insect pests were observed in the upland rice environments in Kitcharao, Agusan del Norte and Socorro, Surigao del Norte, namely; Green Leafhopper (GLH), Whorl Maggot (WM), Rice Black Bug (RBB), Rice Bug (RB) and Plant Hopper(PH).

- Six species of natural enemies were recorded in both locations namely: lady beetle (LB), ground beetle (GB), wasps, crickets, spiders and damselfly. Higher population of spiders, wasps, ground beetle, and crickets were observed in Kitcharao, Agusan del Norte than in Socorro, Surigao del Norte except for LB. Spiders obtained the highest natural enemy population followed by wasps, LB, crickets, and GB, respectively.

IV. Improving Productivity and Profitability of Upland Rice Farming Ecosystem in Caraga Region
IV Valzado and CA Mabayag

In Caraga Region, owing to its vast upland agricultural areas, upland rice culitvation and expansion can optimistically be promoted. Although there is no exact data of the total area currently planted to upland rice in the region, there are communities of local farmers and indigenous people who are continuously producing upland rice primarily for consumption. In the case of the municipality of Socoro, Surigao del Norte, upland rice is continually being produced, but has a declining trend in terms of area planted and farmers engaged in it. Thus, to reinvigorate and create impact in the once vigorous upland rice farming communities, Socorro was chosen as the study pilot site. This participatory upland rice research, funded by the DA-RFU XIII, was implemented in Socorro, Surigao del Norte from November 2011. Initially, activities were focused on documentation of upland rice cultivation practices, varietal demo cum research, seed purification, and establishment of seedbank after harvest. Later on, testing and demonstration of various technologies i.e., soil conservation and rain water harvesting strategies will be developed. Organic fertilizer production and diversified farming system using Palayaman® model will also be introduced.

Five varieties/lines were planted in a 1-ha farm. These include: Denorado, Peria, Remoletes, NSIC Rc9, and UPL Ri5. Other lines included in the test were: Azucena from the provincial office of Surigao del Norte, and PSB Rc7 from the farmers' group. Similarly, modern varieties produced high yield at 1.9t/ha for UPL Ri5; 2.3t/ha for NSIC Rc9; and 2.08t/ha for PSB Rc7. Traditional lines such as Denorado (1.1t/ha), Peria (1.3t/ha), and Azucena (1.3t/ha) obtained fairly good yield. Remoletes had very poor germination; the area was just replanted with NSIC Rc9.

Adaptability trial of saline, drought and submergence-tolerant lines in Caraga region
DG Mayote and GF Estoy, Jr

Several rice varieties released by the National Seed Industry Council (NSIC) failed to perform well under the local soil and climatic conditions in Caraga Region. This is due to the unique abiotic and biotic factors such as reduced solar radiation associated with the wet climate, soil nutrient deficiencies, and insect pests and diseases which severely affected crop growth. With the current conditions brought about by climate change, development and identification of suitable and location-specific varieties with desirable traits, such as tolerance to saline, submergence and drought, must continue as we get better understanding of the various factors affecting rice production. More varieties would mean more options to farmers, greater genetic diversity, and sustainability in rice farming.

Highlights:

- NSIC Rc190 (Salinas 5) performed better (3.85t/ha) than other varieties evaluated for two cropping seasons.

- NSIC Rc9 and NSIC Rc11 will be tested in Esperanza, Agusan del Sur; Tandag, Surigao del Sur; Bacuag, Surigao del Norte; and Libjo, Dinagat Island this cropping season.

Indigenous pest management practices of upland rice farmers in Caraga
GF Estoy, Jr.

Indigenous pest management practices were used before the arrival of chemical pest management and were location and pest-specific besides being cheap. With those practices, farmers would manage pests effectively without causing harm to the environment. These practices could be very important if incorporated into integrated pest management (IPM) research to enrich the research process and make it more relevant for the farmers.

Highlights:

- Conducted an immersion activity for two days with the indigenous people (Higaunun tribe) of Brgy. Bonaguit, Esperanza, Agusan del Sur.

- Staking in the field serves as perching place of predatory birds.

- An improvised scare crow will prevent seed-eating birds from coming to the harvestable rice fields.

- Putting nylon a small nylon net or plastic bag on a peg near the field will scare away wild pigs.

- Use of plant bark ("Anagilan") as base of the stored rice panicle will repel stored product insect pests.

Community-based Integrated Pests Management (IPM) Approaches in Selected Rice Producing Towns in Caraga.
RL Tabudlong, DG Mayote, ZM Palo and GFEstoy, Jr.

