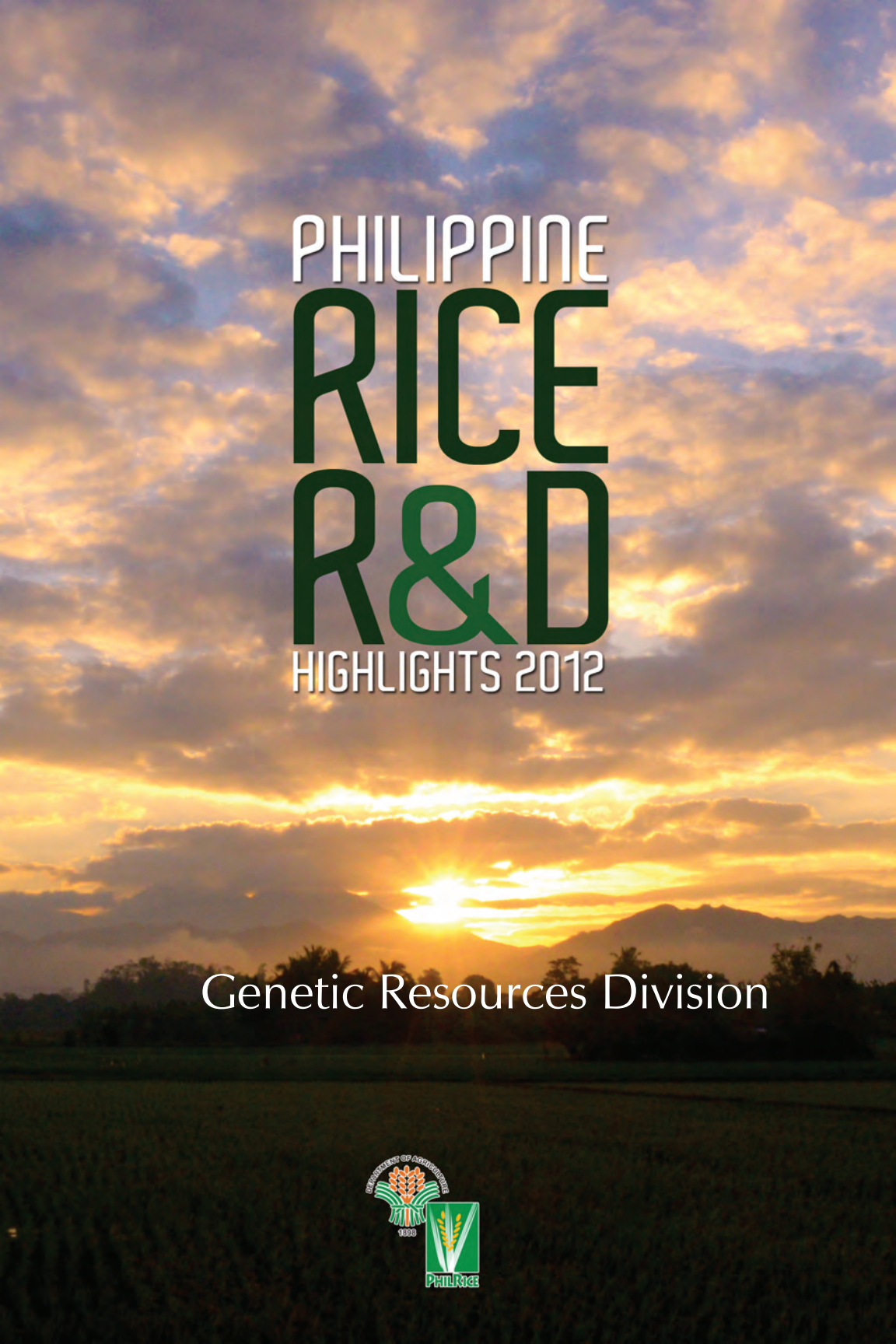
PHILIPPINE
RICE
R&D
HIGHLIGHTS 2012
Genetic Resources Division
PHILRICE

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GENETIC RESOURCES DIVISION

Division Head: Loida M. Perez

The core functions of GRD include genetic diversity research, germplasm collection, conservation, management, dissemination, and utilization of genetic resources. Research on genetic diversity of rice germplasm entails assessment of the current status of conserved rice genetic resources in PhilRice Genebank in terms of verification of its identity, germination rate, passport information, and other morphological data gathered using the standard descriptors of rice. Thus, this work is essentially deferred and will not be conducted directly in 2012, pending the results of the optimization of the germplasm conservation activities and application of the standard operating procedures in the genebank.

The division houses the PhilRice Genebank,which stores approximately 12,000 rice germplasm covering traditional or indigenous Philippine cultivars and improved varieties including elite breeding lines and commercially-released rice varieties. Although data show that 50% of stored germplasm are traditional varieties, many provinces in the Philippines are still considered as 'collection gaps' in the genebank database.

A milestone in germplasm conservation at PhilRice is the re-establishment of the standard operating procedures (SOPs) of its Genebank covering general procedures of collection, conservation, characterization, regeneration, and distribution of rice genetic resources. This was accomplished with the help of the genetic resources experts from UPLB as well as training of GRD personnel in international genebank institutions like the Genetic Resources Center of IRRI (IRRI-GRC) and the National Agrobiodiversity Center of Korea through its Rural Development Authority (RDA) Genebank. Said SOPs are hoped to address issues on seed mixtures, identity of germplasm, non-germinating seeds provided to requesting parties, confusion on statistics of conserved germplasm accessions, non-standardized protocols for characterization and regeneration and many others. Additionally, a revised and standard procedure for seed request from the PhilRice Genebank has been drafted as well as the guidelines on the use of the Standard Material Transfer Agreement for all incoming and outgoing rice genetic resources of the Institute. These guidelines are currently being finalized in adherence to quality management procedures in GRD as well as for proper documentation and reference particularly on issues concerning intellectual property rights of rice genetic resources.

The acquisition of additional laboratory equipment and personnel contributed in improving the quality of distribution of germplasm and other information requested by PhilRice researchers and other stakeholders. The immediate viability testing of 4,820 accessions provided information on the status of rice germplasm stored in the cold storage facility of the PhilRice Genebank. These data provided significant information on the quality and ensured the viability of seeds for distribution to researchers and breeders.

Evaluation of the grain quality of germplasm as well as the important biotic and abiotic stresses of rice is central to preparing the genetic resources for use in research and breeding of rice varieties. Of the 215 rice accessions evaluated for physico-chemical properties, milling potential, physical attributes, and aroma, 30 were identified to have general good grain quality in terms of superior head rice recovery, long and slender grains, less than 5% chalkiness, and apparent intermediate to soft cooked rice texture. These accessions are candidate genetic resources in breeding and improvement of rice for good grain quality. In addition, 12 accessions were recently identified to have perceived aroma based on KOH analysis. Advanced methods such as the use of molecular markers are currently being explored to determine aroma or fragrance gene in said varieties.

In order to exhaust the natural richness of alleles or genetic variations existing in our germplasm, a preliminary investigation exploring the use of Multiparent Advanced Generation Inter Crosses (MAGIC) was conducted. This research aimed to develop mapping populations using PhilRice's elite rice breeding lines and improved varieties. The goal is to exhaust the natural allelic variants that can be sources of novel quantitative trait loci (QTL) for traits like yield, disease resistance, tolerance to abiotic stresses like drought, submergence, and salinity, as well as grain quality. We have initially identified 12 varieties as candidate founder lines with traits like high yield potential (13 t/ha), drought tolerance, heat tolerance, tungro resistance, blast resistance, bacterial blight resistance, insect (green leaf hopper) resistance, and anaerobic germination tolerance. More candidate varieties will be explored and the final 8 founder lines will be selected as parents in developing the MAGIC mapping population. Characterization of these founder lines using molecular tools and morphological parameters must be conducted towards the end of 2012 to establish the identity of the parental cultivars.

