BRRI at a glance

Bangladesh Rice Research Institute
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Background

Rice is the staple food of our people. At present, it accounts for about 92% of the total food grains produced in Bangladesh. It is the main source of energy for our people. Seventy-five percent of necessary calories and 66% of protein are met from rice in the average daily diet. It shares 76% to the total crop value and rice is the source of cash income for many farmers. Moreover, rice production employs 55-60% of our labour forces. It also ensures political stability for the country and provides a sense of food security to the people.

Rice research started in this part of the sub-continent in 1910. However, the modern era of rice research and development started in the mid sixties.

The demand for rice will be increasing in future because of increasing population size. Realizing the importance of rice in the socio-economy and politics, an autonomous organization in the name of East Pakistan Rice Research Institute (EPRRI) was established on 1 October 1970 with an 76.82 hectare of land at Joydebpur, Gazipur; 36 km away to the north of the capital city Dhaka. After liberation in 1971, it was renamed as the Bangladesh Rice Research Institute (BRRI) through the Parliamentary Act, 1973 (Act X of 1973). In order to bring dynamism in the management system, an amendment was made by a parliamentary act in 1996 (Act V of 1996).

The institute operates with 19 research divisions and nine regional stations, three support service divisions and eight sections with administrative and technical service. Total manpower of the Institute is 678, of which 248 are scientists. Most of them are highly trained professionals with MS and PhD degrees.

Mandate

- Conduct research on all aspects of rice improvement and production;
- Establish research centers and sub-stations in different regions of Bangladesh for conducting research on different problems of rice;
- Establish project areas for demonstration of new varieties of rice developed by the institute and organize training of framers for the cultivation of these rice varieties;
- Train agricultural extension personnel and progressive farmers on modern techniques of rice production;
- Publish annual reports, monographs, bulletins and such other documents relating to research activities of the institute;
- Advise the government on rice related policy issues.

Management

BRRI is an autonomous organization under the Ministry of Agriculture. A 12-member Board of Management (BoM) headed by the Director General determines and executes the polices and undertakings of the Institute.

Research Programme

Nineteen research divisions at BRRI HQ and nine regional stations across the country execute the research and technology development programmmes of BRRI. Multi-disciplinary, problem orientated annual research programmes are developed and executed by involving all level of scientists. Research at BRRI is organized in seven programme areas. Each programme area is composed of

one or more research divisions called the programme performing units (PPU). The programme areas, component research divisions and regional stations are:

Programme Area	Component Divisions/PPU
Varietal	Development Plant Breeding
	Biotechnology
	Genetic Resources and Seed
	Grain Quality and Nutrition
Crop-Soil-Water Management	Agronomy
	Soil Science
	Irrigation and Water Management
	Plant Physiology
Pest Management	Entomology
	Plant Pathology
Rice Farming Systems	Rice Farming Systems
Farm Mechanization	Farm Machinery and Post Harvest Technology
	Workshop Machinery and Maintenance
Socioeconomic and Policy	Agricultural Economics
	Agricultural Statistics
	Farm Management
Technology Transfer	Adaptive Research
	Training

BRRI Regional Stations

Name	Year of establishment	Main research area
BRRI Regional Station, Barisal	1970	Tidal non-saline ecosystem
BRRI Regional Station, Habiganj	1970	Deep water ecosystem and Boro
BRRI Regional Station, Comilla	1970	Favourable ecosystem
BRRI Regional Station, Sonagazi	1977	Coastal ecosystem
BRRI Regional Station, Rajshahi	1978	Drought prone ecosystem
BRRI Regional Station, Bhanga	1986	Deep water ecosystem and Boro
BRRI Regional Station, Rangpur	1991	Cold and upland ecosystem
BRRI Regional Station, Khustia	1996	Upland ecosystem of gangetic flood plain
BRRI Regional Station, Satkhira	1999	Saline ecosystem

Annual research programmme is developed and finalized in three steps: a) Intra divisional meeting; b) Programme area meeting and c) Programme committee meeting. Annual research plans are prepared based on priority areas and implemented under different ecosystems:

Irrigated lowland	Transplant Boro
Rainfed lowland	Transplant Aman
Rainfed upland	Broadcast/Dibbling Aus
Tidal wetlands (saline/non-saline)	Rainfed Aus and T. Aman
Deepwater (flood prone)	Broadcast Aman

After finalization, the research programme is executed by the programme performing units at HQ and as well as at regional stations and at the farmers' field. The concerned heads of the research division monitor the programme approved for execution. In addition, Director (Research) and the Director General supervise the overall research activities of the Institute. Thereafter,

results of the executed programmme are presented in the Annual Internal Review meeting, where all the scientists of the institute and also expert members from other institutions take part as a final evaluation process. Director research is the chief coordinator of all research activities of the institute assisted by a Coordinator for Advanced Studies and Research (CASR).