Community-based Integrated Pest Management (IPM) is the application of an interconnected set of methods for managing pests including pest prevention techniques, pest monitoring methods, biological control, pest attractants and repellents, bio-pesticides, use of insect resistant varieties, and the chemical pesticides at the last resort. Community IPM is people-related. IPM focuses on long-term prevention or suppression of pest problems with minimum impact on human health and the environment. It involves regular monitoring and technical management of all those processes of crop production starting from preparation of land up to postharvest management practices.

Highlights:

- Introduced Trap Barrier System for rats and used of resistant variety and synchronous planting for WSB management.

- Used of home-made fertilizer such as vermi tea

Adaptabiity test of newy released and promising hybrid and inbred rice in Region 12
GV Romarez, AA Chin and RS Escabarte, Jr.

Hybrid rice is one of the key technologies that can make the country self-sufficient in rice. Our level of rice importation during the normal years is about 600,000 metric tons (mt). A minimum yield increase of 1mt/ha through hybrid rice cultivation in the 800,000 ha irrigated rice area in the country can result in an additional rice production of 1.6mt of palay (960,000mt milled rice), easily making the country self-sufficient in rice. Hybrid rice can raise farmers' present yields by 15%. With proper management practices, farmers can raise yields up to 240 cavans per hectare per season or 12t/ha every year.

As of this study, PhilRice had developed four hybrid rice varieties which include Mestizo 16, 17, 19, and 20. In addition to this, there are several promising hybrid rice combinations in the pipeline. Thus, this activity aims to demonstrate and evaluate the performance as well as to identify high yielding stable lines of the newly released and promising hybrid and inbred rice.

Highlights:

- During 2012 DS, one site was established in Brgy. Dajay, Surallah, South Cotabato with 14 entries from PhilRice and private companies. Moreover, during wet season, test sites were: a) Brgy. Buayan, Mlang, Cotabato with 12 entries; b) Brgy.Baluntay, Alabel, Sarangani with 10 entries; c) Brgy .Kapingkong, Lambayong, Sultan Kudarat with 10 entries; and d) Brgy.Dajay, Surallah, South Cotabato.

- Among the 14 entries in 2012 DS, PR36465H had obtained a higher yield of 5.09t/ha and had a better crop stand than Mestiso 1 (check variety) based on the farmers' preference evaluation. Furthermore, PR36519H (4.77t/ha), Mestizo 19 (4.77t/ha), and SL18H (4.72t/ha) had obtained a comparable yield to Mestiso 1 (check).

- In addition, 15% of farmers evaluated SL18H as comparable to Mestiso 1 (check) based on its crop stand, while 20.5% of the farmers evaluated PR35664H as poorer than Mestiso 1 (check). It was also observed that PR35664H and IR79643 (inbred) obtained the lowest yield of 3.66t/ha and 3.40t/ha.

- During 2012 WS, among seven entries of hybrid rice (promising and newly released) tested in Brgy. Buayan, Mlang, Cotabato, Mestizo 19 obtained the highest yield of 13.42t/ha followed by Mestizo 29 with 12.55t/ha. It was noted that Mestizo 20 had obtained a lowest yield of 9.02t/ha.

- Meanwhile, among five entries of inbred rice in Mlang, Cotabato, NSIC Rc240 and NSIC Rc216 obtained a highest yield of 12.05t/ha and 10.34t/ha, respectively, while IR79643 (promising inbred) obtained the lowest yield of 8.13t/ha. In addition, in Brgy. Baluntay, Alabel, Sarangani, it was observed that Mestizo 38 and PR35664H (promising hybrid) obtained a highest yield of 7.67t/ha and 7.60 t/ha, respectively and Mestizo 20 achieved a lowest yield of 7.58t/ha.

- It was also observed that NSIC Rc216 and NSIC Rc240 were numerically not significant in yield compared to Mestiso 38 (7.62t/ha) and PR35664H (7.60 t/ha).

- Moreover, in Brgy. Kapingkong, Lambayong, Sultan Kudarat, PR36465H and Mestiso 1 obtained the highest yield of 11.22t/ha and 10.84t/ha while Mestizo 19 achieved the lowest yield of 6.57t/

ha. PR31379 (promising inbred) got the highest yield among inbred tested of 7.93t/ha followed by NSICRc240 of 6.79t/ha. Meanwhile, Mestizo 19 and Mestizo 20 achieved the highest yield in Brgy. Dajay, Surallah, South Cotabato of 5.87t/ha and 5.80t/ha, respectively, while PR36747H (promising hybrid) obtained the lowest yield of 5.18t/ha.