In terms of establishing the integrity of seed files as reference standards of germplasm accessions, we have initiated a basic research using microsatellite markers. We established the similarity of DNA fingerprint profiles generated with genomic DNA from seed files and their corresponding seed stock stored in medium- and long-term storage facility. We endeavor to rule out any possibility that a certain seed file does not match with its corresponding seed stock stored in PhilRice Genebank. By

getting random germplasm accessions from the list, genomic DNA has been prepared from the seed files and its stored seeds. In the next couple of months, genetic similarity analysis will be conducted using the microsatellite DNA fingerprints that will be generated in the seed files and stored seeds. All this leads to efficient and reliable genebank management system of PhilRice. We have also initiated the germplasm inventory of accessions PRRI000001-914. This activity is critical and important in ascertaining the current status (physical location of the seeds and database information) of the rice germplasm. Our findings show that 61% (550 accessions) are secure in terms of viability (germination rate), availability of seeds (physical), and verified from the seed file (as reference standard for identity). Approximately 16% (146 accessions) have low viability (<85% germination rate) while the rest are in problematic conditions such as 0% germination rate, mismatched seed files (DNMSF) and thus unknown identity, missing stocks/stock data absent, no seed file, low stock and viability, and many others. . Our initial findings suggest that an immediate and urgent inventory of all germplasm collections/accessions at the PhilRice Genebank must be be conducted to determine accessions that have to be rescued particularly those with very low viability status. This move will enable GRD to promptly respond to requests for delivery of requested germplasm for research.

I. Conservation, Characterization, and Distribution of Rice Germplasm
LM Perez

The collection, preservation, evaluation, and use of crop genetic resources, collectively known as germplasm, are vital activities and concerns in our quest to produce food. Over the years, the ancestors of our important crops have generated immense pools of genetic variants that support survival in diverse and changing natural environments. Modern plant breeding has developed techniques and strategies to use genetic variations in producing cultivars of crop plants with desirable traits.

Among the major crops, rice germplasm has been the most dynamically exchanged and cooperatively evaluated. With the changing scenario such as population explosion, industrial revolution, genetic erosion as a result of modern breeding, and probably neglect, important measures to safeguard this important heritage should be highly prioritized. The rice germplasm needs to be well conserved and harnessed more efficiently to better meet the rising rice consumption. The threat of losing these valuable materials makes conservation efforts increasingly more urgent and important.

Collection and acquisition of new germplasm materials

IG Pacada, MC Ferrer, and LM Perez

Upland cultivars are known to have genetic wealth for grain quality and resistance to pathogens. In general they require less input and use minimal pesticides. They are also important culturally since some if not most of them are being cultivated to be used in specific rituals, festivals, and traditional cuisines. Hence, collection and storage of traditional cultivars are important tasks. In this research, our goals were to collect germplasm from upland areas, and gather salient background information particularly those concerning traditional knowledge being employed in cultivating them.

Highlights:

- 136 new and viable traditional cultivars (TRVs) were collected from 3 regions and 8 provinces namely: Benguet, Ifugao, Aurora, Bulacan, Tarlac, Zambales, Agusan del Sur, and Surigao del Sur (Table 1).

- Cultivars were from actual farm and household collections; Upland Technologists helped in cultivar acquisition

- Actual collection has the following information, which is now kept at the PhilRice Genebank database: acquisition descriptors, collecting descriptors, collection and/or characterization/evaluation environmental descriptors, and notes.

Table 1. New collected TRVs from the CAR, Central Luzon, and CARAGA regions, Philippines.

Region	Province	Municipality	Barangay	No. of TRVs collected
CAR	Benguet	Kibungan	Palina	9
	Ifugao	Lagawe	Ponghal	2
III	Aurora	Dingalan	ButasnaBato	10
		San Luis	Brgy. Nonong Sr.	1
		Dingalan	Caragsakan	15
		Dipaculao	Diarabasin	6
		Ma. Aurora	Decoliat	7
		Ma. Aurora	Cadayakan	6
		Dipaculao	Ditale	6
		Dipaculao	Dimabuno	4
	Bulacan	Doña Remedios Trinidad	SapangBulak	8
	Tarlac	San Jose	Mamot	2
	Zambales	Botolan	Villar	4
		Kibungan	Poblacion	5
		Bakun	Poblacion	10
XIII	Agusan del Sur	Vereuela	Sawagan	2
		StaJosefa	San Jose	4
		Trento	Sta Maria	19
		San Francisco	Pasta	2
		Esperanza	Tagbalili	2
		Loreto	Binucayan	3
	Surigao del Sur	Tandag City	Poblacion	5
		Tandag City	Mabuhay	4
			TOTAL	**136**

Conservation, regeneration, and characterization of rice germplasm

DA Saclangan, MIC Calayugan, CQ Cortaga, CL Diaz, MCV Newingham, MC Ferrer, and LM Perez

The rich genetic diversity of rice in the Philippines must be highly valued. Diverse rice germplasm plays key roles in the quest for attaining rice- self-sufficiency. They serve as sources of valuable traits for crop improvement. As the shift of using few modern varieties increases, rice cultivars are under threat to the narrowing of genetic diversity. There is therefore an urgent need to safe guard this natural heritage for its present and future use. Ex-situ conservation provides a safe storage system for these germplasm materials where they are kept under optimal storage conditions efficiently managed and made accessible to users. Regeneration through seed multiplication is the most crucial way to revitalize stocks in germplasm collections. In conjunction with this, characterization is performed. Adequate characterization of germplasm for agronomic and morphological traits is the basic necessity for its utilization. The objective of the study is 1) to conserve rice germplasm for present and future use, 2) regenerate sufficient and viable stocks for storage and distribution, and 3) characterize rice germplasm for agro-morphological traits made accessible to end-users.

Highlights:

Conservation

Conservation of germplasm starts with the manual seed sorting and selection of high quality seeds for storage using the seed file as reference. The main tasks in the conservation of rice germplasm are the registration and processing of new acquisitions, low temperature drying of seeds, initial viability tests and monitoring, and packing for medium-and long-term storage.

Inventory

Preservation of genetic integrity and prolonging the longevity are the goals of germplasm conservation. Due to the evolving seed processing practices, germplasm stocks are in disparate conditions. Consequently it was observed that a high number of germplasm are under critical viable state. A detailed inventory system was then initiated to assess and identify germplasm accessions that need rescue and reorganization.

- Stocks for Accessions PRRI000001 to PRRI000914 were extracted from the drying room, medium-, and long-term storages for inventory. The stocks were consolidated according to accession and verified with the corresponding seed file. Moisture content (MC) percentage and germination rate were assessed for each stock.

- Accessions assessed with less than 3-84% viability and less than 100g stock were sown for 2013DS regeneration. While accessions identified with 0-3% viability were set for embryo rescue (Figure 1).

- Weak areas in the conservation processes identified such as drying to 6% MC, seed processing, verification process, regeneration, labeling system, and database system are continuously being improved to ensure genetic integrity and prolong longevity.

Viability Testing

All seeds prior to storage, new collections, and regenerated accessions, are analyzed for percentage viability. After the seeds are cleaned and dried below 7% MC, viability testing is performed for each collection. In-between papers method (Ragdoll) of germination is used for the test. Seed samples (100), replicated twice, are obtained from each entry and germinated following the above-mentioned method. Seeds are germinated in incubator set at 30°C and scored at 7 and 14 days after sowing. Incoming seeds with viability scores that fall below 85% are set for seed regeneration in the best season. Regular viability tests are performed every 5 years for active set and 10 years for base set. Prior to germination test, inherent dormancy is broken by subjecting the seed samples in an oven set at 50°C for 5 days. Collections will be regenerated when the viability of stored seeds falls below 85% of the last viability test.

- Viability testing of remaining regenerated materials of 2010WS (255 collections), 2011DS (154 collections), 2012DS (233 collections), and other regenerated materials for viability checking (130 collections) was done (Table 2).

- Aside from regenerated materials, viability testing was also done with Excellent Quality Rice (EQR) (112 collections), inventoried materials (Accessions 000001 – 000914; 417 packets), original collections of 2008 and 2012 (252 collections).

- There is higher number of collections with high (85% above) viability than below 85% viability status.

- Some of the EQR's and original collections did not undergo viability testing due to very low amount of seeds (below 1 gram).

Drying and Foiling

Seeds for each collection are stored in the base (long-term) set and active (or distribution) set. At least 400g clean seeds will be prepared for each accession and seeds must reach MC level of less than 7% before finally placing them in aluminum foil packets.

Base set for each accession is prioritized. The base will have 2 foil pouches; 50 g each is prepared for each accession and stored in upright freezers with -10 to -20° C. For new acquisitions and original seed stocks, a 50g for long-term storage is set aside. The active set will likewise have 2 foil pouches; 100 g each accessions and stored in cold room with 10° C. This is for the purposes of germplasm evaluation and seed request distribution. All cleaned seeds are stored depending on the amount of newly acquired seeds or rejuvenated accessions.

- 100% processing and foiling for storage of 2012 collections were done (Table 5).

- Other original collections from 200 to 2011, and other germplasm materials from IRRI were retrieved and processed for foiling (base and active collections) totaling to 277 collections.

