THE 9th MULTI-ENVIRONMENT TESTING FOR IRRIGATED LOWLAND RICE STAGE 1 WET SEASON (MET1-IR, 2015 DS)

INTRODUCTION

IRRI breeding programs generate fixed and stable lines each season that are identified from pedigree nurseries as well as observational and replicated yield trials. Eventually, elite lines are advanced to multi-environment testing (MET) conducted via breeding networks. These networks, however, presently have limited geographical coverage and face challenges in terms of germplasm movement. Moreover, the materials tested through these networks are generally in the advanced stage of varietal development. An exhaustive MET system for early generation breeding products is so far lacking at IRRI and in the global rice breeding community. For this reason, a new MET system was established at IRRI beginning in 2011 under the Global Rice Science Partnership (GRiSP), to be piloted for irrigated lowland rice.

Goal

- To establish a systematic, sequential, multistage, and multi-environment testing (MET) system for elite breeding lines, managed through one entity, in order to improve overall breeding efficiency.

Objectives

- To identify elite breeding lines with high and stable yields and wide adaptation across a target population of environments that can be the future mega-varieties;
- To be able to select superior breeding materials adapted to one or more specific environment(s) and agro-ecologies;
- To develop and deploy varieties and breeding products to specific market segments;
- To exploit genotype, environment, and genotype x environment (G X E) interaction contributions to varietal performance in releasing breeding products to one or more target environments;
- To generate earlier feedback to breeders on trait performance and identify trait packages needed for molecular breeding;
- To improve partnerships with public, NGO, and private sectors who may have roles to play at certain testing/variety development stages.

TRIAL COMPOSITION

The MET1-IR trial is the second stage of testing for irrigated breeding lines from IRRI and collaborating NARES institution under the overall MET concept. The trial will consist of **220** test entries and 8 checks. The entries from IRRI include 102 early lines (Module 1) and 47 Medium/late lines (Module 2), with 8 international check varieties. The entries from collaborating NARES, will include 50 early lines (module 1) and 21 medium/late lines (module 2). All the test entries were developed by the various breeding programs (both hybrid and inbred) of IRRI and PhilRice. The designation, source and other information of each entry are provided in Table 1.

The check varieties and their corresponding entry numbers are as follows:

Designation	Classification	MET No.	Entry No.		
			Border	Module 1	Module 2
PSB Rc 10	Very early	MT4901	901	153	
PSB Rc 82	Early	MT4902	902	154	
NSIC Rc 238	Early	MT5433	906	155	
NSIC Rc 132H (Mestizo 6)	Early (Hybrid)	MT5434	907	156	
NSIC Rc 222	Medium/Late	MT4903	903		69
PSB Rc 18	Late	MT4904	904		70
NSIC Rc 158	Late	MT5435	908		71
NSIC Rc 124H (Mestizo 4)	Late (Hybrid)	MT5432	905		72

THE EXPERIMENTAL SITE

An experimental field uniform in soil texture, depth, and fertility should be chosen for the trial. It should have not been used previously for fertilizer experiments. It should also have adequate irrigation and drainage systems. The area covers 0.5 hectare of land per site. It is suggested that the same area be utilized for MET trial every season.

EXPERIMENTAL DESIGN

The trial will be conducted using a **Row-Column Design with two replications.** This design is used to consider possible field variation. There are two modules, based on the flowering time of entries - Module 1 for very early/early flowering and, Module 2 for medium/late flowering, as follows:

Flowering	Classification
90 days and below	Very early/Early
Above 90 days	Medium/Late

***This fieldbook contains the plot randomization (Tables 2 and 3), field plan and data sheets for the MET1-IR 2014 Dry Season.**

For each module, the test entries are randomly assigned with plot numbers. Within each module, the 2 replicates have different randomizations. All four checks are randomly assigned in a replicate and are included within each column (checks are systematically arranged on every 11th, 22nd, 33rd and 43rd rows for Module 1 and on the 5th, 10th, 15th and 22nd for Module 2) to help on PACP scoring. Different trial sets have different randomization of entries. The plot randomization of entries is given in Tables 2 and 3. For each replicate, there are 172 plots for Module 1, while Module 2 has 88 plots. The seed packets are arranged and numbered according to plot numbers.

