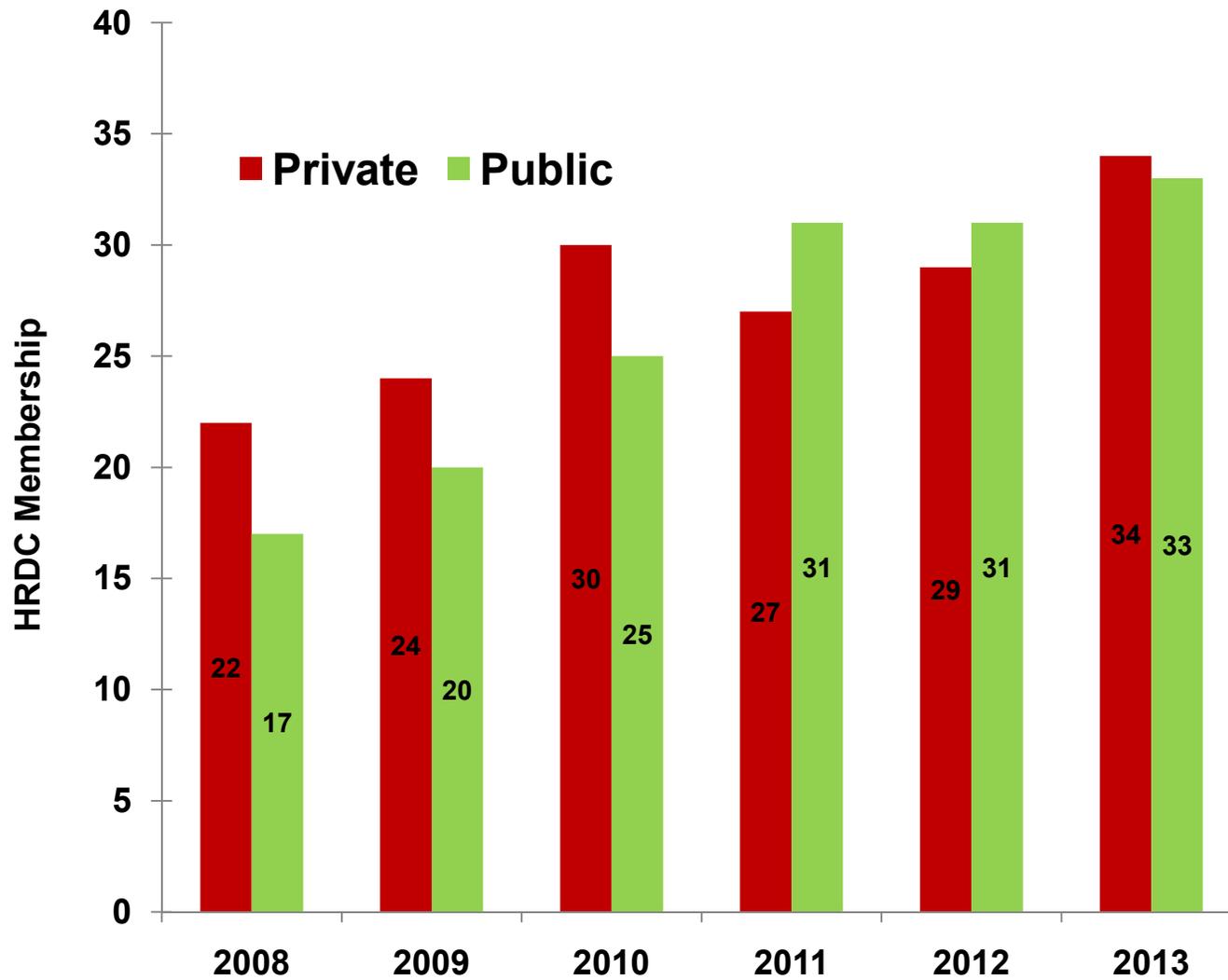


# **Hybrid Rice Development Consortium**

**Annual Meeting**

**(April 2, 2013)**

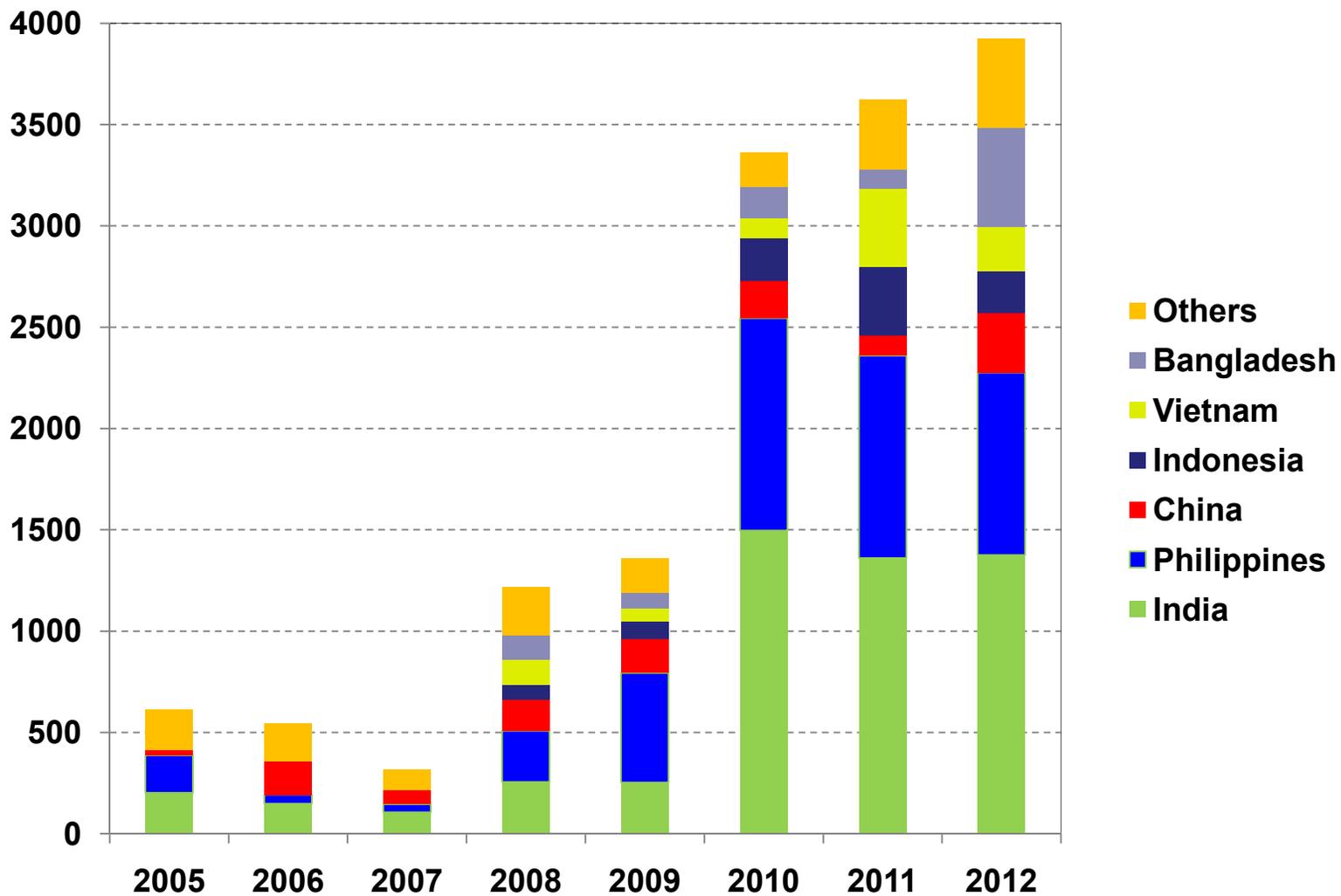
# HRDC is still Growing



## Status of Hybrid Rice Breeding and Yield Trial in 2012

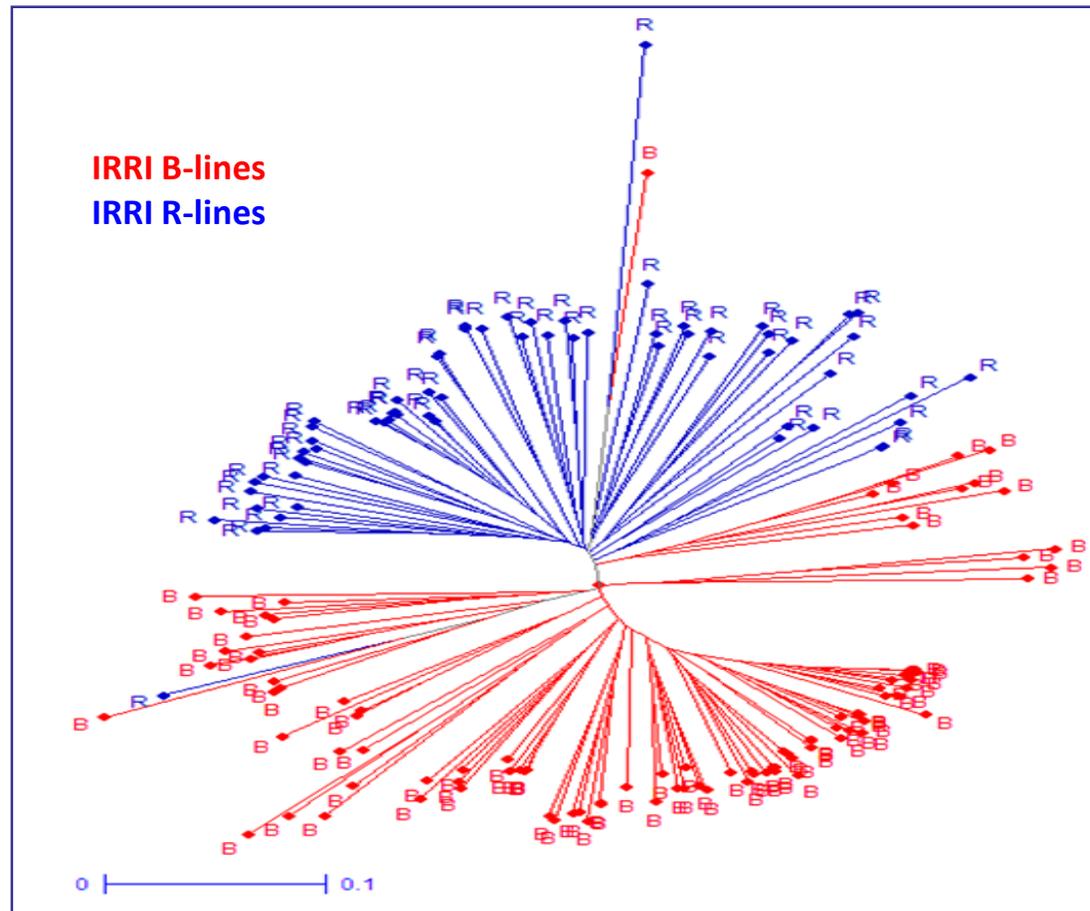
Activity	Materials	2010	2011	2012
Breeding	New Crosses for breeding (IRRI named crosses)	182	252	928
	F2 Population	72	127	410
	AxB Pairs	1,203	950	834
	Breeding Lines > F2	8,743	8,324	15,138
	<b>Total Breeding Lines</b>	<b>13,086</b>	<b>11,902</b>	<b>17,310</b>
Hybrid Yield Trial at IRRI	Observation Trial			4,348
	Replicated Trial			278
	Advanced Trial			48
	<b>Total hybrids for yield trials</b>			<b>4,674</b>