- Processing and foiling (base and active collections) of regenerated materials from 1997 years before it up to 2012 DS were also done while 68 collections from 2012 DS are still under drying and 83 collections from 2011DS and WS were found to have no seed file (SF) and "Did Not Match Seed File" (DNMSF).

Regeneration

Accessions with viability less than 85% and below 50g stock amount were identified and set for regeneration. Similarly, newly acquired collections with seeds of low quantity and poor viability underwent seed increase. Seed stocks for planting were verified with the original seed files prior to seed invigoration. Proper labeling and setup were ensured to avoid mixing of stocks. Seedlings were raised in wet-bed plots and transplanted 25 days after sowing (DAS). Field set-up was a non-replicated systematic plot arrangement with 3 rows of 8 meters each in DS and 6 rows of 5 meters each in WS. Materials were maintained as lowland transplanted in 25 x 25 cm row distance, with minimum fertilization, including upland varieties. Entries were harvested at 80% maturity and were manually threshed and placed in individual net bags. Within the same day of harvest, low temperature drying of seeds at 14-18° C was performed. After two weeks of air-drying at low temperature, entries were then submitted for seed cleaning.

Three stages of seed file verification was done to ascertain the identity of regenerated germplasm starting from 1) harvest, 2) pre-seed cleaning as guide in selection of grains, and 3) final verification prior to foiling. In the field, seasonal working seed files that were taken from verified seed stocks were used as guide during harvest.

- 515 and 545 rice germplasm collections for dry and wet seasons respectively were selected and sown in the field and screenhouse for regeneration (Table 3).

- 165 (DS) and 372 (WS) of the sowed entries in 2012 did not germinate, of which 11 and 21 for dry and wet seasons respectively were collections recently donated to the PhilRice Genebank.
- High percentage of unsuccessful regeneration was due to the use of low viability stocks for seeding.

- Due to continuous downpour of rain, high incidence of BLB & BLS was observed among entries. To ensure quality seeds for conservation and utilization, it is well recommended to regenerate during the dry season to avoid pest and disease damage.

- The data obtained can serve as basis when planning for regeneration of rice germplasm in the next cropping season to achieve higher sufficient harvests.

Characterization

Rice conservation is the major activity being undertaken by the Genetic Resources Division of PhilRice. Proper conservation entails collection and maintenance of unique accessions in the Genebank to provide sufficient and accurate gene pool for the breeders to use. As seeds are maintained for the breeding program and other uses, the individual characterization of each accession is done to establish each accession's identity based on its agromorphological characteristics.

The genetic potential of breeding materials, whether developed through conventional breeding or genetic engineering, is evaluated based on phenotypic expressions with the stress of interest. Standard descriptors for rice released by Bioversity International are used to characterize and identify the materials to efficiently harness, to properly assess and to identify potential donors for use as parents in breeding. Characterization was coincided with regeneration to maximize time and resources. Fifty-eight quantitative and qualitative agro-morphological traits were observed and recorded. These characteristics were identified priority in support for breeding and diversity analysis.

- 230 entries in 2012 DS were characterized and 5 seed lots found having mixed types were tagged and characterized individually (Table 4).

- In 2012 WS, 152 field entries were characterized in vegetative stage

while only 137 were characterized for reproductive stage for some varieties were photoperiod sensitive and late maturing. For post-harvest characterization,132 collections have panicle harvests, and 3 collections were identified to have mixed phenotypes.

- The data obtained were uploaded in the germplasm database.

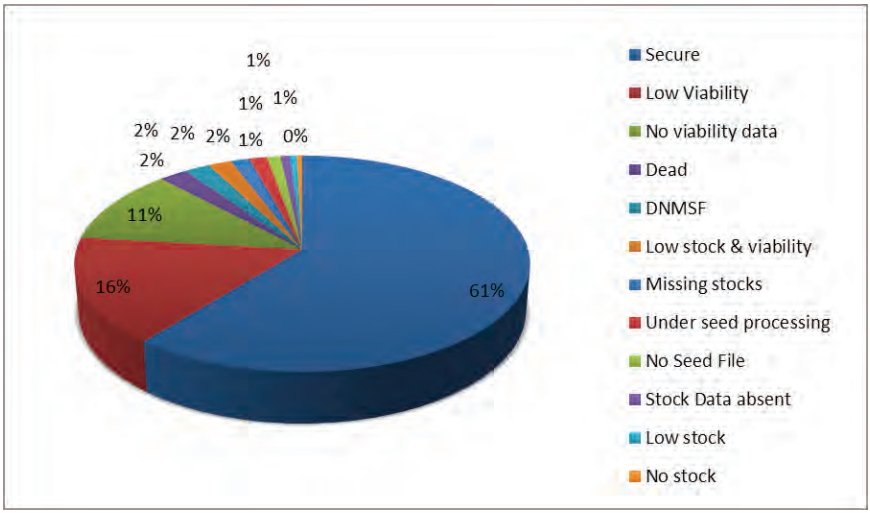

Figure 1. Inventory results for Accessions PRRI000001-914.

Table 2. Viability status of germplasm materials tested.

	Total no. of collections:	No. of entries tested:	> 85% via	< 85% via:
REGENERATION				
Pre-2010 regenerations	130	130	33	97
2010WS regeneration	-	255	253	2
2011DS regeneration	-	154	154	-
2012DS regeneration	-	233	208	25
Total Regenerations		**772**	**648**	**124**
INVENTORY				
ACCESSIONS	PRRI000001 - 914	417	126	291
Total Accessions		**417**	**126**	**291**
ACQUISITIONS				
2012-08-01-01 to 229 (EQR)	229 collections	112	2	110*
2012-06-04-01 to 23	23 collections	23	19	4
Some 2008 orig collections	41 collections	41	24	17
2012-03-01-01 to -26	26 collections	26	25	1
2012-09-01-01 to -17	17 collections	17	8	9
2008-05-01-01 to -40	40 collections	40	6	
2012-10-08-01 to -09	9 collections	9	6	3
2012-10-02-01 to -19	19 collections	19	12	7
2012-10-03-01 to -08	8 collections	4	3	1
2012-11-01-01 to -05	6 collections	6	4	2
2012-10-07-01 to -16	38 collections	38	30	8
2012-10-01-01 to -02	2 collections	1	1	0
2012-11-03-01 to -20	20 collections	20	7	13
2012-11-04-01 to -05	5 collections	5	5	0
2012-12-01-01 to -03	3 collections	3	3	0
Total Acquisitions		**364**	**155**	**209**
Total Entries of 2012		**1553**	**929**	**624**

**78 of which have 0% viability*

Table 3. Summary of regenerated rice germplasm harvested in 2012 dry and wet season.

Season	Total sown	Live	Sufficient harvests	Unsuccessful regeneration
2012DS	515	286	244	55.5%
2012WS	545	173	130	76.1%

Table 4. Summary of characterized rice germplasm in 2012 DS and WS.

Season	Entries	Vegetative	Reproductive	Post Harvest
2012DS	230	100% completed and encoded	100% completed and encoded	100% completed and encoded
2012WS	152	100% completed and encoded	100% completed and encoded	100% for database upload

Table 5. Seed processing for conservation of germplasm materials.

	Drying/ Processing	Foiled (Base & Active)	No SF/ DNMSF
Original collections:			
2012	-	100% of 2012 foiled	-
2011	-	14	-
2010	-	8	-
2009	-	42	-
2008	-	144	-
2007	-	7	-
2001	-	39	-
IRGC original seeds	-	23	-
Regenerated:			
2012 DS	68	165	-
2011 DS & WS	-	150	83
2010 DS & WS	-	40	-
2008	-	4	-
Other seasons (1997 & below)	-	12	-
Total collections processed	**68**	**648**	**83**

Germplasm distribution and information management
MCV Newingham, DA Saclangan, CQ Cortaga, and MIC Calayugan

All data generated from the characterization, evaluation for pests, diseases and grain quality were encoded in GEMS (PhilRiceGermplasm Data Management System). Viability data, inventory of germplasm accessions, and inventory of base and active sets were likewise encoded. Documentation of seed and germplasm data requests was conducted. Additionally, the online database which will provide basic and other important data about the germplasm accessions in the PhilRice Genebank to anyone interested, is being completed and improved.

Highlights:

- Of 521 newly acquired germplasm in 2012, 44% of those with passport data were inputted in the Germplasm Management System (GEMS) database of GRD, while others are still being processed (Table 6).

- 13 seed requests from PhilRice staff members for research and seed increase purposes covering 57 accessions/collections were served in 2012(Table 27.