The field layout in Figure 1 is provided for your reference. Please do not modify the design or the layout.

Prepare the field thoroughly at least one month before transplanting following the locally recommended standards. Lay out rows in beds before seeding. The experimental field should be properly labelled. The plot size for each entry is **7.28 m^2 = 1.4 m x 5.2 m** (7 rows by 26 hills at 20 cm distance between hills).

There should be no vacant rows between plots (entries). Number the plots consecutively from left to right in all replications. Place the stakes bearing the plot number at the first hill of the left-most row of each plot. Label all plots before distributing the seedlings for transplanting.

Apply molluscicide two times, i.e. once at four days before and another immediately after transplanting.

NURSERY ESTABLISHMENT AND MANAGEMENT

Initially all seeds are placed in an oven for breaking dormancy at 50^{o}C for 5 days. A total of 50 grams of seeds for each entry are seeded, which should allow the planting of 2 replications each with 1.4 m width (7 rows) x 5.2 m length (26 hills). The seeds could be seeded in either wet or dry beds where they are grown for 21 days. The seedling beds are carefully kept free from insect and diseases and properly irrigated. After seeding, apply uniformly 1kg/100m^2 of Ammonium Sulfate (21-0-0 S) in the seedbed. If the seedlings show yellowing (N deficiency), apply another 1kg/100m^2 of Ammonium Sulfate (21-0-0 S) 10-12 days after seeding (DAS).

Prior to pulling, prepare tags to mark seedlings to be transported from seedbed to the field. After 21 days of sowing, each seedling of the entries are pulled out from the seedling beds, bundled, and tied with a G.I. wire marked with pot labels bearing the plot numbers. Distribute seedlings in the field corresponding to the lay-out. Check the entries and the plots for any possible mistake(s) before transplanting the seedlings.

Alternatively, apply zinc sulfate in the nursery seedbed, or dip seedlings in 2-4 % zinc oxide suspension before transplanting. (If zinc sulfate is to be applied in the soil as basal, dipping is no longer necessary.)

The seedlings are transplanted into the field in 1-3 seedlings per hill following a spacing of 20 cm x 20cm (1 seedling for hybrid rice). Keep some seedlings at the end of the plot near the plot label to replant missing hills.

Shallow water depth should be maintained starting from about 3 days after transplanting that is gradually increased to 3-5 cm until the hard dough stage. Replant missing hills within 7 days after transplanting to obtain a uniform plant population. Care should be taken for uniform distribution of fertilizers and plant protection chemicals.

The recommended fertilizer rates (kg/ha) for different test sites are the following:

Recommended at IRRI

Season	Stage	N[1]	P[2]	K[3]	Zn[4]
DRY (*Dec-May*)	*Total*	160	30	40	5
	Basal	60	30	40	5
	Mid Tiller	40	-	-	-
	Panicle Initiation	60	-	-	-
WET (*June-Nov*)	*Total*	90	15	20	5
	Basal	30	15	20	5
	Mid Tiller	30	-	-	-
	Panicle Initiation	30	-	-	-

For PhilRice – Nueva Ecija and Isabela

Season	Stage	N[1]	P[2]	K[3]	Zn[4]
DRY (*Dec-May*)	*Total*	150	60	60	5
	Basal	60	60	60	5
	Mid Tiller	40	-	-	-
	Panicle Initiation	50	-	-	-
WET (*June-Nov*)	*Total*	90	60	60	5
	Basal	60	60	60	5
	Mid Tiller	15	-	-	-
	Panicle Initiation	15	-	-	-