## Germplasm shared with HRDC members & other partners increased

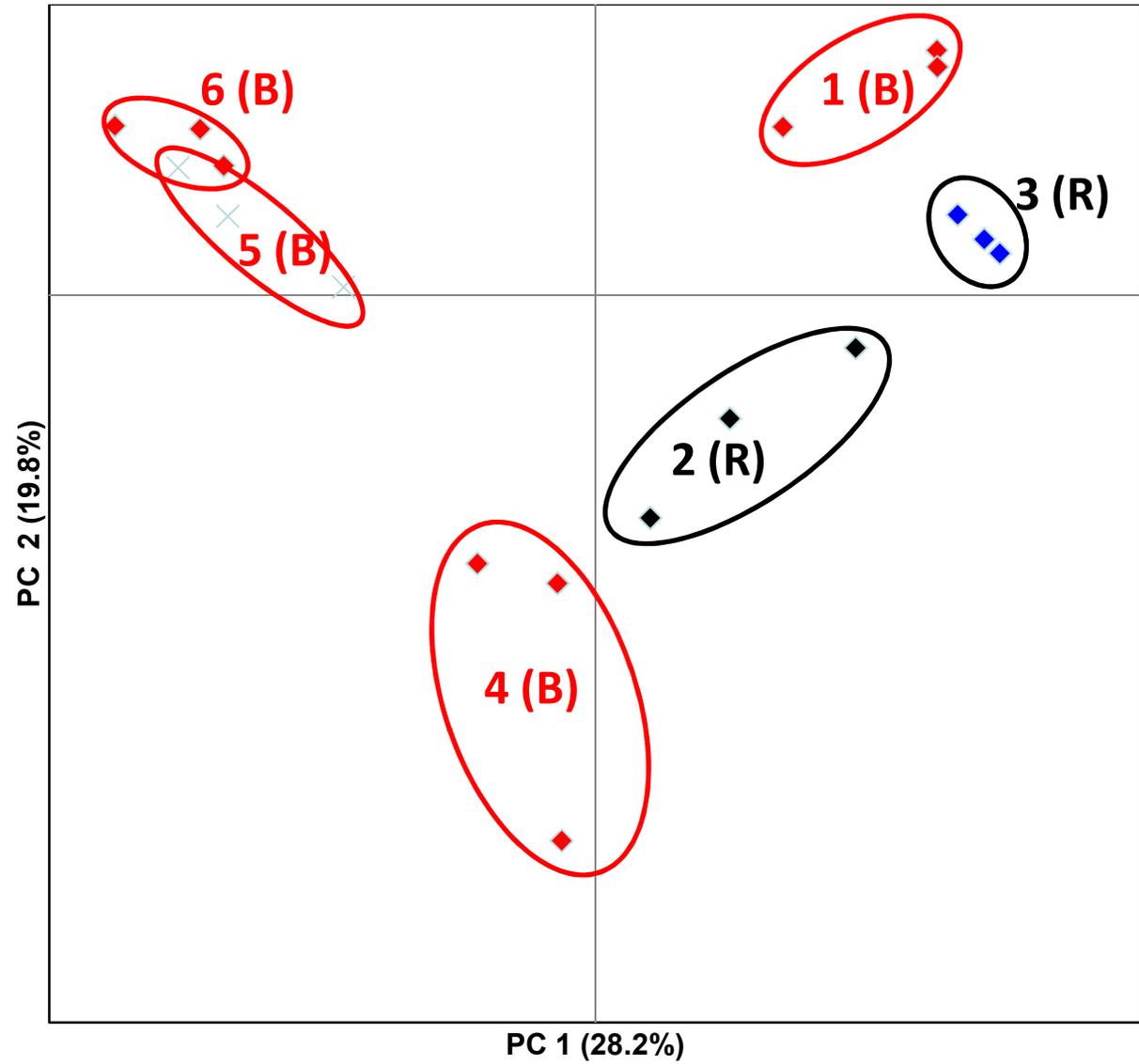
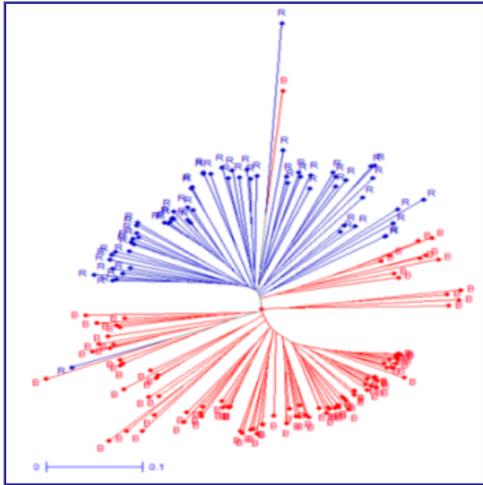