Major Achievement

Since its establishment in 1970, BRRI has made outstanding contribution to the national development through the release of high yielding rice varieties and improved packages of production technologies. It has so far-

- Released 67 high yielding rice varieties having three times higher yield potential than traditional ones. Out of them 63 are inbred and four are hybrid rice;
- Developed salt, drought, cold and submergence tolerant varieties along with zinc, iron, antioxidant enriched and diabetic-patient friendly rice;
- Developed more than 50 improved technologies on soil, water, fertilizer and cultural practices of rice;
- Developed 39 profitable rice-based cropping patterns for different AEZs;
- Developed and improved 32 agricultural machinery;
- Identified 32 rice diseases (10 major) and 266 species of rice insect pests (20 major), and developed control measures for the major insects and diseases including IPM;
- Achieved the ability to produce about 100 tons of breeder seed per year and supplying them to the farm level through GOs, NGOs and PS;
- Preserved over 7,000 rice germplasm in the BRRI Genebank collected at home and abroad;
- Imparted training to more than 68,500 personnel including scientists, farmers and extension agents from GOs and NGOs;
- Published 259 books, booklets, folders and extension materials;
- Developed and utilize Bangladesh Rice Knowledge Bank (BRKB), an online information hub of BRRI technologies;
- Developed stability model to BRRI varieties;
- Developed producer and consumer preference model to BRRI varieties;
- Developed econometric model for rice production;
- Developed optimum plot size and sampling plan for field experiments with rice;
- Developed sampling techniques for disease assessment in rice fields in collaboration with plant pathologist;
- Identifyed the probability of low temperature stress at different growth stages of Boro rice;
- Estimated spatial variability of arsenic in soils in arsenic contaminated shallow tube well command areas used for irrigated wet land rice cultivation.

Moreover

- Rate of return per one taka investment in rice research and development is Tk 46;
- BRRI developed 19 rice varieties are cultivated in 14 countries of the world; and
- GIS unit of BRRI is now enriching about 500 digital maps including BRRI varieties suitable areas and other agriculture related data.

Impact

BRRI is engaged in developing new rice technologies to improve socio-economic conditions of the rice farmers of Bangladesh. Farmers may not accept even an improved rice technology if it does not suit their socio-economic conditions. Scientists of Agricultural Economics and Agricultural Statistics Divisions are giving inputs to biological scientists, policy makers and extension agents through:

- Socio-economic survey of rice farmers;
- Economic evaluation of new rice production, technologies before and after they are released;
- Identifying constraints to widespread adoption of MV rice technologies;
- Surveying impact of MV rice technology on production, and employment;
- Studying rice marketing systems;
- Studying genetic coefficient of BRRI released varieties;
- Studying stability analysis of BRRI released varieties;
- Estimating sampling technique for rice yield components;
- Providing training programmes for manpower development of BRRI scientists on statistical analysis, computer processing and data analysis;
- Disseminating statistical method in almost all aspects of agricultural research.

MV rice coverage was 2.46 million hectares (24.88% of the total rice area) in 1972-73. It increased to 8.82 million hectares (84.50%) of the total rice area in 2012-13 that produced 27.8 million tons or 91.85% of the total harvests.

During 1971-72 to 2012-13, MVs produced 816.85 million tons of clean rice. The total value of MV rice output in 2012-13 was more than Tk 2,110 billion at world price over the time. Had there been no MV rice and only traditional varieties were grown during the last 43 years, the production of clean rice would have been less by 141 million tons. Moreover, there are areas where no rice could be grown had there been no MV rice. In that case, the government would have to spend Tk 2,110 billion in foreign exchange over years to provide succor to the starving millions. The institute has generated an annual average return of 252 times from a small investment of only Tk 1038 million for rice research. The return will certainly be more during the coming years because most of the planned construction and development work have already been completed.

Table 1. Characteristics of BRRI developed varieties, 1970-2014.

