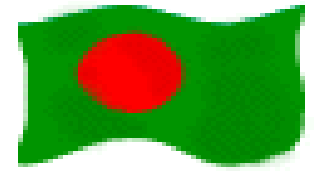


WELCOME

**to the Presentation
of**

Bangladesh



Hybrid Rice Research and Development: Bangladesh Perspective

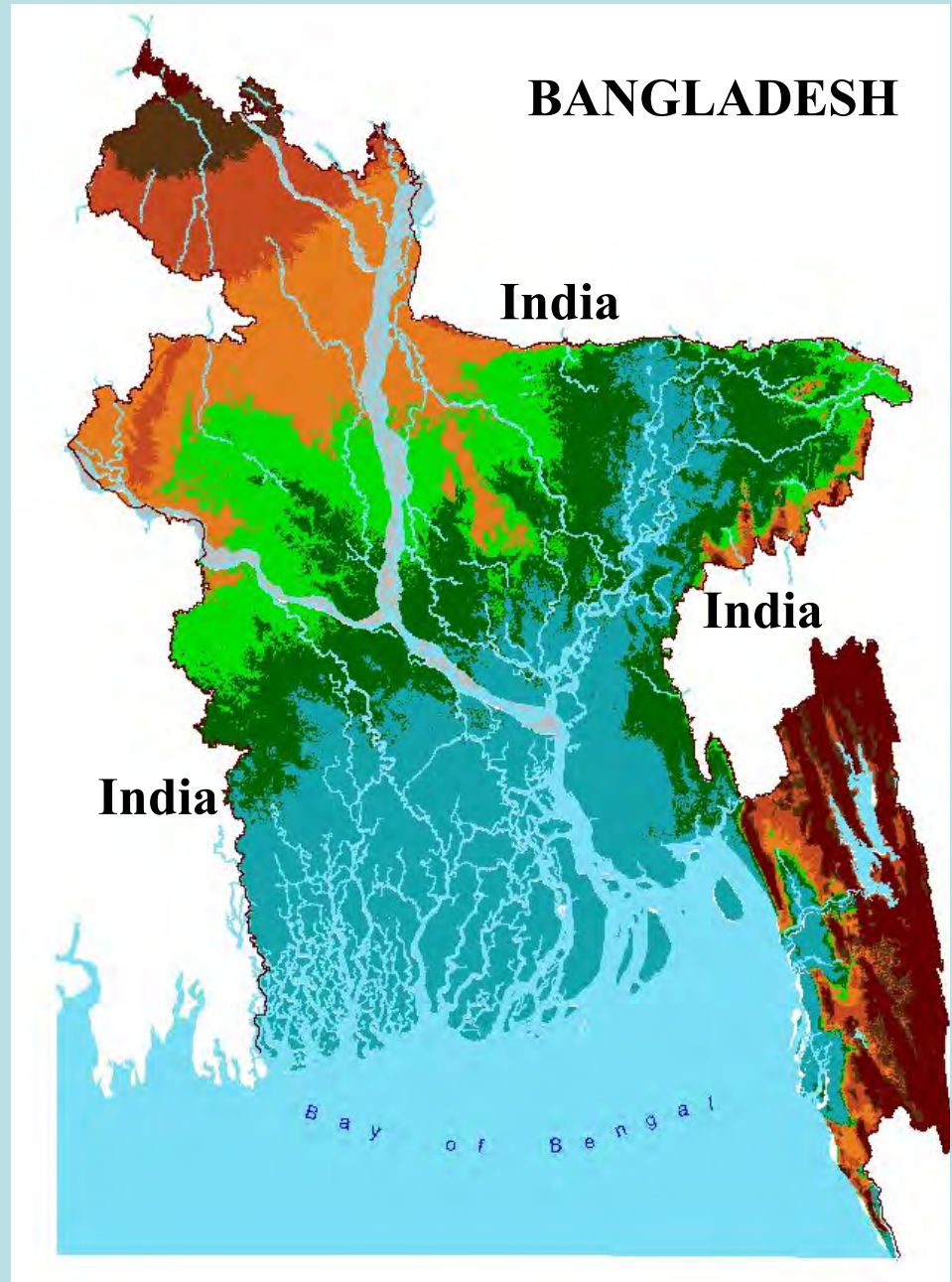
Dr. Helal U Ahmed

Chief Scientific Officer & Head Plant Breeding
Division

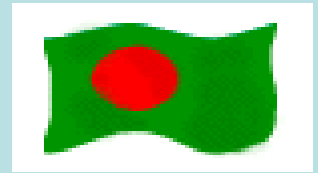
Bangladesh Rice Research Institute

Introduction

- Bangladesh-West, North, east side bordered India, southeast Myanmar and Bay of Bengal in south.
- It lies in the South Asia sub-continent between 20-26°N latitude and 88-92°E longitude
- Total area of the country is 1,47,570 skm. (14.8 M ha)

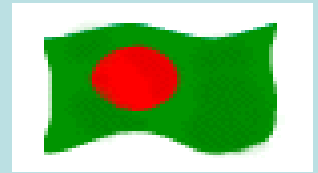


Climate

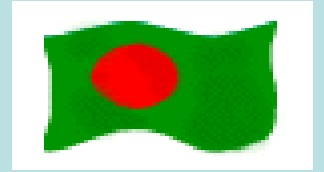


Bangladesh enjoys a sub-tropical monsoon climate - short and dry winter from November to February.

- **Rainfall:** 1400 to 4500mm, with maximum in the south and north-east part, while minimum in the western and northern parts
- **Temperature:** in winter, minimum average temp. : 15°C
maximum average temp. : 26°C
in summer, minimum average temp.: 25°C
maximum average temp.: 32°C
- **Solar radiation:** max. in winter (9 hrs/day) and min. in monsoon (4-5 hrs/day)



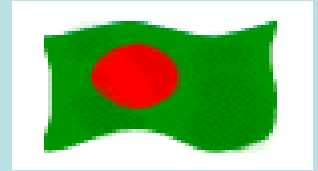
- **Total Area of the country** : 1,47,570 square km
- **Total cropped land** : 14.20 million hectare
- **Rice cropped land** : 10.00 million hectare
(77.5% of total cropped area)