[1] In the form urea
[2] As P_2O_5 from triple superphosphate or solophos
[3] K_2 from KCl
[4] As $ZnSO_4$

For PhilRice – Agusan

Season	Stage	N[1]	P[2]	K[3]	Zn[4]
DRY (*June-Nov*)	*Total*	90	40	70	5
	Basal	40	40	70	5
	Mid Tiller	25	-	-	-
	Panicle Initiation	25	-	-	-
WET (*Dec-May*)	*Total*	90	40	70	5
	Basal	40	40	70	5
	Mid Tiller	25	-	-	-
	Panicle Initiation	25	-	-	-

For DA – Bohol

Season	Stage	N[1]	P[2]	K[3]	Zn[4]
DRY (*Nov-Apr*)	*Total*	91	24	14	-
	Basal	22	24	14	-
	Mid Tiller	34.5	-	-	-
	Panicle Initiation	34.5	-	-	-
WET (*May-Sept*)	*Total*	91	24	14	-
	Basal	22	24	14	-
	Mid Tiller	34.5	-	-	-
	Panicle Initiation	34.5	-	-	-

For weed control, a pre-emergence herbicide (Sofit EC if available) and molluscicide may be applied uniformly in the experimental field immediately after transplanting following the recommended rate. Maintain a shallow water depth of 2-5 cm for at least 2 weeks after herbicide application. Subsequent hand weeding may be done if needed.

For disease and insect control, the experimental field should be well protected. Choose the appropriate cultural, chemical, and biological control to effectively manage insects and diseases. If available, carbofuran may be applied at around 15 DAT and at PI. Do prophylactic application of Benlate at PI and follow up spray 2 weeks later for sheath blight. Rouging should be done to remove off-type plants. Rogue the field repeatedly up to the hard dough stage or for as long as off-types can be identified. These off-type plants should be cut at the base.

At harvest, collect all the plants in a plot except the border rows, one on each side of the plot and 2 border rows on both ends of all the plots (the total number of plants harvested from a plot is 5 rows x 24 plants or 120 hills). The harvest from each plot is placed in clean net bags. Put the labels, bearing the entry number and plot number inside the bag. A vogel thresher is used to thresh the samples. Clean the thresher well after every sample. Put the label inside the bag after threshing. All threshed samples are dried in a batch dryer at 45^{O}C for 4-5 days. In removing half and empty grains, clean the seed blower before processing each sample to avoid seed mixtures. Transfer clean seeds into labelled paper bags bearing the MET name, MET entry number, plot number, year, and season.

DATA COLLECTION

The general reference for data collection is the Standard Evaluation System for Rice (SES, 1996). The following agronomic data are collected:

Trait — Explanation

VG: Vegetative Vigor. Note: Several factors may interact, influencing seedling vigor (e.g. tillering ability, plant height, etc.) Use this scale for evaluating genetic material and varieties under stress and non-stress conditions.

1	Extra vigorous (very fast growing; plants at 5-leaf stag have 2 or more tillers in majority of population)
3	Vigorous (fast growing; plants at 4-5 leaf stage have 1-2 tillers in majority of population)
5	Normal (plants at 4-leaf stage)
7	Weak (plants somewhat stunted; 3-4 leaves; thin population; no tiller formation)
9	Very weak (stunted growth; yellowing of leaves)

ZN: Zinc Deficiency

1	Growth and tillering nearly normal, healthy
2	Growth and tillering nearly normal, basal leaves slightly discolored
3	Stunting slight, tillering decreased, some basal leaves brown or yellow
5	Growth and tillering severely retarded, about half of all leaves brown or yellow
7	Growth and tillering ceases, most leaves brown or yellow
9	Almost all plants dead or dying

FLW (DAS): Days to flowering. Number of days from seeding to 50% flowering. 50% of the main tillers of the whole population (in a plot) are flowering.

