# ABOUT BRRI

A very short introduction


**Bangladesh Rice Research Institute**

Gazipur 1701, Bangladesh

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Gazipur 1701, Bangladesh

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Honourable Prime Minister Sheikh Hasina inaugurates the 'Bangabandhu Pierre Trudeau' Agricultural Technology Center

23 February 2023, Honourable Prime Minister visited innovation stall of BRRI.

# FOREWORD

Bangladesh Rice Research Institute (BRRI) was established on 1st October, 1970 in Joydebpur, Gazipur. The Institute has an outstanding contribution to the food security of Bangladesh. So far it has developed 113 high yielding rice varieties including one hundred-five inbreds and eight hybrids. Moreover, these varieties are cultivated in about 80 percent of the total rice areas and contribute almost 91 percent of total rice production of the country.

During the last 50 years, rice production has increased more than three times synchronizing with the increase of population that has been doubled or more. In 1970, population of our country was 71.32 million and yield of clean rice was 1.05 t/ha. The population has increased to well over 150 million and the yield of clean rice reached to 4.32 t/ha by 2020-21. In 1970 total clean rice production was about 10 million ton (MT), which was 41.30 MT by 2022-23. On the other hand, cultivable land is decreasing by almost one percent per year. These statistics demonstrate the fact that Bangladesh, one of the most densely populated countries of the world, had to face a human catastrophe if rice production was not increased a lot. It is clear that BRRI and farming communities played a pivotal role in making Bangladesh self-sufficient in food production. To draw a clearer picture about the achievements of BRRI and its potentials in ensuring food security of the country, we can shed some light on its past and present as well as the future strategies.

## Background

BRRI is a major component of the National Agricultural Research System (NARS) of Bangladesh, dealing with research and development in relation to rice production.

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 was high in the past and it has been increasing day by day 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 area of 76.82 hectare at Joydebpur, Gazipur; 36 km north of the capital city, Dhaka.

After liberation in 1971, it was renamed as the Bangladesh Rice Research Institute (BRRI) through the Parliamentary Act X, 1973.

To make the management system more dynamic, the BRRI Act was further amended in 1996 (Parliamentary Act V of 1996).

## Mission-vision

BRRI's mission is improvement of rice and development of rice production technologies for sustainable food security and its vision is to:

- Develop high yielding and quality rice at lower cost through genetic improvement;
- Develop biotic and abiotic stress tolerant variety for stress prone areas of Bangladesh;
- Conserve biodiversity through managing disease, insects, fertilizer, water and land for the current and future generations;
- Improve institutional capacity and linkage for advanced research; and
- Develop technologies for the reduction of poverty and hunger in the country.

## Mandate

The mandate of the institute is to:

- Conduct research on all aspects of rice improvement and production;
- Establish research centers and regional stations in different regions of Bangladesh for conducting research addressing different traits of interest, local & regional problems of rice corresponding to country's demand;
- Establish project areas for demonstration of new rice varieties developed by the institute and organize framers' training to train/teach them the cultivation technology of modern rice varieties;
- Train agricultural extension personnel and progressive farmers on modern rice production techniques;
- Publish annual reports, monographs, bulletins, scientific papers and such other documents relating to research activities of the institute; and
- Advise the government on rice related policy issues.

## Management

BRRI is an autonomous organization under the Ministry of Agriculture. A 13-member Board of Management (BoM), headed by the Director General (DG), determines and executes the policies and undertakings of the institute. Director (Research) and Director (Admin and Common Service) assist DG to control administrative and financial activities for smooth functioning of the institute's research programmes through 19 research divisions, 17 regional stations, six satellite stations, three support service divisions and eight sections with administrative and technical service. Total manpower provision of the institute is 786, of

which 308 are scientists. Most of them are highly trained professionals with MS and PhD degrees from home and abroad.