## Studies of heterotic groups – Molecular markers + field evaluation

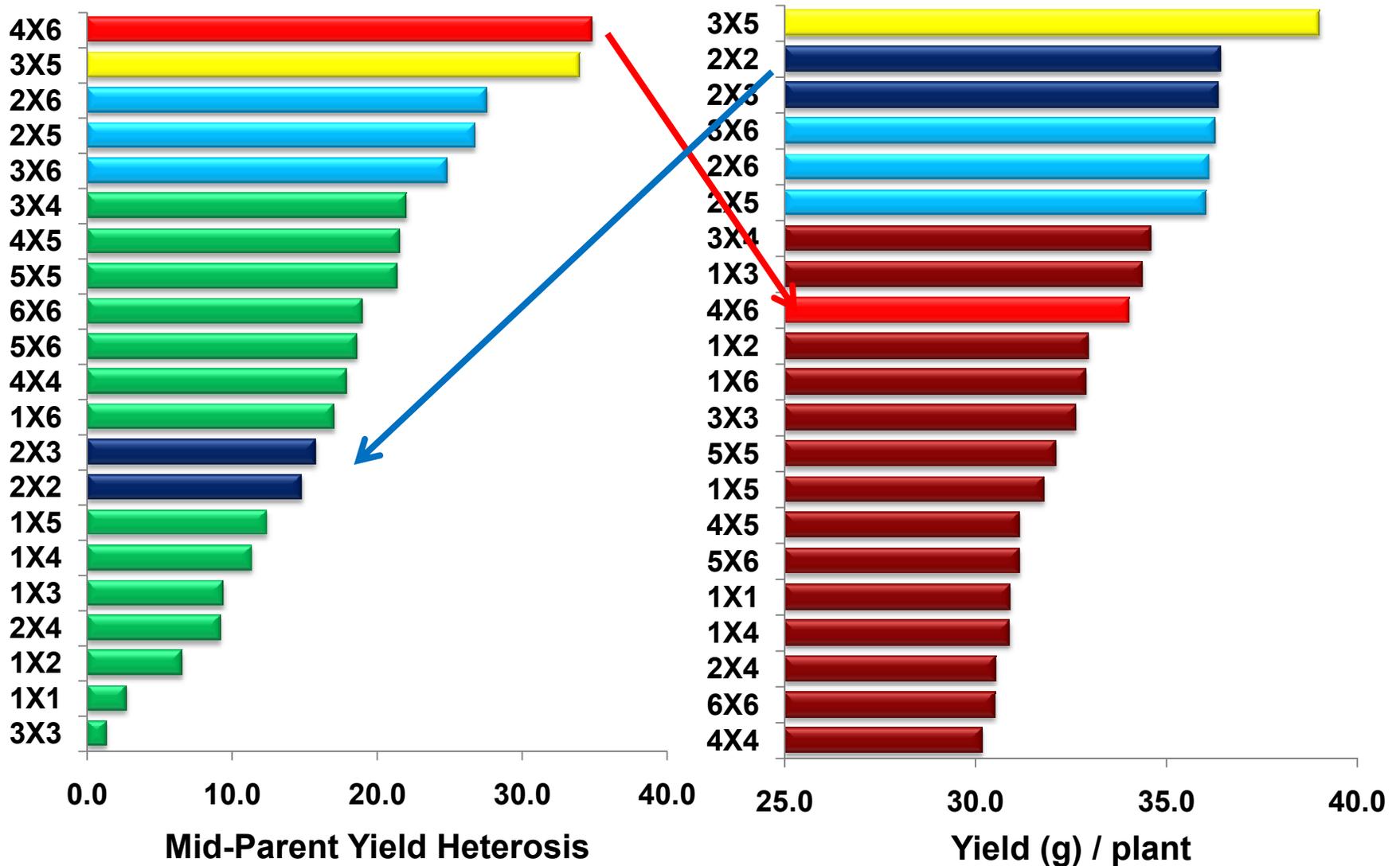
- **Heterotic groups of IRRI hybrid rice parents (168)**
  - **Parents grouped by SSR & SNP markers**
  - **Hybrids between & within groups made and evaluated in multi-location**
  - **Heterosis: Between groups > within group**
  - **Strong yield heterosis was observed between specific groups**



# Parents grouped by markers



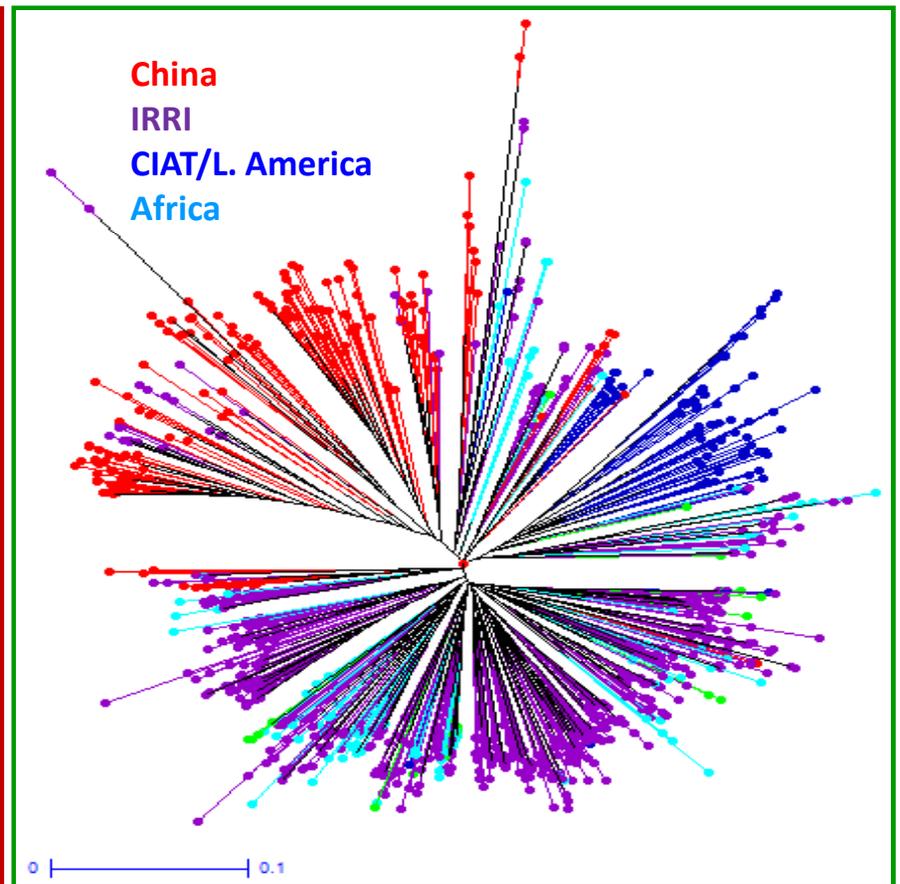
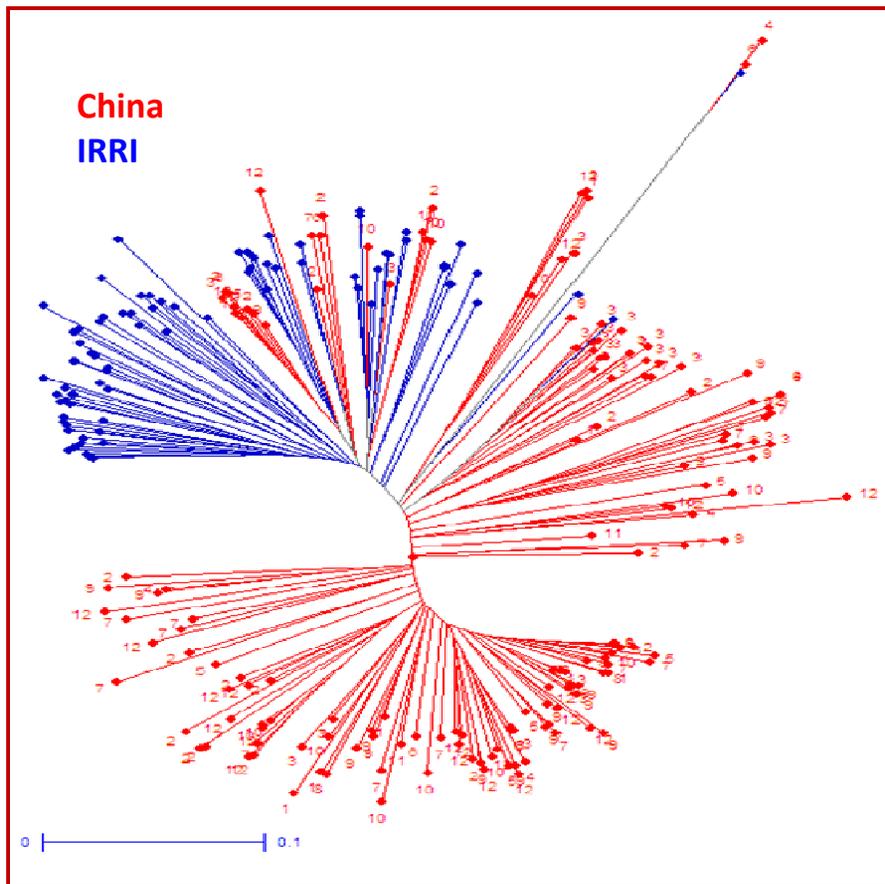
# Hybrid yield performance and heterosis