- As a major requirement for germplasm transfer outside PhilRice (local and international clients/agencies), 8 Standard Material Transfer Agreements (SMTA's) were processed and issued. The transactions covered 1,570 accessions/collections/varieties released outside PhilRice (Table 8). Seeds transferred were from other divisions of the Institute, not from GRD. Some of the seeds were requested while some were intentionally transferred for research purposes.

- Aside from SMTA, GRD also drafted in 2012 another Material Transfer Agreement (MTA) called the PhilRice Material Transfer Agreement for Non- Seed Biological Materials (PMTA-NSBM). GRD likewise issued the PhilRice Material Transfer Agreement for NCT Field Performance Tests of Rice (PMTA-NCT). . Thus in 2012, GRD was able to issue 2 PMTA-NSBM's and 1 PMTA-NCT (Table 9).

- 21 data requests (seed information/data on characterization) were catered to for research, germplasm management, and other purposes requested by PhilRice staff members (Table 10).

- GEMS was updated to include stresses evaluation data (7 biotic and 3 abiotic stresses) of different rice varieties upon entry of evaluation scores (Table. 11).

- Grain quality evaluation data coming from the 1st batch of rice germplasm (209 entries) submitted to the Rice Chemistry and Food Science Division were also added to GEMS.

- The 2012 DS agro-morphological data (characterization data) from 156 entries from verified seed lot numbers were uploaded into GEMS.

- Back-up/updating of germplasm data from GEMS for online database at ISD database was conducted in February, June, and September 2012.

Table 6. Regions/provinces explored, and number of varieties collected, 2012 germplasm acquisition.

REGION	PROVINCES EXPLORED	NO. OF VARIETIES COLLECTED
CAR	Apayao, Benguet and Ifugao	31
REGION I	Ilocos Norte and Ilocos Sur	15
REGION 2	Cagayan	1
REGION 3	Aurora, Bulacan, Nueva Ecija, Tarlac and Zambales	79
REGION 4A	Cavite, Laguna (IRRI) and Quezon	6
REGION 4B	Mindoro	5
REGION 6	Antique, Capiz and Negros Occidental	16
REGION 8	Samar and Leyte	11
REGION 9	Zamboanga Del Sur and Zamboanga City	20
REGION 12	South Cotabato	4
REGION 13	Agusan Del Sur and Surigao Del Sur	41
NO DATA	EQRs, etc.	292

Table 7. Seed requests in 2012.

2012-GBSR-	REQUESTING PARTY	NO. OF MATERIALS / TYPE	PURPOSE
0001	C. Cabusora / PhilRice	7 traditional varieties	Physiological study
0002	T. Padolina / PhilRice	1 traditional varieties	Breeding
0003	M. Garcia / PhilRice	3 advanced cultivars	DUST
0004	T. Padolina / PhilRice	2 advanced cultivars	Breeding
0005	A. Agustin / PhilRice	2 advanced cultivars	Breeding
0006	L. Perez / PhilRice	6 advanced cultivars	Genetic study
0007	HX Truong / PhilRice	1 advanced cultivars	Pest resistance
0008	V. Dalusong / PhilRice	6 advanced cultivars, 3 unknowns	EQR checks
0009	T. Alegado / PhilRice	8 advanced cultivars	BSP
0010	M. Calayugan / PhilRice	8 traditional varieties	PhilRice/IRRI study
0011	C. Cortaga / PhilRice	7 traditional varieties	Genetic study
0012	V. Dalusong / PhilRice	2 advanced cultivars	Grain quality study
0013	M. Calayugan / PhilRice	4 traditional varieties	Genetic study

Table 8. Standard Material Transfer Agreements (SMTAs) issued with corresponding recipient, number of materials sent, and purpose of seed transfer.

2012-GRDIn-SMTA-	RECIPIENT / AGENCY	NO. OF MATERIALS	PURPOSE
0001	Glenn Gregorio/IRRI	3	Research
0002	Jerome J. Carandang / IRRI	36	Research (sub screening)
0003	Imelda dela Cruz / DevGen	44	Research
0004	Imelda dela Cruz / DevGen	6	Research
0005	Evergilio M. Aqiuno Jr. / CLSU	10	Subject experiment
0006	Materials for Blast Screening at IRRI / IRRI	1301	Research (blast screening)
0007	Dr. FangmingXie / IRRI	(SMTA legally rejected and replaced with PMTA-NCT)	
0008	Alvaro Pamplona / IRRI	156	Research
0009	Alvaro Pamplona / IRRI	14	Research

Table 4. The PhilRice Material Transfer Agreements (PMTA's) issued for non-seed biological and NCT materials transfers.

2012- GRDIn-		RECIPIENT / AGENCY	NO. OF MATERIALS	PURPOSE
NSBM-	0001	Casiana M. Vera Cruz / IRRI	12 fungal isolates	Research
	0002	Elbert A. Sana / NVSU	1 bacterial isolate	Research
NCT-	0001	V. Bruce J. Tolentino / IRRI	48 entries	Field Performance Test

Table 9. In-house request for germplasm data/seed stock information.

IO.	REQUESTING PARTY	DATA/INFORMATION REQUESTED
1	Sierra	15 traditional varieties
2	TMSD	107 Cordillera varieties
3	TMSD	982 upland varieties
4	Lambio	89 varieties
5	Dan Saclangan	Aromatic traditional varieties
6	Marilyn Ferrer	Varieties with clustering panicle type with maturity and origin information
7	Loida Perez	Complete list of Philippine traditional varieties at the Genebank
8	Arocena	Pigmented traditional varieties
9	Arocena	Scented traditional varieties
10	ImeldalynPacada	Benguet varieties and CARAGA varieties
11	Loida Perez	Eastern Visayas traditional varieties
12	Loida Perez	Region 3 varieties and their status in the Genebank
13	Marturillas	Accession locations (16 varieties)
14	CrisCortaga	NSIC/PSB base collection info (78 varieties)
15	Dan Saclangan	Latest accession list (7122 varieties)
16	CrisCortaga	Inventory list (309 varieties)
17	Dan Saclangan	Accession locations (678 varieties)
18	Loida Perez	Cordillera list (964 varieties)
19	CrisCortaga	Purple rice (54 varieties)
20	Dan Saclangan	Location data (89 varieties)
21	Dan Saclangan	All data update (12700+ varieties)

Table 10. Number of accessions subjected to biotic and abiotic stress evaluations

	STRESSES	NO. OF ACCESSIONS
Biotic Stresses	Brown plant hopper	210 accessions
	Green leafhopper	202 accessions
	Bacterial leaf streak	102 accessions
	Bacterial leaf blight	105 accessions
	Sheath Blight	105 accessions
	Tungro (field condition)	102 accessions
	Bakanae	102 accessions
Abiotic Stresses	Drought	727 accessions
	Heat tolerance	50 accessions
	Submergence tolerance	50 accessions

II. Evaluation of PhilRice Germplasm Collection for Grain Quality and Tolerance to Biotic and Abiotic Stresses
Joy Bartolome A. Duldulao

Identifying promising rice germplasm with useful traits is an important activity in rice improvement. The genetic potential of breeding materials, whether developed by conventional breeding or genetic engineering, is evaluated based on phenotypic expressions in target environments with the stress of interest. Rice germplasm must therefore be efficiently harnessed and properly evaluated in order to identify genetic donors in the development of tolerant and high-yielding varieties.

Evaluation of PhilRice germplasm collection for resistance to rice diseases and insect pests
JP Rillon, GDC Santiago, and MSV Duca

PhilRice germplasm needs to be continuously screened to determine their resistance to blast, tungro, green leafhoppers, and brown planthoppers. Stability of resistant accessions is dependent on many factors such as the environment and cultural management used. Resistance may breakdown at any point or it may remain the same. Resistant accessions will be used as parent materials for new crosses of potential rice varieties.

Highlights:

Two hundred sixty-five PhilRice germplasm accessions were evaluated for resistance to blast, rice tungro virus (RTV), green leafhopper (GLH), and brown planthopper (BPH) under screenhouse conditions (2012WS). Evaluation was done for blast at 30 DAS; RTV at 4 weeks after inoculation; GLH/BPH at 10days after

infestation or when the susceptible check was completely killed.

- Of 265 accessions, 43 were found resistant to blast, 135 intermediate, and 85 susceptible (Table 11).
- All accessions were susceptible to RTV.
- 16 accessions were resistant to BPH and 19 to GLH.
- Severe infestation was observed in 106 and 44 accessions against BPH and GLH, respectively. Continuous evaluation of these accessions is needed to determine the stability of resistance to blast, RTV, and GLH/BPH.

Table 11. Reactions of PhilRice germplasm rice accessions to blast, induce and BPH/GLH under screenhouse conditions (2012WS).