Designation	Season	Plant ht (cm)	Life cycle (day)[1]	Size and shape (milled rice)	Varietal speciality	Av. yield (t/ha)	Year of recomm-endation
BR1 (Chandina)	Boro	88	150	Short bold	Early maturing	5.5	1970
	Aus	88	120			4.0	
BR2 (Mala)	Boro	120	160	Medium slender	Suitable for puffed rice	5.0	1971
	Aus	120	125			4.0	
BR3 (Biplab)	Boro	95	170	Medium bold	Late maturing	6.5	1973
	Aus	100	130			4.0	
	Aman	100	145			4.0	
BR4 (Brrisail)	Aman	125	145	Medium bold	Strongly photoperiod sensitive	5.0	1975
BR5 (Dulabhog)	Aman	120	150	Short bold	Aromatic; Antioxidant enriched	3.0	1976
BR6 (IR28)	Boro	100	140	Long slender	Short duration	4.5	1977
	Aus	113	110			3.5	

Table 1. Continued.

Designation	Season	Plant ht (cm)	Life cycle (day)[1]	Size and shape (milled rice)	Varietal speciality	Av. yield (t/ha)	Year of recomm-endation
BR7 (Brribalam)	Boro	125	155	Long slender	Good eating quality	4.5	1977
	Aus	125	130			3.5	
BR8 (Asha)	Boro	125	160	Medium bold	Suitable for hail-storm prone areas	6.0	1978
	Aus	125	125			5.0	
BR9 (Sufala)	Boro	125	155	Medium bold	Suitable for hail-storm prone areas	6.0	1978
	Aus	125	120			5.0	
BR10 (Progoti)	Aman	115	150	Medium slender	Weakly photoperiod sensitive	5.5	1980
BR11 (Mukta)	Aman	115	145	Medium bold	Weakly photoperiod sensitive, high yield potential	5.5	1980
BR12 (Moyna)	Boro	105	170	Short bold	Leaf sheath purple colour	5.5	1983
	Aus	105	130			4.5	
BR14 (Gazi)	Boro	120	160	Medium bold	Awned	6.0	1983
	Aus	120	120			5.0	
BR15 (Mohini)	Boro	90	165	Medium slender	Long panicle	5.5	1983
	Aus	100	125			5.0	
BR16 (Shahibalam)	Boro	90	165	Long slender	Low glycemic index	6.0	1983
	Aus	110	130			5.0	
BR17 (Hashi)	Boro	125	155	Medium bold	Suitable for *haor* (depressed) areas	6.0	1985
BR18 (Shahjalal)	Boro	115	170	Medium bold	Suitable for *haor* (depressed) areas, cold tolerant	6.0	1985
BR19 (Mangol)	Boro	110	170	Medium bold	Suitable for *haor* (depressed) areas	6.0	1985
BR20 (Nizami)	Aus	120	115	Medium bold	Suitable for direct seeding and rainfed areas	3.5	1986
BR21 (Niamat)	Aus	100	110	Medium bold	Suitable for direct seeding and rainfed areas	3.0	1986
BR22 (Kiron)	Aman	125	150	Short bold	Late maturing; Photoperiod sensitive	5.0	1988
BR23 (Dishari)	Aman	120	150	Long slender	Late maturing; Photoperiod sensitive	5.5	1988
BR24 (Rahmat)	Aus	105	105	Long slender	Suitable for direct seeding and rainfed areas	3.5	1992
BR25 (Nayapajam)	Aman	138	135	Short bold	Suitable for direct seeding, low glycemic index	4.5	1992
BR26 (Sraboni)	Aus	115	115	Long slender	Intermediate amylose	4.0	1993
BRRI dhan27	Aus	140	115	Medium bold	Suitable for Barisal tidal areas	4.0	1994
BRRI dhan28	Boro	90	140	Medium slender	Early maturing, suitable for low laying areas, less water requiring	6.0	1994
BRRI dhan29	Boro	95	160	Medium slender	Very high yield potential and requiring available water	7.5	1994
BRRI dhan30	Aman	120	145	Medium slender	Weakly photoperiod sensitive	5.0	1994
BRRI dhan31	Aman	115	140	Medium bold	Suitable for southern region	5.0	1994
BRRI dhan32	Aman	120	130	Medium bold	Medium duration, low input variety	5.0	1994

Table 1. Continued.