**Hybrids from G5 (B) x G3 (R) Yielded highest with Best Heterosis**

## Studies of heterotic groups – Molecular markers + field evaluation

- Heterotic groups of IRRI hybrid rice parents (168)
- Variety groups of IRRI and southern China *indica* (215)
- Variety groups of IRRI, China, some Asian and L. America countries (736)



***Rice Science, 2012, 19(3): 193–201***

**Genetic Diversity of Tropical Hybrid Rice Germplasm Measured by  
Molecular Markers**

***Plant Genetic Resources: Characterization and Utilization (2012) 10(3); 186–  
193, doi:10.1017/S147926211200024X***

**Genetic diversity and structure of indica rice varieties from two heterotic  
pools of southern China and IRRI**

## On-going Hybrid Rice R & D at IRRI

- **Heterotic group study:** Classify IRRI hybrid rice germplasm into group using markers and evaluated for heterosis
- **Outcrossing:** Conventional screening and using wild rice
- **BLB resistance:** Transfer Xa genes into hybrid rice parents using field screen & MAB
- **Drought and submergence tolerance:** Transfer drought and submergence tolerant QTLs to hybrid rice parents using conventional and MAS
- **SNP markers:** Convert and confirm SNP markers for *Rf*, sub-1, BLB, Blast genes

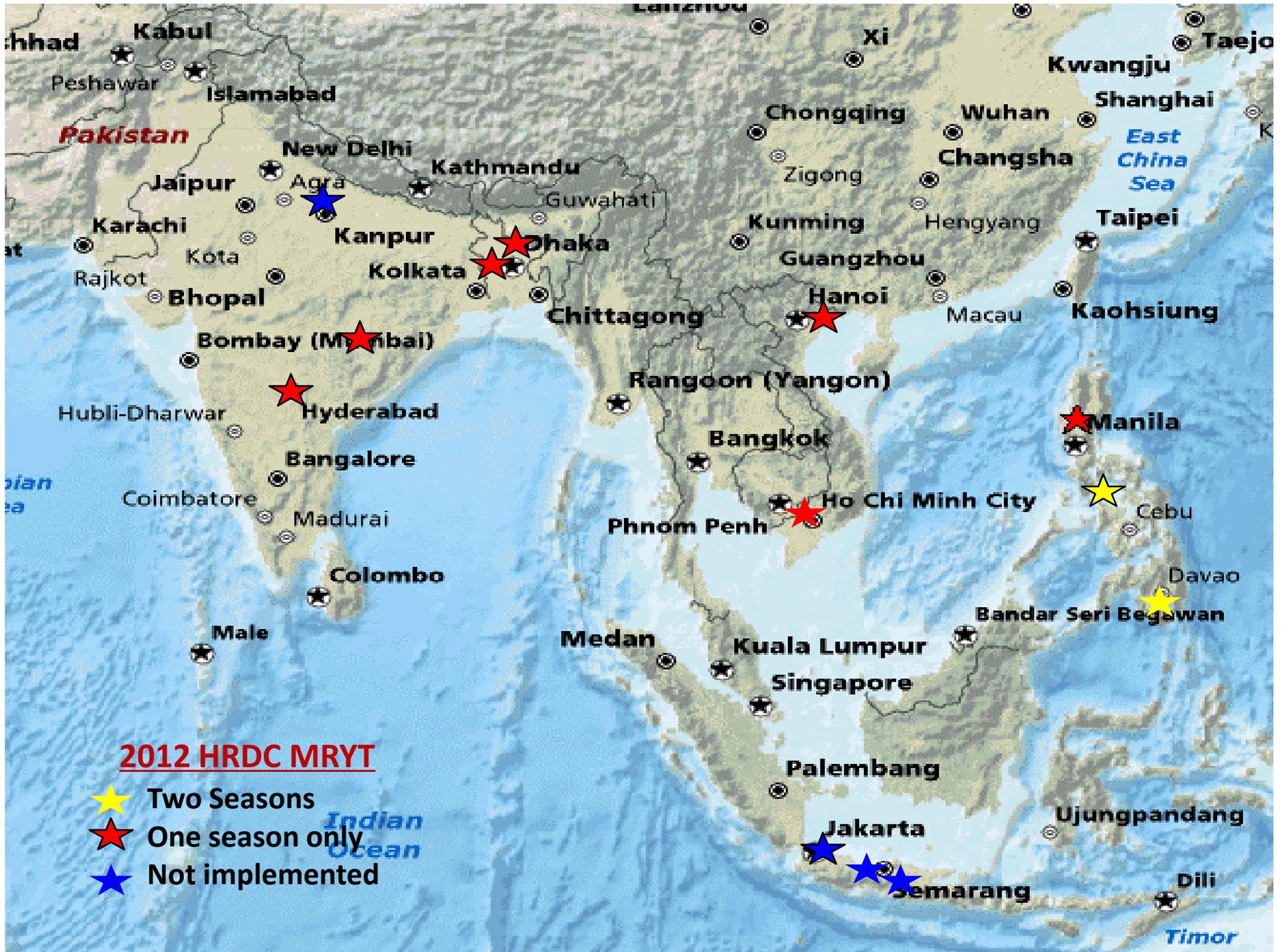
# JAAS-HRDC Hybrid Rice Training (2012, 7 Participants)