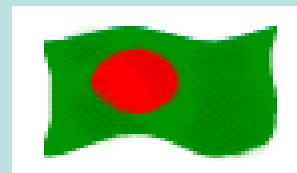
Bangladesh is primarily an agriculture based country

- **Contributing 22% to country's GDP**
- **48% labour engaged in agriculture**

Rice Growing Season



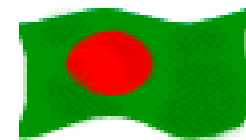
Name of the season	Duration	Land area (M. ha)	Cultivated condition
Aus	April - July	1.15	Rainfed
Aman	July - November	5.11	Rainfed
Boro	November - April	4.74	Irrigated



RICE PRODUCTION

Crop	Area (000' ha)	Production (‘000’ MT)	Yield (t/ha)
Aus	984.6	1709	1.7
Aman	5264.4	12207	2.3
Boro	4708.9	18059	3.8

Hybrid rice: International Scenario



China : Increased total rice production by 270 MT and also by decreasing rice land by 2 M ha. Covering almost 50% of rice area that contribute 60% of the national rice production.

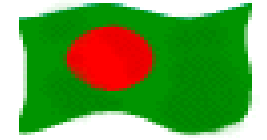
IRRI : IRRI is the pioneer to tropicalized hybrid rice. Hybrid rice research is in progress in 17 countries. IRRI bred parental lines are being used in most tropical countries.

India : About 15 public & a dozen private bred hybrids commercialized & targeted 2 M ha every year which would increase its rice production by 2 M tons per year.

Vietnam: From a country deficit in food, exporting 2 M tons of rice annually of which 13% contributed by hybrid rice

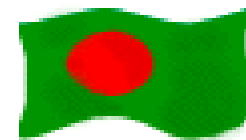
Philippines : Increased its hybrid rice area from 6,000 ha in 2002 to 60,000 ha in 2008.