## Major Achievements

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

- Released 113 high yielding rice varieties having three times higher yield potential than traditional ones. Out of them 105 are inbred and eight are hybrid rice varieties;
- Developed salt, drought, cold and submergence tolerant varieties along with zinc, iron, antioxidant enriched and diabetic-patient friendly low glycemic index 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 34 agricultural machineries;
- Identified 32 rice diseases (10 major) and 232 species of rice insect pests (25 major) and developed control measures for the major insects and diseases including IPM;
- Achieved the ability to produce about 200 tons of breeder seeds per year and supplying them to the farm level by foundation seed, certified seed and TLS through GOs, NGOs and PS;
- Preserved 8,889 rice germplasm in the BRRI Genebank collected at home and abroad;
- Ranked Dinajpur Kataribhog (acc. no. 4791) and Bangladesh Kalijira (acc. no 247) germplasm as GI (Geographical Indication) products of Bangladesh from BRRI Rice Genebank.
- Imparted training to more than 1,51,581 personnel including scientists, farmers and extension agents from GOs and NGOs;
- Published 329 books, booklets, folders and extension materials;
- Developed and updated Salary Management System (SMS), Labour Management System(LMS), Casual Leave Application Management System and Quota Management System.
- Developed dynamic Mobile apps “BRRI Rice Doctor”, “Rice Knowledge Bank (RKB)” and “Modern Rice Nursing”; an online information hub of BRRI technologies;
- BRRI has been Awarded Digital Bangladesh Award 2022 and Smart Bangladesh Award 2023..
- Developed and utilized Bangladesh Rice Knowledge Bank (BRKB), an online information hub of BRRI technologies;
- Developed stability model for BRRI varieties;

- Developed producer and consumer preference model for 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;
- Identified 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.
- GIS unit has prepared Aus cultivable suitable area map of Bangladesh and also calculated mouza wise Aus cultivable suitable area.

## Moreover

- Rate of return per one-taka investment in rice research and development is Tk 56.0;
- Nineteen BRRI developed rice varieties are cultivated in 14 countries of the world; and
- GIS unit of BRRI is now enriching about 300 digital maps including suitable areas for BRRI varieties and other agricultural related data.

## Outstanding Innovation

The most popular Boro varieties developed by BRRI are BRRI dhan28 and BRRI dhan29. For T. Aman (Rainfed lowland rice) season, BR11 is also a mega variety. BRRI dhan33, BRRI dhan39, BRRI dhan56 and BRRI dhan57 are popular Aman varieties, which are early maturing and suitable for the mitigation of seasonal work and food crisis in the northern region. BRRI dhan48 is also a very good variety for Aus season.

BRRI dhan55 can be cultivated throughout the country in favourable conditions and it yields more than BRRI dhan28. Side by side, BRRI dhan56 is a drought tolerant and BRRI dhan57 is a drought escaping early maturing T. Aman varieties. BRRI dhan58 is a Boro variety with high yield potential that matures five days earlier than BRRI dhan29. BRRI dhan56 can produce desired level of yield even if rainless condition prolongs 14 to 21 days. BRRI hybrid dhan3 and BRRI hybrid dhan5 both produces 9.0 ton per hectare yield in Boro season. Other than that, BRRI hybrid dhan1 and BRRI hybrid dhan2 also produces 8.5 and 8.0 ton per hectare yield respectively in Boro season. For T. Aman season, another high yielding variety is BRRI hybrid dhan4, which produces 6.5 ton per hectare yield. BRRI hybrid dhan7 is an outstanding hybrid rice variety for Aus season that produces 7 ton per hectare yield in 110 days only.

Besides, BRRI dhan51,BRRI dhan52 and BRRI dhan79 can tolerate flash flood for the duration of two to three weeks at the vegetative stages. BRRI dhan50 (Banglamati) is an aromatic long slender high yielding Boro variety. There is scope of earning foreign currency through exporting this variety. Introgression of vitamin A producing beta-carotene gene has been accomplished in collaboration with IRRI and research is being carried out for the commercial use of vitamin A-enriched BRRI dhan29. Transgenic rice lines having high iron and zinc have already been developed, which may be released as variety in near future.

BRRI dhan78 is dual tolerant T. Aman variety with tolerance against both submergence and salinity at vegetative stages. The growth duration of this variety is 133-136 days with grain yield potential 5.5-6.0 t/ha.