Designation	Season	Plant ht (cm)	Life cycle (day)[1]	Size and shape (milled rice)	Varietal speciality	Av. yield (t/ha)	Year of recomm-endation
BRRI dhan33	Aman	100	118	Short bold	Blackish spotted paddy; early maturing	4.5	1997
BRRI dhan34	Aman	117	135	Short bold	Aromatic; Antioxidant enriched	3.5	1997
BRRI dhan35	Boro	105	155	Medium bold	Resistant to brown planthopper	5.0	1998
BRRI dhan36	Boro	90	140	Long slender	Cold tolerant	5.0	1998
BRRI dhan37	Aman	125	140	Medium slender	Aromatic	3.5	1998
BRRI dhan38	Aman	125	140	Medium slender	Aromatic	3.5	1998
BRRI dhan39	Aman	106	122	Medium slender	Early maturing	4.5	1999
BRRI dhan40	Aman	110	145	Medium bold	Salt tolerant	4.5	2003
BRRI dhan41	Aman	115	148	Long slender	Salt tolerant	4.5	2003
BRRI dhan42	Aus	100	100	Long slender	Drought tolerant, suitable for rainfed areas	3.5	2004
BRRI dhan43	Aus	100	100	Medium bold	Drought tolerant, suitable for rainfed areas	3.5	2004
BRRI dhan44	Aman	130	145	Medium bold	Suitable for coastal non-saline tidal-prone areas	5.5	2005
BRRI dhan45	Boro	100	140	Long bold	Early maturing	6.5	2005
BRRI dhan46	Aman	105	150	Medium bold	Late maturing, can be transplanted up to 15 September; Photoperiod sensitive, suitable for flood prone areas	4.7	2007
BRRI dhan47	Boro	105	152	Medium bold	Tolerates 12-14 dS/m salinity in seedling stage and 6 dS/m in rest of the life	6.0	2007
BRRI dhan48	Aus	105	110	Medium slender	Early maturing	5.5	2008
BRRI dhan49	Aman	100	135	Medium slender	Seven-day earlier than BR11, Nizersail type grain	5.5	2008
BRRI dhan50 (Banglamoti)	Boro	82	155	Long slender	Premium quality rice, slightly aromatic	6.0	2008
BRRI dhan51	Aman	90	142	Medium slender	Submergence tolerant	4.5	2010
BRRI dhan52	Aman	116	145	Medium bold	Submergence tolerant	5.0	2010
BRRI dhan53	Aman	105	125	Medium slender	Tolerates 8 dS/m salinity in seedling and reproductive stages	4.5	2010
BRRI dhan54	Aman	115	135	Medium slender	Tolerates 8 dS/m salinity in seedling and reproductive stages	4.5	2010
BRRI dhan55	Boro Aus	100 100	145 105	Long slender	Moderately tolerant to salt, drought and cold	7.0 5.0	2011
BRRI dhan56	Aman	115	110	Long bold	Drought tolerant; tolerates rainless condition for 14-21 days at the reproductive stage without losing much yield	5.0	2011
BRRI dhan57	Aman	115	105	Long slender	Drought escaping, tolerates rainless condition for 10-14 days at the reproductive stage without losing much yield	4.5	2011

Table 1. Continued.

Designation	Season	Plant ht (cm)	Life cycle (day)[1]	Size and shape (milled rice)	Varietal speciality	Av. yield (t/ha)	Year of recomm-endation
BRRI dhan58	Boro	100	155	Medium slender	Five-day earlier than BRRI dhan29	7.2	2012
BRRI dhan59	Boro	83	153	Medium bold	Flag leaf erected and deep green, non lodging	7.1	2013
BRRI dhan60	Boro	98	151	Long slender	Early maturing, yield potential equivalent to BRRI dhan29, extra long grain	7.3	2013
BRRI dhan61	Boro	96	150	Medium slender	Salt tolerant	6.3	2013
BRRI dhan62	Aman	102	100	Long slender	Moderately zinc enriched (19 ml/kg), high protein (9%) and early maturing	3.5	2013
BRRI dhan63	Boro	85	150	Long slender	Premium quality rice	7.0	2014
BRRI dhan64	Boro	105	152	Medium bold	Zinc enriched (25 ml/kg)	6.0	2014
BRRI hybrid dhan1	Boro	110	155	Long slender	Late maturing	8.5	2001
BRRI hybrid dhan2	Boro	105	145	Medium bold	Early maturing	8.0	2008
BRRI hybrid dhan3	Boro	110	145	Medium bold	Early maturing	9.0	2009
BRRI hybrid dhan4	Aman	112	118	Medium slender	Early maturing	6.5	2010

[1]Life cycles vary with seeding date.

New Strategic Focus

Recently BRRI has stengthened its rainfed Aus and T. Aman reserarch programmes as the part of a new strategic plan for the next decade.