Hybrid rice R&D in Bangladesh

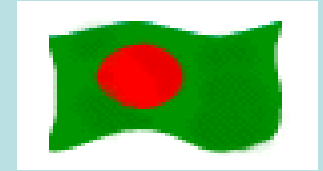


- Involved public and private sectors in 1998-99
- NGO's and private entrepreneurs commercialized Chinese hybrid rice
- Hybrid rice research project through IRRI-ADB and DFID financial support since 1993
 - GOB project “Research and development of hybrid rice in Bangladesh” (July 2005- June 2011) now shifted as hybrid rice component in revenue budget under plant breeding division

Hybrid rice Research at BRRI



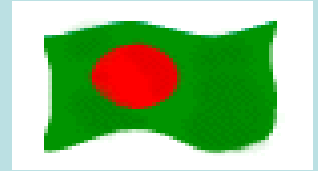
- + 1993, BRRI started hybrid rice research with IRRI by ARMP Funded
- + 1998, BRRI continue hybrid rice research with IRRI by ARMP Funded
- + 2001, BRRI released first hybrid variety by PETTRA Funded
- + 2002, BRRI conducted hybrid rice research with IRRI by PETTRA Funded
- + 2005, BRRI strengthen hybrid rice research with IRRI by GoB Funded
- + 2008-11, BRRI released additional three hybrids consequently



General Objectives

- To develop hybrid rice having good adaptability, high yield, acceptable grain quality for irrigated and rainfed lowland areas of Bangladesh
- To improve tolerance to major stress, pests and diseases
- To produce nucleus and breeder's seed and meet the demand of hybrid rice seed in the country
- To impart training to public and private agencies, extension people, farmers and seed producers for efficient delivery of hybrid technology

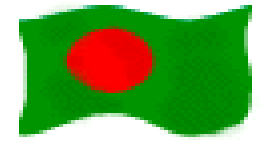
Major research area



- ☐ **Material Development**
- ☐ **Evaluation of Parental Lines & Hybrids**
- ☐ **Seed Production**
- ☐ **Capacity Building**

Improvement of parental lines by (B x B) and (R x R) crosses

Components of hybrid rice breeding



Source Nursery: To evaluate and test cross



**Test cross Nursery: Identifying B and R lines,
selection of heterotic hybrids**



Backcross Nursery

R-line evaluation nursery



New A and B line

Elite R line

Steps of developing parental materials



Source nursery



Test cross nursery



Back cross nursery



CMS

Working steps involved in Source Nursery



SPIKELET CLIPPING



Male parent collection



Dusting



F1 seed setting

CMS lines development in Backcross Nursery

Sl.No	Parent	Cross combination	Designated
01	BOB x V20B	BOA/ HR 021-28-7-B-2B	BRR1 1A/B
02	IR 58025B x IR 77801B	IR 8888A/ HR024-3-5-21-2B	BRR1 2A/B
03	IR 68888B x IR78355B	Jin23A/ HR026-11-3-7-5B	BRR1 3A/B
04	BRR11B x Z.S97B	II32A/ HR027-3-3-11-5B	BRR1 4A/B
05	BRR11A/BR6420-13-1-4	BRR1 1A/BR6420-13-1-4	BRR1 5A/B
06	BRR1 1A/Amul	BRR1 1A/Amul	BRR1 6A/B
07	BRR11A/RPSC148	BRR11A/RPSC148	BRR1 7A/B
08	BRR11A/BRRIdhan33	BRR11A/BRRIdhan33	BRR1 8A/B
09	ZS97B x IR 68890B	Gan46A/ HR 033-9-21-3-3B	BRR1 9A/B
10	BRR1B x II 32B	II32A/ HR 051-10-8-5-3B	BRR1 10A/B
11	BRR1 10B x You 1B	BRR110A/ HR 063-7-33-B-2B	BRR1 11A/B

Results of observational trials (OT) during T. Aman season 2011

Entry	Designation	PHT (cm)	E/T	DFF	SF (%)	DTM	Yld (t/ha)	Grain type	Yield advantage (%) over		
									CK-1	CK-2	CK-3
01	Jin23A/BR701 3-62-1-2R	98.0	7.0	92	78.0	118	6.8	S	28.30	21.43	9.67
02	BR11A/BR16R	101.7	7.5	95	80.0	122	7.0	M	32.01	25.0	12.90
CK-1	BR11	115	8.0	113	75.4	143	5.3	B	-	-	-
CK-2	BRRi dhan49	98.5	7.7	107	74.09	132	5.6	M	-	-	-
CK-3	BRRi hybrid dhan4	110	8.0	93	81.5	120	6.2	S	-	-	-