BRRI dhan82 has been developed through pure line selection of NERICA10. Under optimum management BRRI dhan82 can produce 4.5-5.5 t/ha grain yield. The growth duration of this variety is 4-5 days shorter than BRRI dhan48. Eventually cultivation of this T. Aus variety will open up the avenue of in-time cultivation of T. Aman varieties.

BRRI dhan90 is a high yielding premium quality T. Aman variety. The grain size and shape of this variety is as like as BRRI dhan34. The average yield potential of this variety is 5.0 t/ha and average growth duration is 122 days. Importantly, BRRI dhan90 is 21 days is earlier than BRRI dhan34 but can produce 1.0-1.4 t/ha more grain yield. The clean rice of this variety can be used for preparing special festival cuisines like polao and paes.

Two Zinc-enriched T. Aman varieties i.e., BRRI dhan62 and BRRI dhan72 (short duration) with 20.0 and 22.8 ppm Zn, respectively have been developed. On the other hand, five Zinc (Zn) enriched varieties i.e. BRRI dhan64, BRRI dhan74, BRRI dhan84, Bangabandhu dhan100 and BRRI dhan102 with 25.5, 24.2, 27.6, 25.7 and 25.5 ppm Zn, respectively, developed for Boro season. The average yield of newly released BRRI dhan102 is 8.1 t/ha, however, with proper management, it is possible to get yield up to 9.6 t/ha under favorable environment. Eventually it can play a vital role to meet up the 50-70% zinc requirement of the people of Bangladesh.

BRRI's latest innovation from the year of 2020 include eleven high-yielding rice varieties started from BRRI dhan96 to BRRI dhan106. However, total list of all BRRI varieties are allocated in Table 1.

BRRI dhan96 is a short-duration Boro rice variety that has a high yield, lodging resistance, and high protein content (10.8%). It grows up to 87 cm and yields 7 tons per hectare on an average. Its lifespan ranges 140-145 days. It has a rice elongation ratio of 1.6 and a thousand grain

weight of 18.4 g. The amylose content of the rice is 28%. The seed coat color of this rice is bright golden similar to the rice cultivar Swarna makes it very much attractive. This variety has country-wide suitability and will potentially complement the mega rice variety BRRI dhan28.

BRRI dhan97 is a salinity tolerant MV for the Boro season, it can withstand a soil salinity level as high as 14 dS/m at the seedling stage and 8-10 dS/m at all critical stages during vegetative to reproductive growth. It is more salinity tolerant than the other salt tolerant MV, BRRI dhan67. BRRI dhan97 grains do not shatter away from the panicles. BRRI dhan97 matures in 152 days and gives an average yield of 3.93 to 5.95 t/ha depending on the soil salinity level. However, under favorable conditions and improved management, it can produce more than 7.0 t/ha.

BRRI dhan98 is a short duration high-yielding rice for the T. Aus season. BRRI dhan98 matures in 112 days as the same as BR26, but gives a higher yield of 5.1 t/ha with the ability to deliver as much as 5.9 t/ha in a favorable environment and with proper management. The short growth duration of BRRI dhan98 permits the timely establishment of the succeeding T. Aman rice crop.

BRRI dhan99, salinity tolerant rice for the Boro season. It can tolerate 14 dS/m salinity at the seedling stage and 8-10 dS/m salinity at the later critical stages of vegetative and reproductive growth, yet deliver well in terms of yield. BRRI dhan99 matures in 155 days, and yields in the range of 4.1 to 6.6 t/ha depending on the soil salinity level, with a mean yield of 5.4 t/ha. It has the ability to produce more than 7.1 t/ha in a favorable environment and with proper management.

Recent development of two zinc-enriched rice varieties includes Bangabandhu dhan100 and BRRI dhan102 with 25.7 and 25.5 ppm Zn, respectively for Boro season. The average yield of Bangabandhu dhan100 is 7.7 t/ha, but, in congenial agro-ecological conditions and with appropriate management, this variety can produce up to 8.8 t/ha. This variety is comparable to BRRI dhan49 and the local varieties, Nizersail and Zira. The grains come with excellent physico-chemical characteristics, with a 1000 grain weight of 16.7 g, and white, slender milled grains, amylose and protein contents are 26.8% and 7.8%, respectively. With its high zinc content, BRRI dhan100 can play a vital role in alleviating zinc deficiency. The average yield of BRRI dhan102 is 8.1 t/ha, however, with proper management, it is possible to get yield up to 9.6 t/ha under favorable environment. Eventually it can play a vital role to meet up the 50-70% zinc requirement of the people of Bangladesh.