- Among 14 promising and newly released hybrid rice tested in four sites, PHB 77 and PR36465H (promising lines) obtained highest yield of 12.12t/ha and 11.22t/ha, respectively, followed by Mestiso 1 (10.84t/ha). SL115 got the lowest yield of 5.60t/ha in all sites. Meanwhile, NSICRc216 (8.98t/ha) and IR79643 (8.13t/ha) obtained the highest yield among six entries of inbred rice tested in Region 12.

- Furthermore, Mestiso 19 was the most preferred by farmers in Mlang, Cotabato and Surallah, South Cotabato of 28.77 and 24.0 %, respectively, because of its good crop stand, tolerant to lodging due to its intermediate height and is high yielding variety. While in Alabel, Sarangani, Mestiso 38 was the most preferred by the farmers of about 33.93% and 20% of the farmers in Lambayong, Sultan Kudarat preferred PR36465H (promising hybrid). However, NSICRc240 was considered as the most prefer by the farmers in 4 sites.

Evaluation of Controlled Irrigation in Light Soils in Regions 12
GV Romarez, EO Escomen and RS Escabarte, Jr.

In Central Mindanao, almost 40% of irrigated lowland rice in the region are planted in light soils ranging from sandy clay to sandy clay loam soils especially in Sultan Kudarat and South Cotabato province. Loamy or sandy soils had a higher water requirement than heavy soils of 25mm to 30mm/d or 2500-3000 mm/100 days (IRRI powerpoint presentation, 2009) due to seepage and high percolation, thus, low water holding capacity. In some cases, light soils are good in root crops, however, some areas have irrigation and are planted with rice. Most of the farmers in these areas encounter problems on irrigation or unavailability of water especially in downstream. Hence, this study was conducted to evaluate the effect of CI to growth and yield of the crop in light soils, determine the appropriate number of day interval for the releases of irrigation water in light soils, and establish the technology recommendations on water management for light soils.

Highlights:

- The study was established and characterized in Brgy. Sison, Bagumbayan, Sultan Kudarat and Brgy. Roxas, Sto.Niño, South Cotabato.

- Upstream areas observed eight times of irrigation water introduced in the field throughout the cropping season with an average interval of 9.14 days. While in midstream irrigation, water was introduced for seven times with an interval of 9.14 days. Meanwhile, downstream areas introduced the irrigation water two times with an average of 19-day interval. Farmer's practice noted a day interval of 9.85 days at eight times irrigation water introduced in the field throughout the cropping season.

- Furthermore, field in the upstream recorded nine times water introduction in the field throughout the cropping season due to frequent rains with an average interval of about 2.33 days. While in midstream irrigation, water was introduced in the field about eight times with 2.5-day interval. However, it was recorded also that 8 times throughout the cropping, the field was introduced with water with an average of 2.66 days in downstream areas. Farmer's practice had a day interval of 1.56 days as it introduced water in the field for 15 times.

- The midstream part of irrigation canal obtained the highest plant height, productive tillers, percent filled grains and yield (tons/ha) with 112.4 cm, 208 tillers 85% and 6.10 t/ha, respectively. Lowest height and productive tillers were obtained in upstream with 109.8cm and 204 tillers respectively. In addition, lowest percent filled grains and yield was obtained from downstream with 60% and 3.92 t/ha, respectively. The upstream part of irrigation canal had obtained highest productive tiller/m2, percent filled grains (45%) and yield (2.44t/ha) from 615 tillers. Lowest yield was observed in downstream at 1.18t/ha. It indicates irrigation water greatly affects the growth of the crop especially its availability in critical stages of the crop.

Evaluation of location specific technology (LST) developed in Region 12 through Clustering Approach – A pilot test
GV Romarez, EO Escomen and RS Escabarte, Jr.

Development of location-specific technology (LST) for different rice ecosystem requires critical analysis of farmers' needs and problems that are limiting their crop yield. Lack of location-specific technologies that address field problems such as varietal selection, pests and diseases, soil nutrient deficiencies, and farm management practices reduce farmers' chances of attaining higher yield. To obtain the best performance in rice cultivation, farmers should adopt the most appropriate high-yielding varieties and cultivation technologies for their respective areas. Therefore, the development and promotion of "location-specific" technologies in respective barangays are critical for the agricultural development in the municipality.

After four (4) seasons of development of location-specific technologies (LST) on rice production in Region 12, the ultimate challenge to agricultural extension workers and facilitators as well as researchers on how this LST work in a cluster approach for a wider adoption. Hence, this study was conducted to evaluate the yield and economic performance of developed LST package for lowland rice in a cluster approach in Sultan Kudarat, South Cotabato, and North Cotabato provinces.

Highlights:

- Results showed the four common management factors that may increase the yield and income where the LST developed and farmers' practice differentiated: 1) the variety used; 2) seeding rate; 3) crop establishment; and 4) fertilizer used and rate.