D/S: 6.7.11 D/T: 28.7.11 S= Slender, M= Medium, B = Bold

Results of observational trials (OT) during Boro season 2011-12

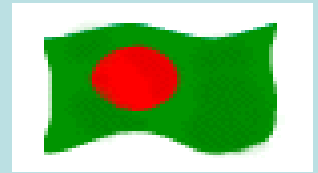
Entry	Designation	PHT (cm)	E/T	DFF	SF (%)	DTM	Yld (t/ha)	Grain type	Yield advantage (%) over				
									CK-1	CK-2	CK-3	CK-4	CK-5
01	Jin23A/PR326	86.5	7.8	115	82.13	141	7.72	S	19.69	5.03	34.73	-	-
02	Jin23A/PR344	87.4	8.1	113	87.69	137	8.07	S	25.12	9.78	40.84	-	-
24	BR10A/BR26R	99.8	9.4	120	92.88	146	7.95	S	23.26	8.16	38.74	-	-
26	BR10A/PR506	102.6	8.6	123	79.41	148	8.21	S	27.29	11.70	43.28	3.66	-
49	BR11A/PR326	98.8	9.6	116	86.5	141	8.36	S	29.61	13.74	45.90	5.56	-
65	GuiA/BR15R	99.8	9.4	120	92.88	146	7.85	S	21.71	6.80	37.10	-	-
76	WanA/BR22R	103.4	6.2	124	90.99	150	8.26	S	28.10	12.38	44.15	-	-
CK-1	BRRi dhan28	102	13.2	116	89.89	140	6.45	S	-	-	-	-	-
CK-2	BRRi dhan29	92.6	11.8	131	74.09	156	7.35	S	-	-	-	-	-
CK-3	BRRi dhan50	83.8	13.6	129	77.12	154	5.73	S	-	-	-	-	-
CK-4	BRRi hybrid dhan2	97.6	8.6	125	84.82	150	7.92	M	-	-	-	-	-
CK-5	BRRi hybrid dhan3	102	8.6	125	86.52	149	8.52	M	-	-	-	-	-

D/S: 10.12.11 D/T: 12.01.12 S= Slender, M= Medium

Performance of six promising hybrids at four BRRI-R/S, during Boro, 2010-11.

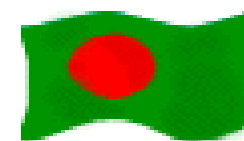
Sl.#	Designation	Days to mat. (Avg.)	Plant height (Avg.)	Yield (t/ha)				
				GAZ	COM	RAN	BAR	Avg.
1	BR10A/BR12R	155	103.33	6.19	9.0	7.09	8.40	7.67
2	BR10A/BR15R	155	105.14	6.76	8.1	7.30	9.07	7.81
3	II32A/BR10R	153	103.53	7.78	8.8	6.95	9.69	8.31
4	II32A/BR12R	152	101.85	6.60	9.2	7.30	8.73	7.96
5	BR9A/BR12R	148	102.28	6.32	7.6	6.25	8.17	7.09
6	BR1A/BR11R	148	96.66	6.61	7.9	5.97	8.00	7.12
7	BRRI dhan28	143	101.09	6.44	8.3	4.71	6.51	6.49
8	BRRI dhan29	160	101.88	7.60	9.6	6.91	8.55	8.17
9	BRRI hybrid dhan2	153	105.12	7.29	9.2	7.07	8.63	8.05
10	BRRI hybrid dhan3	152	107.22	7.56	10.0	7.71	10.15	8.86

Gaz=Gazipur, COM= Comilla, RAN= Rangpur, BAR= Barisal



Development of four hybrid rice varieties

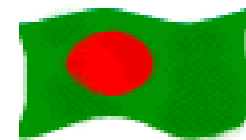
- **BRRI hybrid dhan1**
- **BRRI hybrid dhan2**
- **BRRI hybrid dhan3 and**
- **BRRI hybrid dhan4**