## Locations for 2012 HRDC Hybrid Rice Multiple Location Yield Trial

#	Location	Country	Member	DS	WS
1	Raipur	India	JK Agri Genetics	YES	NO
2	Long An	Vietnam	Bioseed Vietnam	NO	YES
3	Hanoi	Vietnam	FCRI, Vietnam	YES	NO
4	Gazipur	Bangladesh	BRAC	YES	NO
5	Pabna	Bangladesh	BRAC	YES	NO
6	Los Baños	Philippines	IRRI	YES	YES
7	Davao	Philippines	Bioseed Philippines	YES	YES
8	Muñoz	Philippines	PhilRice	YES	NO
9	Hyderabad	India	Indo American	NO	YES
10	Lucknow	India	Nuziveedu Seeds	---	NO
11	Malang	Indonesia	Pioneer Overseas	NO	NO
12	Kediri	Indonesia	PT BISI	NO	NO
13	Sukamandi	Indonesia	ICRR	NO	NO

**Thanks for Location Sponsors for Providing Services to other Members**



# 2012 DS HRDC MRYT at IRRI



## 2013 MRYT at BRAC, Bangladesh



### **Yield ANOVA for Season of 2012 MRYT**

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<b>Season</b>	<b>Mean</b>	<b>N</b>	<b>Duncan Grouping</b>
WS	6884	460	A
DS	6374	844	B

---

## Result of 2012 HRDC MRYT

### MRYT Yield ANOVA for LOCATION (2012DS)

LOC	Mean	N	Duncan Grouping
Munoz	8302	124	A
Gazipur	6830	123	B
GenSan	6496	126	C
LosBanos	6347	129	D
Raipur	6242	117	D
Pabna	5092	123	E
Hanoi	5064	102	E

**Mean** 6374

**R<sup>2</sup>** 0.94

**CV** 6.66

### MRYT Yield ANOVA for LOCATION (2012WS)

LOC	Mean	N	Duncan Grouping
Hyderabad	8879	126	A
GenSan	6809	114	B
LosBanos	6193	118	C
BinhLoi	5302	102	D