MAT: Days to maturity. Number of days from seeding to grain ripening (85% of grains on panicle of the whole plot are mature, i.e. color is yellow).

HT (cm): Plant height. Average of five samplings measured in centimeters from soil surface to the tip of the tallest panicle (awns excluded) and can be measured when 80% are mature (i.e. HT1 = height for sample 1, so on).

TILLER: Tiller Number. Average of five samplings taken from inner hills by counting the number of productive tillers (the same samples used in measuring plant height). (i.e. TILLER1 = number of tillers for sample 1, so on)
Note: 1-3 seedlings per hill.

LDG: Lodging incidence. The percentage of plants that lodged with at least 45 degree angle.

PACP: Phenotypic acceptability

Scale* (the grain size will be depending on the market demand of each NARES)

1	Excellent = very good plant type, dense medium slender grains, no grain discoloration, without awns, no symptoms of diseases or deficiencies, medium to high tillering, comparable or better than the best check.
3	Good = good plant type, medium to high tillering, no symptoms of diseases and deficiencies, no grain discoloration, comparable to the check varieties.
5	Fair = moderate tolerance to diseases and deficiencies, acceptable plant type, medium tillering and good grains.
7	Poor = poor plant type, awns, discolored grains, low tiller number, showing disease and deficiency problem.
9	Unacceptable = very poor plant type, all plants have diseases and showing symptoms of deficiencies.

* *based on grain size demand of the Philippines and other SE Asian countries*

YLD: Plot yield (g) at harvest (excluding borders)
Adjusted yield = (plot yield)*MF
Where MF = (100 – MC at harvest)/86
Note: Upon weighing, simultaneously measure MC.

MC: Moisture Content. In Percent. Weigh the samples and test the moisture content for yield data calculation. Note: Upon weighing, measure also MC.

NO_PLANTS: Number of plants harvested. Standard number of hills to harvest = 120.

Data are to be recorded in electronic field books utilizing a Samsung Galaxy Tablet with an App (FieldLab v 2.9) developed by IRRI.

DATA REPORTING

Data can be reported to the MET Coordinator -- electronic copy (sent as e-mail attachment) or hard copy (via courier). The weekly update is done by filling up a Google form accessed from the internet via the following link: **http://inger.irri.org/met/submit-weekly-met-report**, where you can also upload weekly pictures one for each module. All other related files can be submitted via www.dropbox.com under the MET_2015DS folder which will be shared with the contact persons of each site. The www.dropbox.com can be freely downloaded from the internet.

There is also an excel file for data recording that corresponds to a trial-year-set number combination. A set number refers to a specific testing site. Examples of excel files are:

a. MET1-IR 2014/Set No. **1** - _____ (PHILRICE Munoz, Nueva Ecija, Philippines)

The data sheet names and data to be entered in each sheet are summarized below:

Excel file sheet name	**Data to be entered**
LOCATION and EXPT-DESC (experiment-description)	Test site data, names of cooperators and data about agronomic practices
WEATHER-OBS (weather-observation)	Monthly weather data
PEST-OBS (pest-observation)	Pest type, pest name and degree of pressure
EXPT-OBS (experiment-observation)	Entry data (plant height, days to heading, etc.)

In excel data sheets, only rows and columns important to cooperators are shown. Hidden rows and columns are for MET use only. For example, in sheet LOCATION and EXP-DESC, rows 2-3 and columns C-T are hidden while in sheet WEATHER-OBS, rows 1-13, 19, 33-34 and columns H-I are all hidden.

Please fill-in the excel data sheet and send to IRRI as an email attachment to: **a.tabanao@irri.org** or **a.galang@irri.org**.

You may send printed data sheets of this field book to:

Mr. Alvaro Pamplona
MET Coordinator
Plant Breeding, Genetics and Biochemistry Division
International Rice Research Institute (IRRI)
DAPO Box 7777
Metro Manila, Philippines