BRRI dhan101 is the first BB (Bacterial Blight) resistant Boro rice variety. For being a BB resistant variety, the field appearance of this

variety is clean. Growth duration of this variety ranges between 135-152 days with an average of 142 days, which is four days earlier than the popular variety BRRI dhan58. The average yield of this variety is 7.72 ton per hectare. However, it can produce 8.99 ton per hectare yield under optimum management. The variety showed strong resistance to BB (BB score-1) under artificial inoculation with virulent BB pathogens. QTL fingerprinting with functional SNP markers for the BB resistance detected three dominant BB resistant genes Xa21, Xa7 and Xa4 in this variety.

BRRI dhan103 is a T. Aman rice having similar growth duration (128-133 days) as like as BRRI dhan87. The grain size and shape are long-slender, so this variety will be profitable to farmers. Average yield is 6.2 ton per hectare, if proper management is ensured, it can produce up to 8.0 ton per hectare of yield.

BRRI dhan104 is a high yielding premium quality aromatic Boro rice variety. Its average height is 92 cm and growth duration 147 days. This variety can produce 7.29 tonnes per hectare yield. Rice kernel is extra-long-slender basmati type and white. Its grain contains 29.2% amylose and 8.9% protein. The cooked rice is non-sticky. This is an important basmati type aromatic rice variety of BRRI.

BRRI dhan105 is a low glycemic index (GI value 55.0) i.e., diabetic rice variety suitable for Boro season. So, it is expected to gain wide acceptance as a diabetic rice due to its low GI properties. The average grain yield of the variety is 7.6 t/ha. If proper management is provided, it can produce 8.5 t/ha grain yield. Its growth duration is 148 days. The thousand grain weight of this variety is 19.4g. The amylose content of BRRI dhan105 is 27.0% and protein content is 7.3%. The grain size and shape of this variety is long slender and the colour of the milled rice is white. The cooked rice is neat and tastes savory.

BRRI dhan106 is a high-yielding T. Aus rice variety suitable for non-saline tidal areas in Bangladesh. Its average yield is 4.79 ton per hectare which is 17.4 percent higher than the check variety BRRI dhan27. If proper management is ensured, it can produce 5.49 ton per hectare yield. The special feature of the new variety is having lodging tolerance ability. The grain size and shape of the variety is medium bold and golden in color. Its growth duration is 117 days, thousand-grain weight of this variety is around 24.5 grams which will be accepted by the farmers of Barishal regions. Its grain contains 27.2% amylose and 8.5% protein. The cooked rice is fluffy.

## On-going Research

As per Rice Vision 2050, total population of this country will be 215.4 million and production demand of clean rice by that period will be 60.9

million to according to Doubling Rice Productivity (DRP) strategies. BRRI is committed to meet-up this demand to save the nation from hunger and has taken the following strategies to fulfil this commitment.