- Most of the farmers used farmers' variety wherein the classification is farmers' seeds while the LST developed suggested the NSIC Rc158. Moreover, most of them used a seeding rate of 80kg/ha to 120kg/ha which is 50% to 220% difference from the LST recommendation and used direct wet seeded rice of crop establishment.

- Furthermore, among three three sites, farmers in Brgy. Kudanding, Isulan, Sultan Kudarat had obtained the highest nitrogen (N) application of 100kg/ha which is higher than the LST recommendation of 40% (60kg/ha of N). Brgy. Lower Malamote, Matalam, Cotabato had obtained a lowest N application of 37kg/ha which is 27% lower than the LST recommendation (47kg/ha of N). In Brgy. GPS, Koronadal City, most of the farmers applied 48.5kg/ha of N which is 24% lower than the LST recommendation (60kg/ha of N).

- In addition, most of them applied phosphorus (P) ranging from 8 to 41kg/ha, while the LST recommendation ranging from 0-30kg/ha of P. Brgy. Lower Malamote, Matalam, Cotabato had the highest P application of 41kg/ha, higher than the LST recommendation of 27% (30kg/ha og P). Farmers in Brgy. Kudanding, Isulan, Sultan Kudarat had the lowest P application of 8kg/ha which is 75% lower than the LST recommendation (14kg/ha of P). Brgy. GPS, Koronadal City applied 14kg/ha of P. Meanwhile, potassium (K) application ranged from 30 to 51kg/ha and 0 to 29kg/ha in farmers' practice and LST recommendation, respectively.

- LST recommendation obtained an increase yield of 0.33t/ha (6% increase), 0.83t/ha (18.77% increase) and 0.30t/ha (6% increase) in Brgy. GPS, Brgy., Kudanding, and Brgy. Lower Malamote. Brgy. Kudanding obtained the lowest yield due to stemborer and rice black bug damage, and zinc deficiency.

- Furthermore, LST recommendation had also increased the net income per hectare from P9,520 to P60,930. Results showed that 17.23%, 23.79% and 7.89% increase in net income per hectare in Brgy. Kudanding, Brgy. Lower Malamote, and Brgy.GPS, respectively.

Training on Rice Science & Technology Updates for NIA-Irrigators' Association (IAs) In North Cotabato
GV Romarez, RH Patalen

The task of attaining food security and rice self-sufficiency is one of the priority programs of the national government to curb hunger and poverty especially in rural areas. While significant accomplishments have been achieved in recent years by the government in rice production, the increasing food demand of its increasing population needs to be addressed. Hence, recent rice technologies have to be introduced to extension workers and farmers to increase production and income of farmers. Partnership between LGUs and national agencies like DA, NIA is significant to attain food sufficiency among local governments. This activity is a step toward finding support from various stakeholders to enhance productivity and profitability.

Highlights:

- Two batches of a two-day training on "Rice S&T Updates for NIA-IAs in North Cotabato" were conducted on October 24-25, 2012 at USM Hostel, Kabacan, Cotabato and at PhilRice Midsayap on October 30-31, 2012 to enhance technical knowledge and skill of Irrigators' Association officers and NIA staff in North Cotabato on recent advances in rice science and technology. Three NIA-Irrigators Associations in North Cotabato participated in this training namely, Libungan River Irrigation System (LIBRIS); Kabacan River Irrigation

System (KABRIS); and M'lang/Malasila River Irrigation System (M'LARIS).

- Fifty participants from NIA-IAs in North Cotabato attended the two-day training. Eighty percent of the participants were male and 20% were female. The average age of participants was 52 years old from KABRIS/M'LARIS and 51 years old in LIBRIS. The youngest participant was 31 years old (batch 1) and the oldest was 75 years old (batch 2). Majority were married (92%) and the rest were single and widow/er.

- All participants increased their knowledge level from the training.

- Highest knowledge gained was 76% for KABRIS/M'LARIS and 78% for LIBRIS while the lowest knowledge gained for batches 1 and 2 was 7.0 % and 26%, respectively. Overall, average knowledge gained was 38% for KABRIS/M"LARIS and 49% for LIBRIS participants.

- Fifty six percent of participants gave the training an overall rating of "very good". They expressed that their training expectations were well-met and felt more confident now to share rice information to other farmers.

Assessment of Farmers' Field Day and Forum in Rice Technology Adoption
R H Patalen and JLJ Duque

Conduct of farmers' field day and forum is among the many effective strategies that can be used to facilitate fast and effective dissemination of new technologies and other end products of research to its intended users, the farmers. It is a great venue for farmers and extension workers to learn and get updated with the latest advances in the world of agricultural research. Furthermore, this activity provides the opportunity for farmers to interact with other farmers from different localities and discuss their current farming situations and problems with the researchers.