Reaction	No. of Accessions			
	Blast	Tungro (induce)	BPH	GLH
Resistant	43	-	-	-
Moderately Resistant	-	-	15	19
Intermediate	135	-	52	32
Moderately Susceptible	-	-	85	164
Susceptible	85	265	105	40
No germination	2	-	8	10

Evaluation of PhilRice germplasm collection for grain quality
JBA Duldulao, KB Bergonio, CT Estonilo, DA Saclangan, and LM Perez

The value of a germplasm collection depends on the available information on the accessions. Information on the morphological and agronomic traits, reaction to biotic and abiotic stresses as well as grain quality characteristics add to the importance of the germplasm and their potential for eventual use by breeders and other stakeholders. Good grain quality dictates consumer acceptability and marketability of rice, thus considered an important component in the rice breeding program. Evaluation and characterization of PhilRice germplasm collection for grain quality is therefore important for effective utilization and successful conservation.

This study is aimed at evaluating the grain quality of the PhilRice germplasm collection as specified in the Descriptors for Rice published by Bioversity International and efficiently providing grain quality data through a computerized database system.

Highlights:

- 813 rice accessions were seed produced and characterized for

milling quality (% hull, % brown rice, % milled rice and % head rice), physical attributes (% chalky grains and grain length and shape), physicochemical properties (moisture content, amylose content, gelatinization temperature by alkali-spreading value, gel consistency, and protein content), and special traits (aroma).

- Most of the accessions had a milled rice recovery of at least 65%, indicative of good milling recovery. For each batch of accession, 199 out of 215 accessions from batch 1, 80 out of 100 accessions from batch 2, 55 out of 110 accessions from batch 3, and 364 out of 388 accessions from batch 4 satisfied the head rice recovery requirement of at least 48% (grade 1 to premium) of the National Seed Industry Council (Table 1). Percentage hull content ranged from 17-34%, with an average of 22%.

- Majority of the accessions from each batch had grain dimensions of long and slender with a grain length and shape (L: W ratio) of at least 6.4 mm and >3.0, respectively. 115 accessions had acceptable percentage of chalky grains of less than 5%. 21 accessions from batch 1, 7 accessions from batch 2, and 24 accessions from batch 3 were pigmented and/or glutinous (with opaque endosperm).

- Most of the accessions had amylose content of 12-25%, which is low to intermediate in classification, while 29 and 84 out of 425 accessions from batches 1-3 were identified waxy and high, respectively. Out of 47 high-AC accessions from batch 1, 11 had medium gel consistency, whereas 36 had hard gel consistency. As to GT type, majority of the entries were intermediate to high-intermediate (70°C -74°C GT).

- By aroma detection using KOH sniffing method, 3 analysts scored 54 out of 215 accessions from batch 1 as aromatic. Protein content of the accessions ranged from 6.3-12.0%.

- Out of 425 accessions with complete grain quality characteristics from batches 1-3, 51 were identified with generally good grain quality. These accessions had superior head rice recovery (grade 1 to premium), chalkiness of less than 5%, long and slender grain dimensions, and apparent soft to intermediate cooked rice texture [14.2 to 24.4 % amylose content, and intermediate to low gelatinization temperature (<74.0°C)]. Twelve of these from batch 1 accessions were perceived to have aroma.

Table 12. Grain quality properties of PhilRice Genebank accessions

Grain Quality Property		Batch Number/Number of Accessions			
Parameter/ Level/ Classification		1 (N=215)	2 (N=100)	3 (N=110)	4 (N=388)
Milling Recovery					
Brown Rice					
>80%	Good	63	0	24	18
75.1- 79.9%	Fair	125	58	74	308
<75%	Poor	27	42	12	62
Milled Rice					
>70.1%	Premium	128	33	59	186
65.1- 70.0%	Grade 1	86	61	45	188
60.1- 65.0%	Grade 2	1	6	6	12
55.5- 60.0%	Grade 3	0	0	0	2
<55.5%	Below Standards	0	0	0	0
Head Rice					
>57%	Premium	153	44	25	286
48.0- 56.9%	Grade 1	46	36	30	78
39.0- 47.9%	Grade 2	12	16	32	21
30.0- 38.9%	Grade 3	3	3	15	3
<30.0%	Below Standards	1	1	8	0
Physical Attributes					
Grain Length					
>7.5mm	Extra Long	5	1	3	-
6.4-7.4mm	Long	102	29	49	-
5.5-6.3mm	Medium	96	58	51	-
<5.4mm	Short	12	12	7	-
Grain Shape (L:W ratio)					
>3.0	Slender	111	38	55	-
2.0-3.0	Intermediate	96	52	49	-
<2.0	Bold	8	10	6	-
Chalkiness					
0-2.0%	Premium	65	23	25	-
2.1-5.0%	Grade 1	50	20	26	-
5.1-10.0%	Grade 2	45	20	18	-
10.1-15.0%	Grade 3	14	9	5	-
>15%	Above Standards	20	21	12	-
Others (Opaque/pigmented/mixture of opaque and translucent grains)		21	7	24	-
Physicochemical Properties					
Amylose Content					
0.0- 2.0%	Waxy	16	5	8	-
2.1- 10.0%	Very Low	8	13	4	-
10.1- 18.0%	Low	48	33	37	-
18.1- 25.0%	Intermediate	96	35	38	-
>25.0%	High	47	14	23	-
Gelatinization Temperature (Alkali-spreading value)					
74.5-80.0°C	High	0	3	0	13
70.0-74.0°C	High-Intermediate	11	15	16	144
70.0-74.0°C	Intermediate	136	63	65	159
<70.0°C	Low	68	19	29	72
Gel Consistency of high-AC accessions		*(N=47)*	*(N=14)*	*(N=23)*	
25-40mm	Hard	36	-	-	-
41-60mm	Intermediate	11	-	-	-
61-100mm	Soft	0	-	-	-
Grain Quality Cluster*					
Cluster 1	Soft Texture	152	81	76	-
Cluster 2	Intermediate	40	16	30	-
Cluster 3	Hard Texture	23	3	4	-

Note: -, data not yet available (analysis is ongoing); *, Grain quality clustering by Juliano, BO (2010) are: cluster 1, low AC-low GT or intermediate AC- high intermediate GT; cluster 2, intermediate AC-low GT or high AC- high intermediate GT and; cluster 3, high AC-low GT

III. Seed Quality Testing of Rice Germplasm

Susan R. Brena

This project focused on seed viability monitoring of accessions, dormancy assessment of traditional rice germplasm, and maximum storage potential of traditional rice germplasm. During the workshop held in the early part of 2012, it was decided that the project will only focus on seed viability testing of very old accessions stored at PhilRice CES genebank. This part of the project is crucial because regeneration activities depend on the seed viability of the stored germplasm. In genebank management, renegeration should be done when the seed viability falls below 85%.

Seed Viability Testing

SR Brena, JM Manangkil, AA Sanchez, and AR Sagun

Viability was monitored through germination test on a fixed sample size of 200 seeds per accession. Each 100 seeds sample served as a replicate. Seeds were sown in between moist paper towel, rolled, placed upright in plastic tray, and then enclosed in plastic. Plastic tray was placed inside improvised germination room. First counting was done 7 days after seeding and second counting was done after 14 days. Only normal seedlings were considered in seed viability.

Highlights:

- In 2012, there were 85, 2212, and 4612 accessions tested for seed viability in the base, active (drying room), and active collections (cold room), respectively or a total of 6,909 accessions.

- Base collections are accessions with distinct genetic purity for future use. These are not distributed directly to users but are used for regeneration activities, which are held under long-term storage conditions below 00C. In PhilRice-CES genebank, base collections tested were stored in freezers with -200C with 85-90% relative humidity (RH). Two of the base collections tested for viability in 2012 had no passport data as to the year/season of production. Average viability was 69%.

- Accessions produced in 1992DS; 1996WS; 1997DS; 1998DS; and 1999WS had seed viability rating below 85%. These accessions must be included in the succeeding regeneration cycles. Accessions kept from 2007 until WS2009 had 93-99% seed viability. The accessions can be kept in the base collections for several years before the next regeneration cycle is conducted.

- Active collections consist of accessions which are for immediate use and distribution. Owing to frequency of use, they are maintained

under medium-term conditions to ensure viability of above 65% for 10-12 years (FAO/IPGR 1994).

- At PhilRiceGenebank, active collections tested for viability in 2012 were stored in 2 storage conditions. The first storage condition was in the drying room with 140C± 50C with 40-50% RH. The freezer type refrigerator was used as cold room with temperature set at 110C ± 20C with 40-50 % RH.