In future, enough water may not be available to irrigate the entire area for Boro cultivation. As a resource saving option, Aus and Aman based cropping pattern appears to be quite prospective. Around 20% areas of Boro rice (around 0.9 Mha) can be shifted to Aus rice areas. In order to compensate the reduced amount of Boro production, the cumulative Aus areas should be increased to 1.8 Mha and the total production of Aus will have to be 5.2 million metric ton. To harvest this production, grain yield of modern Aus at farmers' field should be around 4.0 ton/ha for which, in addition to other technologies, needs the assurance of partial or supplemental irrigation facilities. Moreover, location-specific varieties along with production technologies will be the crucial factors for attaining the goal. For the timely establishment and post-harvest operations, particularly for Aus rice, farm mechanization needs to be emphasized. Some fallow areas in South and North-eastern region should be brought under cultivation. Special incentive package for providing inputs to the farmers should be ensured. BRRI has so far released 28 T. Aman, 8 Aus rice varieties, another 12 Boro rice varieties which are also good for cultivating as T. Aus. More promising Aus and Aman rice varieties having short duration, biotic and abiotic stress tolerances, and good yield potential should be developed. Suitable cropping patterns based on different ecosystems by the inclusion of 1-2 non-rice crops between Aus and Aman rice should also be developed. Shifting irrigated Boro culture to dry-direct seeded aerobic culture could also be the critical factor to reduce pressure on water consumption during Boro season. Mechanized crop establishment and suitable varieties having aerobic adaptation, cold tolerance and short duration will be required for aerobic

culture during Boro season. Considerable amount of water can also be saved popularizing AWD practice across the country through appropriate policy interventions.

Long term. The long term research strategy is directed to:

- Develop and adopt new plant type, hybrid, super hybrid rice and C4 rice for breaking yield ceiling of existing varieties;
- Develop sustainable disease and insect management packages and gene pyramiding of resistance for the development of varieties;
- Develop nutrient and water use efficient short and long duration varieties for maximum yield per day with appropriate management technologies;
- Develop climate smart, facultative, green saving rice and sustainable crop management technologies;
- Develop economically profitable farming systems technologies to farmers for adoption of climate change;
- Utilize alternative energy sources in farm machineries and water management for rice production;
- Develop policy research for sustainable rice production to ensure food security of the nation;
- Adopt conservation and precision agriculture, web-based fertilizer management and crop modeling based carbon trading;
- Use bio-informatics, next generation sequencing and phenotyping;
- Digitalize knowledge transfer system for rice production technologies;

Short term. The short term research strategy is directed to increase rice productivity and devise methodology to increase the farmers' adoption rate of modern rice varieties. In this regard, BRRI conducts research to:

- Identify major regional, physical, technical and socio-economic rice production problems to develop more site-specific technologies;
- Develop short and long duration varieties for irrigated, rainfed upland and lowland favourable ecosystems and sustainable production technologies;
- Develop climate smart varieties for higher yield and production technologies;
- Develop premium quality, micronutrient rich, arsenic tolerant, aerobic and low input rice varieties;
- Develop cost-effective disease, insect and weed management packages and resistant varieties;
- Identify acute and latent soil micronutrient deficiency and evolve devices (economical means) for their correction;
- Develop profitable cropping patterns and component technologies for different ecosystems or a specific location;
- Design, develop and distribute farm machinery for sustainable rice production;
- Assess impact of transferred technologies and feedback study to increase production and livelihood improvement of farmers;
- Train farmers and extension personnel on updated rice production technologies to reduce knowledge gap.

Recognition

BRRI as well as a number of its scientists have been honoured with 16 prestigious national and international awards for outstanding contribution to the science and technology. The following list presents the details.

Year	Award	Area
1974	Bangabandhu Award	Development of modern rice varieties
1977	President's Gold Medal	Development of BR3 and BR4 varieties
1978	Independence Day Award	Contributions to science and technology
1980	FAO Bronze Plaque	Development of BR10 and BR11 varieties
1980	President's Gold Medal	Development of Low Cost Diafram Pump
1984	President's Gold Medal	Contributions to rice research and development
1986	Begum Zebunnessa and Kazi Mahbubullah Trust Gold Medal	Development of rice variety and research
1991	Dr Maniruzzaman Foundation Gold Medal	Contributions to agricultural development
1992	Independence Day Gold Medal	Contributions to science and technology
1997	Independence Day Award	Contributions to science and technology
2004	Agriculturist Forum of Bangladesh Gold Medal	Development of high yielding varieties-specially BRRI dhan28 and BRRI dhan29
2005	IRRI Plaque of Honour	Achievements of three decades in ensuring food security and health of people
2006	Senadira Rice Research Award	Special contribution to rice research in Asia
2008	Mathematics Olympiad Award	Contributions to food security
2009	National Environment Award	Development of salt tolerant varieties
2013	Mercantile Bank Award	Contributions to food security and overall achievement of rice research

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