**Mean** 6884

**R<sup>2</sup>** 0.82

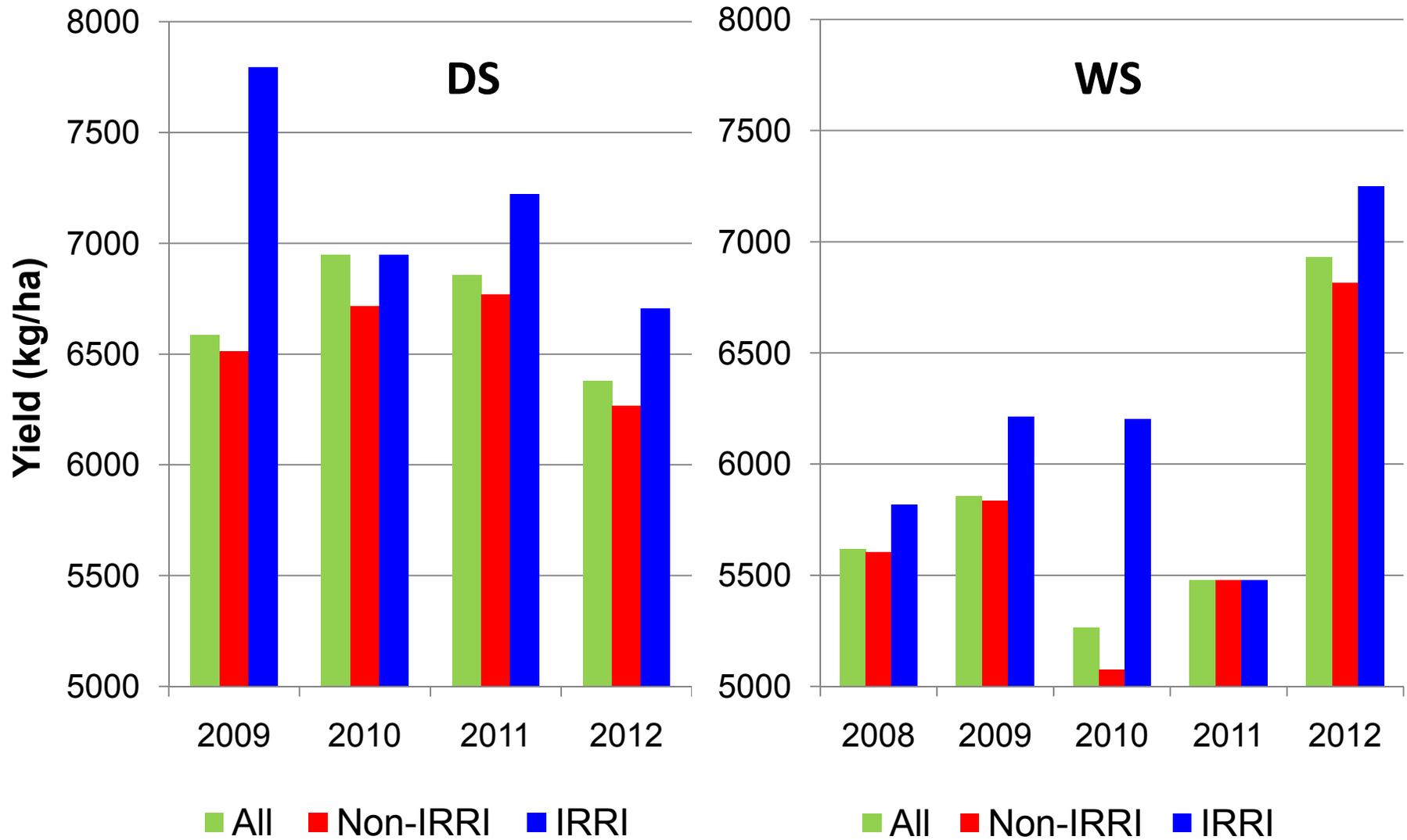
**CV** 13.29

Yield ANOVA for HRDC MRYT in 2012 DS & WS																						
Entry	Mean	+/- PSBRC82	+/- Mestiso 21	N	Duncan Grouping										Name							
HRDC 1236	7181	15.4	5.6	30	A																IR81958H	
HRDC 1227	7157	15.1	5.2	33	A																	
HRDC 1222	7151	15.0	5.1	30	A																	
HRDC 1237	7135	14.7	4.9	30	A																	IR82385H
HRDC 1205	7127	14.6	4.8	30	A																	
HRDC 1207	7067	13.6	3.9	32	A B																	
HRDC 1229	6979	12.2	2.6	33	A B C																	
HRDC 1242	6945	11.7	2.1	27	A B C D																	IR86167H
HRDC 1238	6938	11.5	2.0	30	A B C D																	IR82391H
HRDC 1214	6922	11.3	1.8	33	A B C D E																	
HRDC 1241	6908	11.1	1.6	27	A B C D E																	IR84714H
HRDC 1235	6880	10.6	1.2	30	A B C D E F																	IR81949H
HRDC 1215	6846	10.1	0.7	33	A B C D E F G																	
HRDC 1233	6828	9.8	0.4	30	A B C D E F G H																	IR80637H
HRDC 1243	6801	9.3	0.0	57	B C D E F G H I																	IR83199H (Mestiso 21)
HRDC 1203	6716	8.0	-1.2	30	B C D E F G H I																	
HRDC 1234	6671	7.2	-1.9	30	C D E F G H I																	IR80814H
HRDC 1209	6667	7.2	-2.0	30	C D E F G H I																	
HRDC 1213	6664	7.1	-2.0	33	C D E F G H I																	
HRDC 1206	6655	7.0	-2.2	33	C D E F G H I																	
HRDC 1219	6561	5.5	-3.5	32	D E F G H I J																	
HRDC 1225	6548	5.3	-3.7	30	E F G H I J																	
HRDC 1204	6538	5.1	-3.9	33	E F G H I J																	
HRDC 1217	6504	4.6	-4.4	30	F G H I J K																	
HRDC 1239	6487	4.3	-4.6	25	G H I J K L																	IR82366H
HRDC 1240	6467	4.0	-4.9	12	G H I J K L																	IR84711H
HRDC 1220	6458	3.8	-5.0	33	H I J K L																	
HRDC 1221	6448	3.7	-5.2	33	H I J K L																	
HRDC 1228	6440	3.5	-5.3	33	I J K L																	
HRDC 1223	6251	0.5	-8.1	30	J K L M																	
HRDC 1226	6238	0.3	-8.3	30	J K L M																	
HRDC 1244	6220	0.0	-8.5	51	J K L M N O P																	PSB Rc 82
HRDC 1208	6200	-0.3	-8.8	33	J K L M																	
HRDC 1210	6150	-1.1	-9.6	33	K L M N																	
HRDC 1230	6117	-1.7	-10.1	33	L M N O																	
HRDC 1224	6116	-1.7	-10.1	30	L M N O																	
HRDC 1218	5899	-5.2	-13.3	33	M N O P Q																	
HRDC 1201	5835	-6.2	-14.2	33	N O P Q																	
HRDC 1202	5776	-7.1	-15.1	33	O P Q																	
HRDC 1212	5726	-7.9	-15.8	27	P Q																	
HRDC 1211	5573	-10.4	-18.1	33	Q																	