- Only 792 accessions in the total active collections (2,212) kept in the drying room tested for viability had 85-100% viability. Twenty percent (452 entries) had 51-84% viability. The rest of the accessions tested had below 50% viability. Accessions with low viability must be given priority in the regeneration cycle to be conducted. Moreover, the same accessions must be checked in the base collection because the base collection should be the one used in the regeneration.

- Active collections stored in freezers totaled 4,612. Only 400 accessions produced in 2006- 2009, had 97% average viability. Thirty accessions stored in 2006 had 81% viability. Remaining accessions tested had very low viability. Zero viability was observed in 8 accessions produced in 1990 and 1992. The base collection counterpart of these accessions in the active collection should be generated as soon as possible to maintain decent number of samples in the genebank collection.

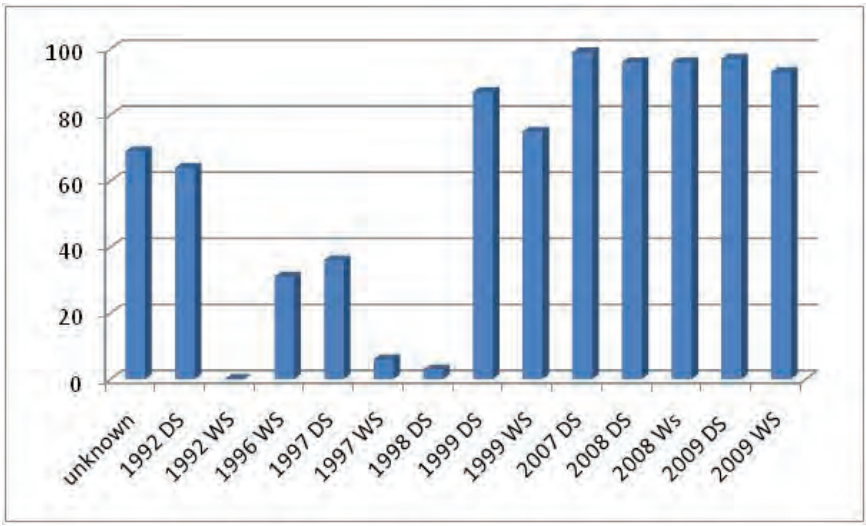

Figure 2. Seed viability test results of 85 accessions under base collections tested in 2012.

IV. Genetic Resources Research
Loida M. Perez

The utilization of genetic resources in research and development particularly in breeding and improvement of new rice varieties equates to the significance and contribution of keeping rice germplasm in ex situ conservation facilities like the PhilRice Genebank. There are many genetic models exploring the richness of natural as well as favorable allelic variation in germplasm. Some studies have used bi-parental mapping populations in genetic and association studies. A new approach exploits the use of MAGIC or Multiparent Advanced Generation Inter Crosses in an attempt to exhaust the natural richness of alleles or genetic variation that can be used by breeders in developing new and improved varieties. This endeavor is currently being investigated using Philippine rice germplasm and its potential of developing novel rice genetic mapping populations for yield, resistance to pests and diseases, tolerance to biotic stresses (drought, salinity, and submergence), and grain quality. The ultimate goal is to develop the MAGIC populations that would serve as genetic resource for scientists and breeders interested in genetic mapping studies and associate QTLs for candidate gene identification and gene discovery in rice.

The availability of molecular tools such as DNA marker technology is a significant aspect towards the improvement and strengthening the conservation and management of rice genetic resources. To be able to ensure the correct identity of conserved germplasm, seed files are prepared upon the entry of original seeds for conservation. The seed files serve as reference for verifying the identity of germplasm throughout the routine procedure of genebanking. Currently, we are trying to verify the similarity of seed files and corresponding germplasm stored in PhilRice Genebank using molecular marker technology. This study aims to determine the integrity of the seed files used as reference standard on verifying germplasm in PhilRice Genebank.

MAGIC (Multiparent Advanced Generation Inter Crosses) in PhilRice genetic resources – a preliminary investigation
MIC Calayugan, TE Mananghaya, VG Dalusong, and LM Perez

In the development of rice cultivars adapted to specific environmental conditions, genetic resources are important in providing appropriate parental donors that can be sources of important traits or genes for high yield, resistance to pests and diseases, and grain quality. Numerous studies were conducted exploring favorable alleles using mostly bi-parental mapping populations in genetic and association studies. However, the natural richness of alleles or genetic variations existing in our germplasm has not yet been exhaustively explored. This study will explore the use of MAGIC to exhaust natural allelic variants that can be sources of novel quantitative trait loci (QTL) for traits such as yield, disease resistance, tolerance to abiotic

stresses like drought, submergence, and salinity, as well as grain quality. MAGIC is an experimental method with which genetic markers are linked to quantitative trait loci (QTL) (IRRI, 2011). It was introduced by Mott et al. (2000) in mice as an extension to the advanced intercross (AIC) procedure of Darvasi and Soller (1995). MAGIC populations are established by several rounds of intercrossing multiple founder lines and the resulting populations are, hence, genetically diverse essential for the detection of multiple QTLs at the same time. As part of the preliminary investigation, the focus is to determine potential founder lines in the PhilRice genetic resources. Decision of founder lines to be included in the MAGIC population will be done with the breeders and in consideration with unique agronomic traits suitable to the need of Filipino rice farmers. Phenotyping as well as molecular characterization of the founder lines will be explored by establishing the traits and methodologies as well as appropriate genetic marker systems for the molecular analysis.

Highlights:

- Conducted literature search and reviewed journal articles on MAGIC including the paper "From mutations to MAGIC: resources for gene discovery, validation and delivery in crop plants" (Cavanagh et al. 2008), "Advanced intercross lines, an experimental population for fine genetic mapping" (Darvasi and Soller, 1995), "A method for fine mapping quantitative trait loci in outbred animal stocks" (Mott et al. 2000), and "Haplotype probabilities for multiple-strain recombinant inbred lines" (Teuscher and Broman, 2007).

- Reviewed the strategies conducted in the papers "Population development through multiparent advanced generation intercrosses (MAGIC) among diverse genotypes to facilitate gene discovery for various traits in rice" and "Developing multiparent advanced generation intercross (MAGIC) populations using diverse genotypes to facilitate gene discovery for multiple traits in rice (Oryza sativa L.)" from IRRI. The selection of materials and the methods employed were evaluated to determine feasibility of the conduct of the experiment in PhilRice.

- 12 elite breeding lines and parents were identified by PhilRice breeders and these varieties are candidates as founder lines for the development of MAGIC mapping population (Table 13).

- In accordance to the Rice Genetic Resources Workshop on 25 July 2012 at PhilRice Central Experiment Station, Philippine traditional rice varieties should be used as parental lines, thus, the initial list of varieties for MAGIC founder lines was changed.

- 12 identified Philippine traditional rice varieties from the PhilRice

Genebank were selected for their resistance to lodging and drought resistance, good reaction to BLB, rice sheath blight, and rice tungro resistance.

- The 12 identified Philippine traditional rice varieties were prepared for planting in 2013 dry season for agronomic evaluation and phenotyping; and for molecular characterization (Table 14).

Table 13. Initial list of varieties and elite breeding materials identified as potential founder lines for the development of MAGIC mapping population.

Germplasm / variety	Varietal Type	Parents	Origin	Agronomic Relevance / Characters
NSIC Rc240 (Tubigan 22)		PSB Rc3/PSB Rc1		Adaptability trials and yield potential experiments, best adapted, Highest Yielder 13 tha^{-1} , maturity 115 days
AdaySel (IRGC 177)	Indica		India	Drought tolerance, tungro resistance, maturity: 124 days, moderately resistant to blast
Dular				Drought tolerance, heat tolerance,
Kalamkati (IRGC 45975)	Indica		India	Drought tolerance, maturity: 116 days,
Moroberekan (IRGC 12048)	Indica		Guinea	Drought tolerance, maturity: 138 days, moderately resistant to blast
Nagina 22				Drought tolerance, heat tolerance
NSIC Rc160				NSIC Rc160 (Tubigan 14) average yield is 5.6 t/ha and maximum yield is 8.2 t/ha. Matures 122 days after seeding when it is transplanted and 107 days when direct seeded. Height is 96 cm. Intermediate reactions to blast, bacterial leaf blight, and green leaf hopper.
PR34159-13-1	Indica	PJ7/PR26946-6-1		Direct Wet-Seeded, Anaerobic Germination Tolerance, yield: 5 t ha^{-1}, maturity: 104 days
PR38868-30-2-3-3-B	Indica	PR36951-B-B-12/SHZ-2		Direct Wet-Seeded, Anaerobic Germination Tolerance, Yield: 8 t ha^{-1}, maturity: 111 days
PR37801-15-1-1-3-2-B-B	Indica	KhaoDawk Mali 105/PJ21		Direct Wet-Seeded, Anaerobic Germination Tolerance, Yield: 7 t ha^{-1}, maturity: 112 days
PR38854-30-2-3-1-B	Indica	PR30536-B-1-2/IR84194-139		Direct Wet-Seeded, Anaerobic Germination Tolerance, Yield: 7 t ha^{-1}, maturity: 112 days
PR37825-18-3-2-3-1-B-B	Indica	PR32771-9-2-B-B/SHZ-2		Direct Wet-Seeded, Anaerobic Germination Tolerance, Yield: 6 t ha^{-1}, maturity: 116 days

Table 14. Selected Philippine traditional rice varieties from PhilRice Genebank as potential founder lines for the development of MAGIC mapping population.