Salient features of BRRI Hybrid rice varieties

Variety name	Recom season	GD (days)	PH (cm)	ET/P (no.)	Fg/P (no.)	TGW (gm)	GT	GY (t/ha)
BHD 1	Boro	160	110	10	146	23.91	MS	7.5
BHD 2	Boro	145	100	9	175	28.01	MB	8.5
BHD 3	Boro	147	110	10	186	27.14	MB	9.0
BHD 4	Aman	117	112	8	180	23.5	MS	6.0

Salient features of BRRI Hybrid dhan1



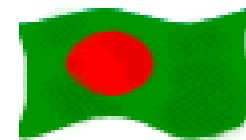
Season: Boro

Plant height: 100-110 cm

Yield: 7.5-8.5 t/ha

Duration: 150-160 days

Salient features of BRRI hybrid dhan2



BRRI hybrid dhan2

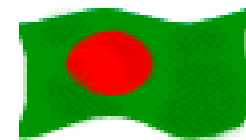
Plant height: 90-100 cm

Yield: 8-8.5 t/ha

Duration: 140-145 days

Season: Boro

Salient features of BRRI hybrid dhan3



BRRI hybrid dhan3

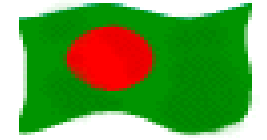
Plant height: 110-112 cm

Yield: 8.5-9.0 t/ha

Duration: 142-147 days

Season: Boro

Salient features of BRRI hybrid dhan4



**IR58025A/
BRR10R**

Check -1

Plant height: 112-115 cm

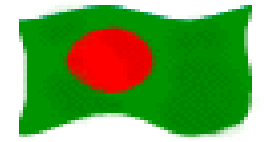
Yield: 6.0-6.5 t/ha

Duration: 115-117 days

Season: Aman

**Eighteen days earlier
than BRRI dhan31**

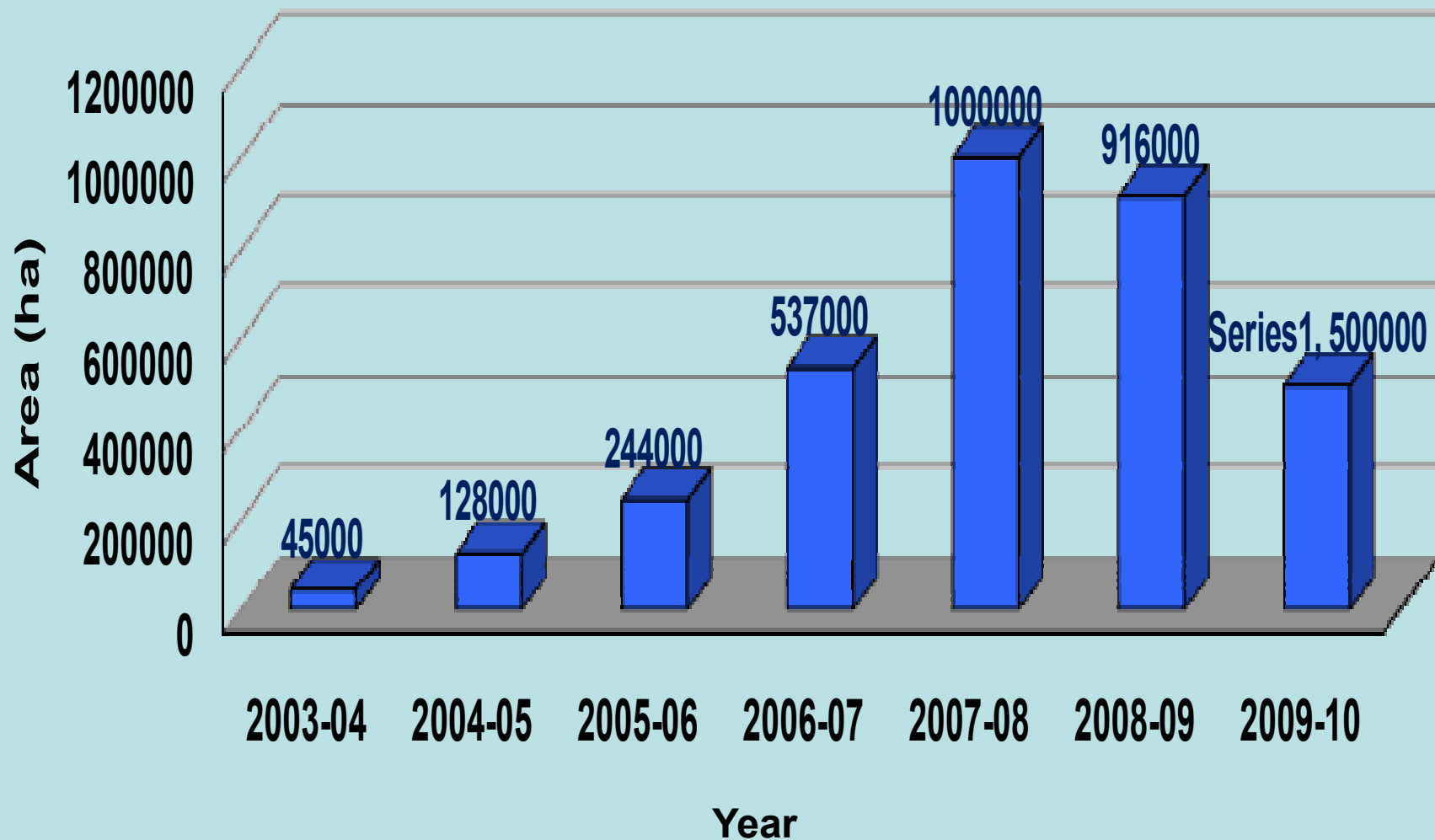
Extension of Hybrid Rice in Bangladesh



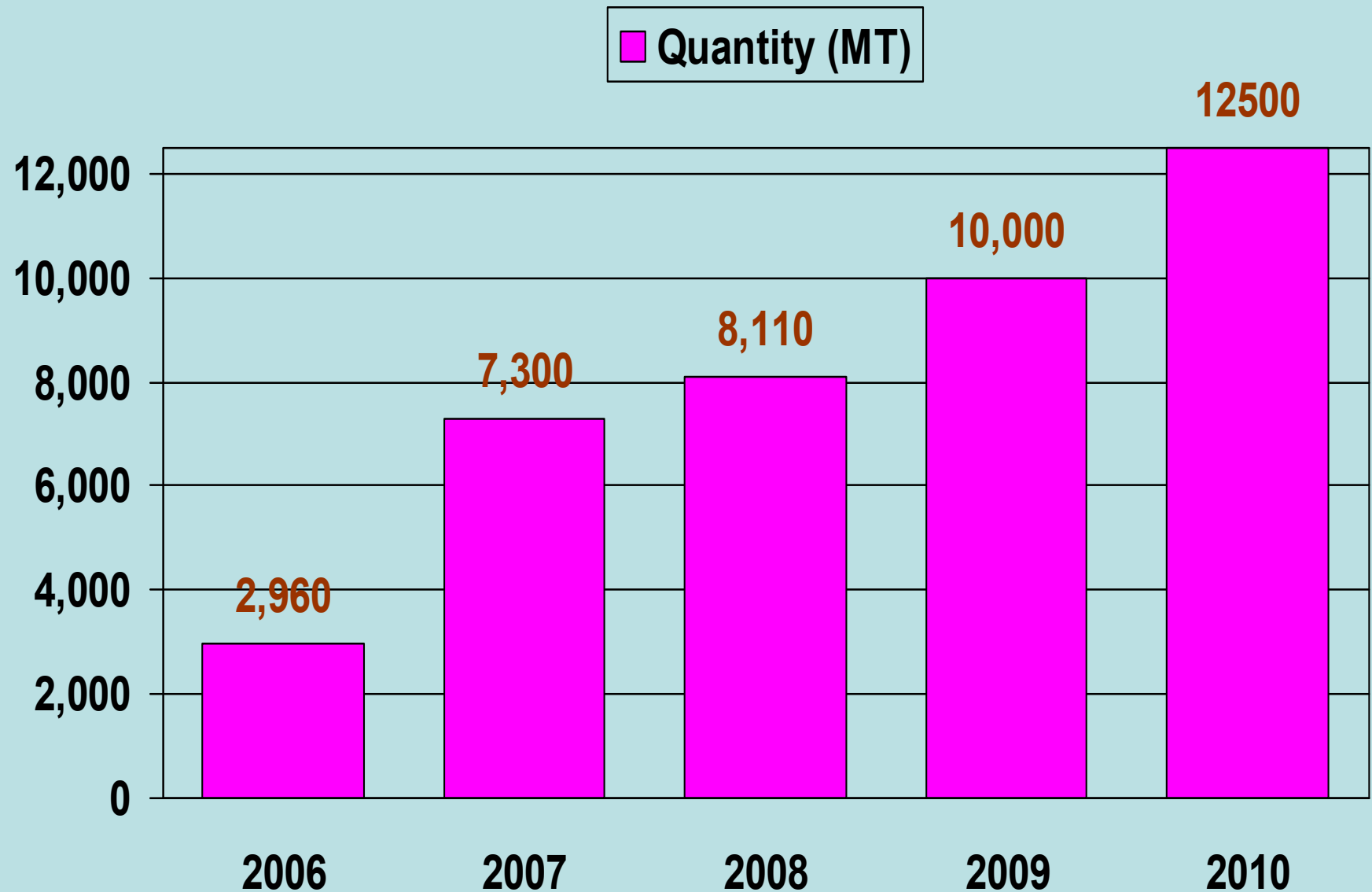
Hybrid rice varieties recommended by Govt. of Bangladesh