"Sapat at Masaganang Pilipinas: Produksyon Pataasin, Makabagong Teknolohiya ang Gamitin, Bigas Huwag Sayangin."

For this Field Day, PhilRice wanted to concentrate on reaching and inviting farmers from its neighboring locality, specifically, farmers of nearby barangays in Midsayap and Libungan. Likewise, members of irrigators' associations (IA) in North Cotabato were invited. Some elementary pupils also attended the Field Day. These pupils were scheduled separately from the farmers to focus on topics from which the children can optimally learn.

Highlights:

Based on the registration records, there were 400 farmers, 51 agriculture extension workers and researchers, and 303 pupils and students who joined the farmers' field day and forum. At least 20% of the total participants served as the sample population.

- Farmers' chose the demonstration on rice-duck as their most preferred station. This may be because of the realizations on the advantages that the ducks may have for the rice farms.

- Another preferred station by the farmers is the demonstration on adaptability of hybrid and inbred lines. At present, there is a clamor to use hybrid rice as it produces higher yield than the inbred lines, and more and more farmers are now seeking for seed sources for the hybrid rice varieties. Likewise, Palayamanan still is among the most preferred stations of the farmers. This may be due to the benefits the farmers may reap by adapting the Palayamanan Farming System.

- The AEWs on the other hand prefer the demonstration on Adaptability of Hybrid and Inbred lines, as it showcased not only the best performing hybrid rice lines/varieties but also the best performing inbred lines/varieties.

- The demonstration on rice-duck was rated as important/very important by the most number of farmer evaluators and of AEW evaluators in relation to work/farm. This was followed by demonstration on Palayamanan and on vermicomposting.

- Most of the field day evaluators found the demonstration on Palayamanan to be quite useful in their work as agriculture extension workers and considered the technology easy to adopt since the farmers are already practicing diversified farming systems.

- Likewise, most of the AEWs also rated the demonstration on drum seeded rice, installation of observation well, and controlled irrigation, demonstration on submergence tolerant rice lines, and demonstration on flatbed driers to be useful and easy to be adopted.

Development and production of print materials as an aid in the dissemination and promotion of location-specific technology (LST) on rice in Region XII
RD Orejudos, LJD Antatico

In the field of agriculture, most of the stakeholders are usually located in rural and remote areas where access to information is very limited. In this context, the importance of print media is much appreciated due to its wide availability. Furthermore, print media such as flyers, posters, and leaflets can be read by farmers over and over again as long as they intend to.

Highlights:

- Technologies and their adopters were identified, interviewed, and featured in the promotional posters to capture the interest of other farmers and persuade them to adopt rice technologies which may be found effective in their respective areas.

- Four promotional posters were produced and prepared for pre-testing, mass production, and dissemination.

Pilot-testing on making simplified and localized instructional posters using economical gadgets and tools and evaluation of its effectiveness to farmers and agricultural technicians
RS Escabarte, RD Orejudos, and LJD Antatico

Various lines of communication are tapped by government and non-government sectors in the field of agriculture. These media are used in many activities such as information dissemination, product promotion, and even in technology extension for farmers.

However, in technology extension, it becomes difficult for these target clienteles to grasp instructional messages through channels such as television and radio. In this premise, the use of conventional media, specifically the print media such as posters and leaflets becomes considerable. Hence, five batches of Training of Trainers in Making Simplified and Localized Instructional Posters in Rice was conducted introducing the Process Description Method (PD).

PD is a method of encapsulating complex procedures in performing a certain technology into eight steps. It incorporates texts and traced pictures to make the poster and the technology understandable adoptable for farmers.

Highlights:

- A total of 48 Agricultural Extension Workers (AEWs) and farmer-leaders from the different provinces and municipalities and agricultural agencies in Region 12 were trained in making simplified instructional posters.

- The posters produced in these trainings will be scanned, re-layout, and printed into tarpaulins for pre-testing and mass production.

Regional stakeholders' meeting and workshop of the department of agriculture-upland rice development program in region 12
GV Romarez, RS Escabarte, Jr., and RB Miranda

In 2011, Upland Rice Development Program was launched to augment national rice production to achieve rice self-sufficiency by 2013 as envisioned in the Food Staples Sufficiency Plans. To strengthen, operationalize, and effectively carry out the program, regional stakeholders' meeting and workshop will be conducted to formalize the roles and commitments of the various local partners involved in the project, such as rice researchers, rice specialists, LGU-AEWs, NGOs, and other development workers from various stakeholders to work with farmers and local leaders in the development and promotion of location-specific technologies for upland rice. Thus, the regional stakeholders' workshop was conducted to formalize the creation of Regional Agri-Pinoy team for the development of upland rice ecosystem and improving the lives of upland farming communities. Specifically, it aims to: 1) orient the stakeholders about the nature and scope of the DA-Upland Rice Development Program (DA-URDP); 2) evaluate program interventions and strategies of implementation; 3) institutionalize members of the Regional Agri-Pinoy teams for URDP; and to formalize commitment, roles, and responsibilities of each stakeholder.