Mean	6554
R <sup>2</sup>	0.98
CV	9.38

2012 DS HRDC MRYT Yield					2012 WS HRDC MRYT Yield				
Entry	Mean	+/- PCBRC82 %	+/- Mestiso 21 %	Name	Entry	Mean	+/- PCBRC82 %	+/- Mestiso 21 %	Name
HRDC1222	7220	13.7	6.0		HRDC1242	7826	18.9	11.0	IR86167H
HRDC1240	7189	13.2	5.5	IR84711H	HRDC1207	7788	18.3	10.5	
HRDC1227	7097	11.8	4.2		HRDC1236	7755	17.8	10.0	IR81958H
HRDC1205	7083	11.6	3.9		HRDC1229	7747	17.7	9.9	
HRDC1237	6993	10.1	2.6	IR82385H	HRDC1219	7689	16.8	9.1	
HRDC1236	6934	9.2	1.8	IR81958H	HRDC1209	7659	16.4	8.7	
HRDC1214	6817	7.4	0.0		HRDC1241	7621	15.8	8.1	IR84714H
HRDC1231	6814	7.3	0.0	IR83199H	HRDC1235	7608	15.6	7.9	IR81949H
HRDC1238	6796	7.0	-0.3	IR82391H	HRDC1237	7349	11.7	4.3	IR82385H
HRDC1204	6781	6.8	-0.5		HRDC1238	7269	10.4	3.1	IR82391H
HRDC1206	6692	5.4	-1.8		HRDC1227	7260	10.3	3.0	
HRDC1207	6689	5.4	-1.8	IR86167H	HRDC1205	7194	9.3	2.0	
HRDC1215	6675	5.1	-2.0		HRDC1221	7193	9.3	2.0	
HRDC1233	6659	4.9	-2.3	IR80637H	HRDC1215	7145	8.6	1.4	
HRDC1234	6572	3.5	-3.6	IR80814H	HRDC1214	7106	8.0	0.8	
HRDC1235	6568	3.5	-3.6	IR81949H	HRDC1203	7095	7.8	0.6	
HRDC1225	6555	3.2	-3.8		HRDC1233	7082	7.6	0.5	IR80637H
HRDC1241	6551	3.2	-3.9	IR84714H	HRDC1217	7067	7.4	0.2	
HRDC1229	6540	3.0	-4.0		HRDC1231	7049	7.1	0.0	IR83199H
HRDC1213	6535	2.9	-4.1		HRDC1222	7046	7.1	0.0	
HRDC1242	6505	2.5	-4.5	IR86167H	HRDC1208	7017	6.6	-0.5	
HRDC1203	6464	1.8	-5.1		HRDC1228	6908	4.9	-2.0	
HRDC1220	6368	0.3	-6.3		HRDC1234	6901	4.8	-2.1	IR80814H
HRDC1232	6349	0.0	-6.8	PSB Rc 82	HRDC1213	6890	4.7	-2.3	
HRDC1239	6270	-1.2	-8.0	IR82366H	HRDC1239	6873	4.4	-2.5	IR82366H
HRDC1217	6262	-1.4	-8.1		HRDC1224	6759	2.7	-4.1	
HRDC1209	6242	-1.7	-8.4		HRDC1230	6669	1.3	-5.4	
HRDC1228	6172	-2.8	-9.4		HRDC1220	6617	0.5	-6.1	
HRDC1223	6063	-4.5	-11.0		HRDC1226	6590	0.1	-6.5	
HRDC1221	6022	-5.2	-11.6		HRDC1206	6590	0.1	-6.5	
HRDC1210	6019	-5.2	-11.7		HRDC1232	6582	0.0	-6.6	PSB Rc 82
HRDC1226	6004	-5.4	-11.9		HRDC1223	6533	-0.7	-7.3	
HRDC1219	5970	-6.0	-12.4		HRDC1225	6531	-0.8	-7.3	
HRDC1224	5840	-8.0	-14.3		HRDC1218	6516	-1.0	-7.6	
HRDC1230	5802	-8.6	-14.8		HRDC1210	6380	-3.1	-9.5	
HRDC1212	5737	-9.6	-15.8		HRDC1240	6226	-5.4	-11.7	IR84711H
HRDC1208	5734	-9.7	-15.9		HRDC1204	6114	-7.1	-13.3	
HRDC1202	5719	-9.9	-16.1		HRDC1201	6047	-8.1	-14.2	
HRDC1201	5714	-10.0	-16.1		HRDC1202	5875	-10.7	-16.7	
HRDC1218	5546	-12.6	-18.6		HRDC1211	5869	-10.8	-16.7	
HRDC1211	5404	-14.9	-20.7		HRDC1212	5703	-13.4	-19.1	

# Yield of Hybrid Rice in HRDC MRYT



***Question/issues related to MRYT (for 2011 MRYT):***

1. Not enough location in **India** and **Bangladesh** – need volunteer locations;
2. Field Management – should be **standard protocol** provided by HRDC;
3. Traits investigated – Should be **standard protocol** provided by HRDC;
4. **Breeding for Season?** - IRRI hybrids relatively stable
5. **High-yielding potential trail** – Location, field management protocol;
6. **Seed quality and shipment** in time

***Question/issues related to MRYT (for 2012 MRYT):***

1. Strengthen implement plan: 14/25 locations could not implemented due to miscommunication and delayed seed shipment/paper work;
2. Follow Field Management and Data Collection **protocols**;
3. **Breeding for Season?** – **Data shows strong interaction**;
4. **High-yielding potential trail** – not move forward, do we need it? If Yes, where?

# HRDC Hybrid Rice Training

## ***Rationale***

- Requested by HRDC members in every year
- Joint training with JAAS, China from 2010 -2012 (28 participants)

## ***Operation***

- Full cost recovery from participants & estimated cost = **\$4,842** PAX for the local expenditures (estimated for 8 participants)
- **10%** of financial support (\$488) from HRDC/IRRI for the **local expenditures**;
- Date: 14 days (**July 1 – July 15, 2013**);
- Minimum # of participants is 8 (cost efficiency)
- Registration deadline: **April 2, 2013**

# **Recommendations from the 6<sup>th</sup> International Hybrid Rice Symposium**

- Increase hybrid yield and yield heterosis
  - 2-line hybrid rice program outside China
  - Rice heterotic group study
  - Using marker technology
  - Disease and insect resistances
- Improve seed production & seed production efficiency
  - Refine seed production technology
  - Find favorable locations to seed production
  - Training for hybrid rice breeders and seed producers
  - Reduce seed cost
- Strengthen public private partnership
- Policies favorable for hybrid rice production