Year of Recom.	No. of hybrids	Recom. season	Sources				
			Abroad		In country		
			China	India	BRRI	BRAC	BADC
1998	4	Boro	1	3	0	-	-
2000	1	Boro	0	1	0	-	-
2001	3	Boro	2	0	1	-	-
2002	1	Boro	3	0	0	-	-
2003	6	Boro	5	1	0	-	-
2006	17	Boro	17	3	0	-	-
2007	12	Boro	12	2	0	1	1
2008	13	Boro	12	2	1	1	-
2009		Boro	7	2	1	1	-
2010		Boro & Aman	6	0	1	-	-
Total	87		65	14	4	3	1

Year wise hybrid rice cultivation statistics, 2003-10 (Land in hectare)



Import scenario of Hybrid rice



Hybrid Rice Seed Production during Boro 2009-10

SL.	Public and Private Company	Production (Mt)
01	BRRI	250
02	BADC	450
03	Supreme Seeds	1200
04	BRAC	900
05	Aftab	400
06	Others	200
Total		3400

Import & Production Target of Hybrid Seed in 2011-2012

Year	Import Target (MT)	Production Target (MT)
2011-2012	7745	4800

Source: DAE, MOA, Bangladesh.

Distribution of parental lines of BRRI hybrid dhan2 among the public, private and farmers during Boro 2009-10

Sl. No.	Institute / Seed company / Division / Farmers	F ₁ (kg)	A line (kg)	B line (kg)	R line (kg)
01	BADC	0.00	100.00	-	25.00
02	18 companies	96.00	145.50	-	42.95
02	54 farmers	123.25	1.25	-	0.750
03	5 BRRI regional stations	-	50.00	9.00	6.00
Total		219.25	296.75	9.00	74.70

F1 seed production of BHD 2 by major organizations during Boro season 2009-10

Sl#	Organization/Company	Production (Mt)
01	BADC, Netrokona farm	8
02	Syngenta Bangladesh Limited	5
03	Northern Agricultural and Industrial Co. Ltd.	8
04	Hossain Ali Agric. Res.Dev. and Seed Farm	6
05	Petrocem Bangladesh Ltd.	2
06	Islam Agro Seeds	2
07	Hi-tech Agro Products	2
08	Golden Valley Agro Source Ltd.	1
09	AUS Bangladesh Agro Ltd.	1
10	Asha Agro Seeds	1
Total		36