Highlights:

- A total of 38 participants coming from different agricultural sectors attended the Regional URDP Stakeholders' Workshop held in Agua Frio Resort, Koronadal Cityfrom June 7 to 8, 2012.

- Formation and identification of Regional Agri-Pinoy Team and its members' responsibilities were identified.

Intensive training course on seed production and seed certification of tgms-based two-line hybrids in region 12
GV Romarez, SR Brena and IV Boholano

In 2009, two (2) TGMS-based two-line hybrids, NSIC Rc202H (M19) and NSIC Rc204H (M20) were released. However, since their release, seed production is only done by PhilRice. In 2010, Administrative Order No. 04 on "Seed and Field standards for the production of Two-line hybrid, Thermosensitive Genetic Male Sterile (TGMS) line and Pollen Parent" was issued by the Department of Agriculture. The potential of the two TGMS-based hybrids was tested in the nationwide adaptability trials conducted in 2010 which showed seven to 10t/ha yields in many areas. To accelerate the wider cultivation of these TGMS-based hybrids, which will contribute to higher productivity of farmers thereby contribute to the attainment of rice self-sufficiency of the country, there is a need to train hybrid rice seed growers with the new system to help PhilRice in producing enough seeds which will be available for all interested farmers. This activity aims for the participants to: 1) understand how hybrids are developed and the difference between hybrid and inbred varieties; 2) know the difference between TGMS-based and CMS-based hybrids; 3) understand and apply field and seed management practices in the production of S- and P-lines and F1 (S x P) of TGMS-based two-line hybrids; and 4) know the requirements for seed grower to commercially produce seeds of TGMS hybrids and their parents;

Highlights:

- One batch of Intensive Training Course on Seed Production and Seed Certification of TGMS-Based Two-Line Hybrids for Seed growers in Region 12 conducted on May 28 to June 2, 2012 in Dolores Lake Resort, Lake Sebu, South Cotabato.

Promotion of rice and rice-based technologies: farmers' adoption of the palaycheck system
GV Romarez, RD Orejudos, LJD Antatico

At present, several modes of extension are tapped by government and non-government agencies to improve the farming practices of local farmers, increase their yield, and eventually attain rice self-sufficiency. Different channels are devised for this purpose and one of these is the PalayCheck System which serves as the platform in the formulation of Location Specific Technology (LST).

However, it is also important to know if the farmers adopt the technologies of the PalayCheck System and how do these technologies create significant differences on the part of its adopters and of those farmers who are not yet acquainted with the PalayCheck System.

Hence, in this study, the Farmers' Adoption of the PalayCheck System and the system's beneficial effects to its adopters were evaluated and compared the farming practices of farmers who underwent PalayCheck System and those who are not yet oriented to the said system.

Highlights:

- Certified seeds. Eighty-eight percent of PalayCheck farmers and 54% of non-PalayCheck farmers are using certified seeds.

- Cost of Seeds per Hectare. The prevailing cost of seeds spent by both Palaycheck farmers non-palaycheck farmers ranges from P1,000 to P1,500 per hectare.

- Fallow period. Results revealed that PalayCheck farmers (78.57%) observed 3 to 4 weeks fallow period while only 57.14% of non-PalayCheck farmers do the same.

- Land preparation. Most of the PalayCheck farmers (76.19%) and non-PalayCheck farmers (80%) prepare their fields 3 to 4 weeks before planting. However, there were few (17.14% non-Palaycheck farmers and 9.52% Palaycheck Farmers) who prepare their fields 2 to 3 weeks before planting.

- Age of seedlings transplanted. More than half (57.14%) of non-Palaycheck farmers transplant 21 to 25-day old seedlings, while less than half of PC farmers (47.62%) transplant the same age of seedlings.

- Synchronous planting. All PC farmers and almost all (97.14%) non-PC farmers practice synchronous planting.

- Fertilizer Application. Most of the PC farmers (66.67%) and a good number among non-PC farmers (48.57%) apply fertilizer twice in a cropping season. On the other hand, a smaller percentage of PC (30.95%) and non-PC (45.71%) farmers apply fertilizers thrice in a cropping season.