ACCESSION NO.	COLLECTION NUMBER	CULTIVAR NAME	PROVINCE	PREFERRED GROWING CONDITION/ ECOSYSTEM	MATURITY (DAS)	CULM STRENGTH	BACTERIAL LEAF BLIGHT	RICE SHEATH BLIGHT	TUNGRO (INDUCED)	DROUGHT SENSITIVITY	PRODUCTIVITY
PRRI006035	11252	INNOWAY	Kalinga		98	9 - Very Strong				Resistant	5 - Intermediate (~ 15 panicles)
PRRI006003	11251	FINONGOD	Kalinga		98	7 - Strong				Resistant	7 - High (>20 panicles)
PRRI006036	11253	INNOYAN	Kalinga		93	9 - Very Strong				Resistant	5 - Intermediate (~ 15 panicles)
PRRI006028	11255	IFO	Kalinga		104	9 - Very Strong				Resistant	5 - Intermediate (~ 15 panicles)
PRRI005942	11145	AZUCENA	Kalinga		98					Resistant	5 - Intermediate (~ 15 panicles)
PRRI006023	11152	GOBERNO (PUTI)	Kalinga		106					Resistant	5 - Intermediate (~ 15 panicles)
PRRI006166	11151	MALAGKIT	Kalinga		100					Resistant	7 - High (>20 panicles)
PRRI000378	2361	BUWA	Kalinga-Apayao	2 - Rainfed Lowland	124			R - 1 - 0-30% infection			
PRRI000426	2409	MONDAY	Palawan (West)	1 - Upland	107		R - 1 - 0-5% lesion area	R - 1 - 0-30% infection	R - 0-20% infected		5 - Intermediate (~ 15 panicles)
PRRI000444	2427	BINIGNAY	Occidental Mindoro	2 - Rainfed Lowland	125			R - 1 - 0-30% infection	R - 0-20% infected		5 - Intermediate (~ 15 panicles)
PRRI000230	2213	KALANGIKING (KILING)	Pangasinan	2 - Rainfed Lowland	118	5 - Intermediate (most plants leaning about 45°)		R - 1 - 0-30% infection			5 - Intermediate (~ 15 panicles)
PRRI000860	1131	TAPOL WHITE	Cotabato		124				R - 0-25% infected		

Comparison of microsatellite DNA fingerprints of original seed files and conserved germplasm accessions

CQ Cortaga, VG Dalusong, and LM Perez

The morphological and molecular identities of genebank accessions are vital to the effective management, conservation and utilization of germplasm resources. In the normal genebank operations, accessions are acquired and processed by following standard operating procedures that include the preparation of original seed files. The seed file serves as resource for verification of conserved germplasm accessions. Therefore, seed files play important roles in a genebank and thus, ensure their correct identity indicates efficiency in germplasm conservation.

DNA markers are being applied to a wide variety of problems central to plant genome analysis. These markers reflect genetic polymorphism at the DNA level, which result from any possible differences existing in the nucleotides (Xu, 2003). In soybean [Glycine max (L.) Merr.], DNA fingerprinting using SSR markers has provided an excellent complement to the conventional markers used to characterize soybean genotypes (Rongwen et al., 1995). In rice, Yashitola et al. (2002) suggested that a single, appropriately chosen SSR marker is sufficient to assess hybrid seed purity in the F1 hybrid and parental lines.

This study focused on comparing the DNA fingerprints of the original seed files and the conserved germplasm accessions located in both active and base collections. In the recent seed preparation for the regeneration and characterization of germplasm in 2012 DS, several seed

packets exhibited mismatched with the supposedly original seed files. Although these accessions were not included for 2012DS, the probability of obtaining the same scenario in the future remains. Therefore, there is a need to establish the similarity of the seed files and those conserved in the active collections.

Highlights:

- 96 germplasm accessions were randomly identified (Table 15) for microsatellite DNA fingerprints comparison of both seed files and active collections. The distribution of the accessions used includes 50% (48) obtained from pre – 2008 stocks (collections before 2008) and 50% from post – 2008 stocks (collections from 2008 up to present).

- Materials for DNA fingerprinting included 192 samples, 96 obtained from seed files and 96 obtained from their corresponding seed stocks in cold storage. From each seed file, 2 seeds were obtained while 5 – 10 seeds were obtained from the seed stock for DNA preparation.

- Genomic DNA was extracted from the seeds using the ZR Plant/ Seed DNA Miniprep for DNA analysis.

- 192 DNA samples were prepared (96 DNA samples from seed files and 96 DNA samples from active collections) for microsatellite DNA fingerprinting.

- DNA concentration reading of 192 extracted DNA was done using Nanodrop Spectrophotometer to determine the concentration of the DNA extracted from the seed.

- As of now, PCR analysis of 16 DNA samples (8 for seed files and 8 for active collection) was done using 9 microsatellite markers (RM224, RM228, RM229, RM27421, RM413, RM10825, RM44, RM490, and RM136) and allele detection using non-denaturing poly acrylamide gels and ethidium bromide staining.

Table 15. Germplasm accessions used for microsatellite DNA fingerprints comparison of both seed files and active collections

			Pre 2008		
No.	**Acc. No.**	**Coll. No.**	**Season / Lot No.**	**Cultivar**	**Biological Status**
1	PRRI002616	831	1992WS-134J	DINAGAHAN	Traditional cultivar / Landrace
2	PRRI002618	833	1992WS-136J	PILIT TAPOL	Traditional cultivar / Landrace
3	PRRI002619	835	1992WS-137J1	BORANGCOY	Traditional cultivar / Landrace
4	PRRI002622	838	1992WS-140J1	WAG-WAG	Traditional cultivar / Landrace
5	PRRI002623	839	1992WS-141J1	LAMPAG	Traditional cultivar / Landrace
6	PRRI002625	866	1992WS-163J1	BORDAGOL	Traditional cultivar / Landrace
7	PRRI000806	1082	1993WS-232	NAGDAMI	Traditional cultivar / Landrace
8	PRRI002274	1246	1994WS-077J3	C-4 DINORADO	Advanced / Improved cultivar
9	PRRI002536	325	1997WS-312J	DAGI	Traditional cultivar / Landrace
10	PRRI001078	1901	1999WS-CG183	GIRONA	
11	PRRI001708	2741	1999WS-CH148	TCF4 704	Hybrid parental line (PhilRice)
12	PRRI001712	2772	1999WS-CH181	TCF4-78	Hybrid parental line (PhilRice)
13	PRRI001713	2790	1999WS-CH203 B1	BAS 4	Hybrid parental line (PhilRice)
14	PRRI001714	2791	1999WS-CH204B	BAS 5	Hybrid parental line (PhilRice)
15	PRRI001553	2999	1999WS-CH435	IR56450-4-2-2R	Breeder's line
16	PRRI001780	170	2000DS-FG069	BULUHAN (B) (FIELD A)	Traditional cultivar / Landrace
17	PRRI001786	187	2000DS-FG083	GINIT-AN	Traditional cultivar / Landrace
18	PRRI001789	200	2000DS-FG085	HINUWAY	Traditional cultivar / Landrace
19	PRRI001794	212	2000DS-FG092	HALAY BINGI	Traditional cultivar / Landrace
20	PRRI001797	227	2000DS-FG104	MILAGROSA	Traditional cultivar / Landrace
21	PRRI004476	3274	2000DS-FG257	P9-1-4 (BPI RI 20)	Advanced / Improved cultivar
22	PRRI005682	3266	2000DS-FG260	P9-2-3 (IR42)	Advanced / Improved cultivar
23	PRRI003604	3268	2000DS-FG264	P9-4-2 (C 4)	Advanced / Improved cultivar
24	PRRI005654	3247	2000DS-FG272	P10-2-1 (IR66)	Advanced / Improved cultivar
25	PRRI002344	3236	2000DS-FG291	P11-4-1 (BURIC (DIKET))	Traditional cultivar / Landrace
26	PRRI000463	2446	2001DS-FG284J1	STA. CATALINA (IRGC 55394)	Traditional cultivar / Landrace
27	PRRI001864	127	2001WS-CG183	PARPARIA	Traditional cultivar / Landrace
28	PRRI001784	185	2001WS-CG210	BULUHAN C (FIELD B)	Traditional cultivar / Landrace
29	PRRI001895	263	2001WS-CG252B2	INAPOSTOL	Traditional cultivar / Landrace
30	PRRI001813	339	2001WS-CG276	CAMPEÑA	Traditional cultivar / Landrace
31	PRRI000816	1137-A	2001WS-CG307	KABUAK	Traditional cultivar / Landrace
32	PRRI003048	3783	2002DS-FG253	MALKITRAN (MALAGKIT)	Traditional cultivar / Landrace
33	PRRI003054	3790	2002DS-FG259	MALASAY (IRGC 19456)	Traditional cultivar / Landrace
34	PRRI003060	3795	2002DS-FG265	MINARINA	Traditional cultivar / Landrace
35	PRRI003064	3800	2002DS-FG269	PENARI (IRGC 19468)	Traditional cultivar / Landrace
36	PRRI003602	4427	2004WS-CG122B	INCHUMAJAG-PINIDWA (IRGC 8175)	Traditional cultivar / Landrace
37	PRRI001001	1318	2005DS-RJ174	PINILI (96-ABR 13)	Traditional cultivar / Landrace
38	PRRI000631	1443	2005DS-RJ191	CAMOROS (96-QZN 52)	Traditional cultivar / Landrace
39	PRRI000645	1472	2005DS-RJ202	MALAGKIT (96-ARAK 11)	Traditional cultivar / Landrace
40	PRRI005641	7736-A	2006-12-01-02	LIPUNAN (2006-12-01-02)	Traditional cultivar / Landrace
41	PRRI005766	7701	2006-12-01-03	BPI MAGCASAR (2006-12-01-03)	Advanced / Improved cultivar
42	PRRI005619	7738	2006-12-01-05	ILON ILON (2006-12-01-	Traditional cultivar / Landrace