CMS multiplication of released hybrids during T. Aman 2010

Combinations	Plant height (cm)		50% flowering (days)		PER (%)	OCR (%)	Yield	
	A line	B line	A line	B line	A line	A line	(kg/ plot)	(t/ha)
BR 10A/B	84	86	73	72	74	34	65	1.4
BR 11A/B	82	85	75	73	77	36	50	1.5
IR58025A/B	88	90	90	79	71	31	25	1.2

CMS multiplication of released hybrids during Boro, 2010-11

Combinations	Plant height (cm)		50% flowering (days)		PER (%)	OCR (%)	Yield		Location
							(kg / plot)	(kg /ha)	
	A line	B line	A line	B line	A line	A line	A line		
BR10 A/B	80	83	121	120	87	45	550	2200	Gazipur
BR11A/B	82	84	123	121	88	49	1500	2500	
IR58025A/B	79	78	120	120	82	43	276	1800	

F₁ seed production of BRRI hybrid dhan1, BRRI hybrid dhan2, BRRI hybrid dhan3 and BRRI hybrid dhan4 during Boro, 2010-11.

Combinations	Plant height (cm)		50% flowering (days)		PER (%)	OCR (%)	Plot size (m ²)	Yield		Location s
								(kg / plot)	(kg /ha)	
	A line	R line	A line	R line	A line	A line		F ₁ Seed		
BRRI hybrid dhan1	76	105	123	133	84	36	100	15	1500	Rangpur
BRRI hybrid dhan2	79	90	122	122	88	46	2040	500	2450	Habigonj
BRRI hybrid dhan3	81	89	123	124	87	48	1474	420	2850	Comilla
BRRI hybrid dhan4	80	89	120	121	85	41	205	37	1800	Gazipur

Amount of parental line and hybrid seed supplied to different organization during Boro 2011-12

Sl. No	Recipient	Nos.	F1 (kg)	A line (kg)	B line (kg)	R line (kg)
01	BADC	1	0.00	150.00	-	30.00
02	Seed Companies	21	75.00	706.00	-	150.00
02	Farmers	65	130.00	1.00	-	0.50
03	BRRI R/S	4	-	102.00	9.00	34.00
Total		91	205.00	959.00	9.00	214.5
Grand Total			1387.5 kg			

Table : Amount of parental line and hybrid seed supplied to different organizations during Aman 2011-12

Sl. No.	Recipient	Nos.	F1 (kg)	A line (kg)	B line (kg)	R line (kg)
01	BADC	1	0.00	65.00	-	20.00
02	Seed Companies	7	0.00	101.00	-	26.00
02	Farmers	25	90.00	1.00	-	0.50
03	ARD, BRRI	1	60.00	-	-	00.00
Total		34	150.00	167.00	0.00	46.50
Grand Total			363.5 kg			

Major barrier for extension of Hybrid rice technology

- **Cooked hybrid rice is sticky due to low amylose content and boiled rice steeped in cold water is not possible as a result farmers have lost their encouragement to cultivate hybrid rice**
- **Due to above reason market price of hybrid rice is comparatively much lower than our modern inbred varieties**

Cont'd

- **Production of hybrid rice needs technical knowhow**
- **BLB infestation is high**
- **Inadequate funds for R&D**
- **Price of hybrid seeds is high**
- **Scarcity of hybrid seeds**
- **Lack of awareness of farmers**

Way forward

- (i) Adaption and development of management technologies and crop varieties resilient to vulnerable areas (stress tolerant)**
- (ii) Development approach to effectively manage drought, flood and salinity**
- (iii) Land use planning**
- (iv) Expansion of Boro cultivation to south-western region**
- (v) Improved cultural practices for Aman as like as Boro**
- (vi) Short term and long term training (MS and PhD on molecular breeding) for capacity build up of researchers**
- (vii) Biotechnology Research**

Recommendations

- ❖ High yielding (> 10 t/ha) with high amylose content (>25) hybrid varieties
- ❖ Saline tolerant ($>12\text{dS/m}$) hybrid varieties
- ❖ Short duration with drought tolerant hybrid varieties
- ❖ Germplasm exchange between two countries for development of desirable hybrid varieties
- ❖ Short term and long term training (MS and PhD on molecular breeding) for capacity build up of researchers

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Bangladesh Rice Research Institute

Thanks

Serving the Nation