- Cost of pest management. Some PC farmers (9.52%) do not spend any amount for pest management. According to them, they manage pest through cultural method and do it all by themselves. However, most of the respondents (50% PalayCheck and 51.43% non-PalayCheck farmers) spent P2,000 and below.

- Average water depth. Most of the farmers, both PC (92.86%) and non-PC farmers (91.43%), estimated the depth of water in their fields from 3 to 5cm.

- Pre-harvest practice - Pressing the grain at the panicle base to know if it is already in the hard dough stage. Both PC and non-PC farmers practice this technique. However, the percentage of non-PC farmers (89%) who practiced this technique is bigger compared to the PC farmers (81%).

- Postharvest practice - Threshing the harvested palay after harvesting (one day after harvest during wet season; two days after harvest during dry season). Farmers in both categories follow the recommendation of the PalayCheck System. However, a higher percentage of PalayCheck farmers (94.29%) compared to non-PalayCheck farmers (90.48%) thresh their harvested palay one day after harvest during wet season and two days after harvest during dry season. According to those who are not practicing this recommendation, they thresh their palay immediately (a matter of hours) after harvest.

- Average yield. There is a significant increase in the yield of farmers after undergoing PalayCheck System.

- Conclusion. Therefore, farmers who underwent lessons on the PalayCheck system and adopted the technologies recommended by the program have lower cost of farming inputs, higher yield, and higher income.

Promotion of rice and rice-based technologies: farmers' adoption of the palaycheck system

GV Romarez, RS Escabarte, Jr., PhD, RB Miranda, ED Maragañas, JD Cordero, E Kiko and M Tuico

A frontier that has not been given focus is the development of technology package suitable for upland rice eco-system. It is community-based and mainly relies on farmers' local knowledge, particularly on the production protocol and planting calendar of the traditional rice varieties. The development of the upland rice eco-system is an opportunity to augment the country's rice supply as this production eco-system is located in the fringes of the rural areas. It is the source of rice, as a staple food, in communities where development is almost hopeless.

Thus, this project aims to harness the potential of the upland rice eco-system as one of the major sources of the country's rice supply and to develop the upland communities as self-sufficient food communities through the promotion of sustainable farming systems and practices in the upland farming communities that will help farmers increase their yields and income; developing a sustainable models of locally organized Community-based seed banks (CSB) and a viable seed production system; capacitating the

LGUs and upland farmer organizations in the implementation of Upland Rice Development Program (URDP); developing sustainable institutional collaboration and support.

Highlgihts:

- Five UpTechs were deployed in Regions 9 and 12 (where there were a total of 38, 280ha of upland rice) from January to June 2012. However, UpTech for ARMM was deployed in July 2012.

- Three regional URDP stakeholders' workshops were conducted. Most of the participants came from Local Government Units (provincial, municipal, and city), non-government organizations (NGOs), DA-regional field office, cooperatives, Department of Environment and Natural Resources (DENR), Agricultural Training Institute (ATI), BPI-National Seed Quality Control Services (BPI-NSQCS), National Commission of Indigenous People (NCIP), state colleges and universities (SCUs), and PhilRice.

- Seven hundred eighty-nine bags at 40kg/bag of upland rice were procured in Cotabato, specifically Awot and Dinorado rice seeds and distributed to 641 farmer-beneficiaries in Regions 9 and 12.

- Among the farmer-beneficiaries of upland rice seeds, 90.3% seed repayment in Alamada, Cotabato and stored in their CSB; 22.9% seed repayment in Lake Sebu, South Cotabato; and no seed repayment in Zamboanga del Sur.

- In Alamada, Cotabato and SNA, Sultan Kudarat, Dinorado cultivar achieved a higher yield of 2.30t/ha and 1.56t/ha, respectively. In Lake Sebu, South Cotabato Kasagpi cultivar performed better with 1.54t/ha and Awot cultivar achieved higher with 2.13t/ha in Mahayag, Zamboanga del Sur .

- However, most of the farmers in Regions 9 and 12 preferred Dinorado cultivars due to its yield performance compared to other upland rice cultivars and its characteristics like aroma.

V. Open Academy for Philippine Agriculture in Mindanao: Promotion of Philrice e-services to modernize Philippine agriculture through ICT
OH Abdulkadil and RD Orejudos

Increasing access points on rice information for farmers, extension workers, and other stakeholders will be made possible through massive information campaign, empowering them with the advancement of information and communications technologies (ICT). Giving farmers, extension workers, and other stakeholders the option in the utilization of ICT services will result in a more convincing and powerful promotion of technologies.

Highlights:

- More than 700 students from three national high schools under PhilRice Midsayap area of coverage benefited from the information awareness on PhilRice e-services, overview of and opportunities in the rice industry.