Table 15. continuation...

43	PRRI005769	7739	2006-12-01-06	RV 8 (2006-12-01-06)	
44	PRRI005770	7740-A	2006-12-01-07	RV 9 (2006-12-01-07)	Advanced / Improved cultivar
45	PRRI005574	7741	2006-12-01-08	RV 55 (2006-12-01-08)	
46	PRRI005764	7693	2006-12-01-09	BLACK RICE (2006-12-01-09)	Traditional cultivar / Landrace
47	PRRI005708	7742-A	2006-12-01-10	CATAMPAL (2006-12-01-10)	Traditional cultivar / Landrace
48	PRRI005771	7744	2006-12-01-12	KOREAN TONNER (2006-12-01-12)	Advanced / Improved cultivar
			Post 2008		
49		12059	2012 DS	MALIKET VARIANT	Traditional cultivar / Landrace
50		12066	2012 DS	PARINA GLUTINOUS	Traditional cultivar / Landrace
51		12071	2012 DS	ZAMBALES	Traditional cultivar / Landrace
52		10810	2012 DS	BINAKA (MALAGKIT)	Traditional cultivar / Landrace
53		10945	2012 DS	BALATINAW	Traditional cultivar / Landrace
54		10816	2012 DS	GALO	Traditional cultivar / Landrace
55		10855	2012 DS	INUWAY	Traditional cultivar / Landrace
56	PRRI006208	11140	2012 DS	OYAK	Traditional cultivar / Landrace
57	PRRI006127	11128	2012 DS	KAMOROS	Traditional cultivar / Landrace
58	PRRI006019	11129	2012 DS	GOBERNO	Traditional cultivar / Landrace
59	PRRI005955	11256	2012 DS	BOLINAO	Traditional cultivar / Landrace
60	PRRI005809	10940	2012 DS	INANTOTE	Traditional cultivar / Landrace
61	PRRI005916	10930	2012 DS	PINARONGPONG	Traditional cultivar / Landrace
62	PRRI005707	10887	2012 DS	BLANDI	Traditional cultivar / Landrace
63	PRRI005792	10886	2012 DS	DORYAT	Traditional cultivar / Landrace
64	PRRI006825	5967	2012 DS	DINORADO	Traditional cultivar / Landrace
65	PRRI006247	11141	2012 DS	SINADUGAN	Traditional cultivar / Landrace
66	PRRI000022	476	2012 DS	BINAGSAC	Traditional cultivar / Landrace
67	PRRI000092	2075	2012 DS	BINOTETE	Traditional cultivar / Landrace
68	PRRI000008	1991	2012 DS	AGLIPAY	Traditional cultivar / Landrace
69	PRRI000162	2145	2012 DS	SINIPIT	Traditional cultivar / Landrace
70	PRRI006418	5897	2012 DS	BIDAY	Traditional cultivar / Landrace
71		6119	2012 DS	KADILAG (PILIT)	Traditional cultivar / Landrace
72	PRRI000522	2505	2012 DS	BOCAO	Traditional cultivar / Landrace
73	PRRI005095	5865	2010 WS	ALANGI	Traditional cultivar / Landrace
74		11595	2010 WS	MALAGKIT	Traditional cultivar / Landrace
75	PRRI005098		2010 WS	AMERICANA	Traditional cultivar / Landrace
76	PRRI000827		2010 WS	C - 21	Advanced / Improved cultivar
77	PRRI005385	7536	2010 WS	MASHURI	Traditional cultivar / Landrace
78	PRRI005470	6340	2010 WS	PADI KETUMBAR	Traditional cultivar / Landrace
79		7788	2010 WS	RED TANGGILING	Traditional cultivar / Landrace
80	PRRI005520		2010 WS	RAMPIT	Traditional cultivar / Landrace
81	PRRI005294		2010 WS	CINA MEE	Traditional cultivar / Landrace
82		11507	2010 WS	RED RICE	Traditional cultivar / Landrace
83	PRRI005511	6351	2010 WS	PADI SIAK	Traditional cultivar / Landrace
84	PRRI005197	6338	2010 WS	PADI JARUM EMAS (IRGC 43499)	Traditional cultivar / Landrace
85	PRRI005484	7432	2010 WS	UMBANG KUDUNG	Traditional cultivar / Landrace

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).

Central Experiment Station
Maligaya, Science City of Muñoz, 3119 Nueva Ecija
Trunklines: (44) 456-0277, -0285 • Telefax: (044) 456-0441
Email: prri@email.philrice.gov.ph

PhilRice Agusan
Basilisa, RTRomualdez, 8611 Agusan del Norte
Tel/Fax: 343-0768; 343-0778
Email: agusan@email.philrice.gov.ph

PhilRice Batac
MMSU Campus, Batac City, 2906 Ilocos Norte
Tel/Fax: (77) 792-4702; 670-1867
Email: batac@email.philrice.gov.ph

PhilRice Bicol
Batang, Ligao City, 4504 Albay
Cell: 0908-884-0724

PhilRice Isabela
San Mateo, 3318 Isabela
Tel: (78) 664-2954 • Fax 664-2953
Email: san_mateo@email.philrice.gov.ph

PhilRice Los Baños
UPLB Campus, Los Baños, 4030 Laguna
Tel: (49) 536-1917
Email: los_banos@email.philrice.gov.ph

PhilRice Midsayap
Bual Norte, Midsayap, 9410 North Cotabato
Tel: (64) 229-8178 • Fax 229-7242
Email: midsayap@email.philrice.gov.ph

PhilRice Negros
Cansilayan, Murcia, 6129 Negros Occidental
Cell: 0928-506-0515
Email: negros@email.philrice.gov.ph

PhilRice Field Office
CMU Campus, Maramag, 8714 Bukidnon
Tel/Fax: (88) 222-5744

PhilRice Liaison Office
3rd Flr, ATI Bldg., Elliptical Road,
Diliman, Quezon City
Tel/Fax: (02) 920-5129
Cell: 0920-906-9052

PhilRice Farmers' Text Center
0920-911-1398

PinoyRice Knowledge Bank
www.pinoyrkb.com

PhilRice Website
www.philrice.gov.ph

CERTIFICATION INTERNATIONAL
ISO 9001:2008 CIP/4360Q/09/1068
ISO 14001:2004 CIP/4360E/09/1068
OHSAS 18001:2007 CIP/4360H/09/1068