- A cyber community was established in Brgy. Baras, Tacurong City on February 17, 2012.

- Rice Teknoklinik was conducted in Upi, Maguindanao. About 30 to 35 farmers were involved during the activity and one location-specific Q&A was developed. The information material was distributed to the farmers.

- ICT-related research: Cellphone Availability to Rice Farming Household
  - A survey conducted among 80 rice farmers revealed that 75% of the farmers do have cellphones while the remaining 25% do not have cellphones. The respondents are using a cellphone for at least five years on the average.
  - Age vs. cellphone utilization. Farmers aged 60 and below are still active in using cellular phones.

- Mobile phones used for agri-related concerns: Those farmers who have tried using their mobile phones in agri-related activities revealed that they often communicate with Agricultural Extension Workers (AEW), chemical/private agri-companies, Irrigators' Association members, farm laborers, seed producers, co-farmers, and traders.

- Load consumption: Farmers also invest in ICT. Farmers are investing at least 256 pesos on the average of cell phone load per month. This spending could have bought more or less 7kg of rice for every household. Result showed that cellphone load is also an important commodity in this ICT age.

Talamdan sa Maayong Pagpanguma: A school on the air program in support to the Agripinoy Rice Program in Agusan del Sur
ST Rivas

Being aware of farmer's attitude towards innovation, it is essential to design a more effective information campaign that will not only educate farmers and the listening public in general by bringing them first-hand information but entertain them as well. A radio program is believed to provide all these in just one package. The fact that radio is a companion medium and the cheapest among the mass media; it could surely deliver the very target of this activity since most of the farmers could have easy access to it. Aside from that, it also has the largest area of coverage. It could surely reach the farmers even in the far-flung areas.

Unlike school-on-the air program that requires a classroom-setting learning, this radio program targets all the LSTD and non-LSTD farmers and other rice stakeholders who are not required to enroll in the program. The traditional classroom setup that features a teacher-student relationship is not applied in the study. The target participants will just listen to the radio program in their house or in their farm but could send their queries through PhilRice Text Center.

Highlights:

- Implemented SOA in Agusan del Sur with three sets of participants located in three barangays having PalayCheck demonstration field in each barangay, total SOA participants is 67.

- Mid-implementation assessment revealed 58% increase in knowledge on PalayCheck system and 31% increase in Agripinoy rice program.

Utilization of Open Academy for Philippine Agriculture (OpAPA) for capability enhancement of rice stakeholders in Mindanao
EMGaquit

Based on the pilot site tested nationwide, the implementation of Open Academy for Philippine Agriculture (OpAPA) was found useful and effective as a tool in accessing agricultural information. The success of OpAPA is the initial idea to implement the use of information communication technology (ICT) in throughout Mindanao to achieve increase in yield and income. ICT plays the role in providing valuable information. In fact, farmers and agricultural extension workers need to be updated of the technologies that relate to crop management and establishment. This project aims to achieve rice self-sufficiency in the country.

Highlights:

- A total of 2,230 copies of various PhilRice knowledge products were promoted and distributed to farmers, extension workers, partners, and students.
- Pest monitoring through the PhilRice Farmers Text Center.

Translation of PhilRice knowledge products from English to Cebuano
SARivas

Technical information is better understood when written in plain language and disseminated in a concise and easy format. The translation of knowledge products has always been one of the highlighted issues during the conduct of field days and even during the DA-PhilRice-JICA seminar workshop conducted on September 2009. It has been emphasized that the importance of translating the PhilRice knowledge products would not only enhance the farmers' rice production knowledge, skills, and practices, but also provide a road map by simply following the processes and implementing the practices and recommendations contained in the knowledge products.

Highlights:

- Edited 16 Cebuano leaflet materials contributed by subject matter specialist
- Repackaged and printed four back-to-back Cebuano leaflets with different contents

VI. Development of diversified and integrated farming systems (DIFS) models for rainfed ecosystem
RSNarisma

PhilRice, as the agency with a mission of helping the country in attaining rice self-sufficiency by increasing the productivity and profitability of rice farmers in a sustainable and competitive manner, is equipped with different technologies that would increase their yield and income. The rice area in Hinatuan, Surigao del Sur is rainfed. Thus, Palayamanan® System will be the main platform that will be followed for this area. Another four rainfed areas will be scouted for 2011 establishment.

Highlights:

- Organized rice farmers with 23 active participants with three farmer-innovators (FIs) and established varietal adaptation trial using the following varieties: NSIC Rc160, PSB Rc18, NSIC Rc224, NSIC Rc192, and NSIC Rc222.

- Assisted the LGU in the conduct of Farmers Field School (FFS).

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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CERTIFICATION INTERNATIONAL

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