- Development of short duration early maturing rice varieties preferably with 90 days growth duration for Aus and Aman seasons;
- Development of premium quality inbred and hybrid rice varieties;
- Development of disease and insect resistant varieties;
- Development of salt, submergence, drought, cold and heat tolerant, early maturing rice varieties;
- Development of iron, zinc, vitamin A enriched, low glycemic index (GI) value and antioxidant enriched rice varieties;
- Development of rice varieties suitable for alternate wetting and drying (AWD) and direct-seeded wetland and dryland conditions;
- Development of deepwater rice varieties suitable for varying water depth condition and improvement of management packages for obtaining higher yield;
- Development of resource saving rice varieties which will consume less water and less fertilizer.
- Manipulation of planting practices including water, fertilizer and soil health to minimize yield gap;
- Improvement of livelihood of the farming community;
- Development of effective sustainable, eco-friendly control of insect-pests and diseases through biological and chemical methods;
- Development of suitable crop management practices including digital tools both online and offline for appropriate doses of nutrients as well as the forecasting method against insect-pests and diseases;
- Intervention of farming systems technologies for improving the livelihood of the resource poor farmers;
- Dissemination of BRRI technologies through training, field demonstrations, rallies and exhibitions;
- Validation and delivery of some cost-effective input management technologies including USG (Urea super granule), AWD techniques of irrigation, zero tillage surface seeding, use of poultry litter, rice blast, sheath blight, tungro disease management and farmers training for minimizing yield gap;
- Probability Climatic mapping of weather variables.
- Comparative study for rice yield estimation by adjusting moisture content
- Simulating of Climate Change Impact on Rice Growth and Yield in Bangladesh using DSSAT Model
- Development digital salary and labour management system of BRRI
- Development of smart profiling of rice varieties in Bangladesh,

sensor-based rice pest management system, new version of rice knowledge bank. Enhance capacity of BRRI official through innovation, service process simplification (SPS), ICT, MIS and 4th Industrial Revolution training, workshop etc.

- Suitability maps of BRRI released rice varieties and various cropping patterns also climatic factors condition maps, various soil properties maps, season wise rice area maps etc.

## How BRRI does it?

Nineteen research divisions at BRRI headquarters (HQ),17 regional stations and six satellite stations across the country execute the research and technology development programmes of BRRI. Multi-disciplinary problem oriented annual research programmes are developed and executed by involving all scientists. Research at BRRI is organized in eight programme areas. Each programme area is composed of one or more research divisions.

The programme areas are: Varietal development, crop-soil-water management, pest management, rice farming systems, farm mechanization, socioeconomics and policy, technology transfer and regional stations.

Annual research programme 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.

After finalization, the research programme is executed by the assigned research divisions at HQ as well as at regional stations and at the farmers' field. The head of the concerned research division monitors 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 programme are presented in the Annual Research Review Workshop, 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).

## PIONEER OF FOOD SECURITY

Rice is the staple food of Bangladesh. For the people of this country, it is the major energy source also. Rice covers 77 % of the total cropped area, around 16.06 million hectares, and it is the main source of cash income for many farmers. Also, special rice varieties are essential for socio-religious functions. BRRI, as a pioneer institution of its kind, has

been dealing with rice since 1970 and showing the nation the way forward to food security. BRRI variety, occupying 80% of total rice area, accounts for 91% of the total rice production.

## Contributions to the Nation

Since its establishment, BRRI has rendered valuable service to the nation through the development of high-yielding rice varieties and improved production technologies, which have been instrumental in tripling the annual rice output in Bangladesh within four decades. For this, BRRI is well known nationally in Bangladesh as well as in the world rice community.

The high-yielding modern varieties (MVs) developed by BRRI at present covers 90% of the Boro (winter rice), 25-30% of the Aus (summer rice), and 50-55% of the transplant Aman (Autumn rice) areas of Bangladesh. These varieties together account for about 65% of the total annual rice production in the country. The BRRI MVs and technology packages played the key role in boosting annual rice production in Bangladesh from 9.93 million tons in 1972-73 to nearly 41.30 million tons annually in 2022-23. The net contribution of modern rice to total rice production was 27.04 million tons in 2013. It grew to 5.1 million tons by 1985 and 8.9 million tons by 1993, more than 10 million tons by 2013 and eventually increased to ??????? by 2022. In absolute terms, the output from MV rice met the food requirements of almost 170 million people annually during 2022-23. Without BRRI MVs, rice production would have grown at the rate of less than 1% per year, almost half the rate at which the population grew during this period. Thus, unless the deficit would have been covered by additional food import, the price of rice would have increased. The market would have distributed the scarce supplies in favour of the upper income groups, which could have worsened food insecurity and poverty in Bangladesh.

BRRI MVs and production technologies benefited the nation in the form of cost saving rice production. But, there were indirect additional benefits to the society, too. The government saved scarce foreign exchange as additional rice production, made possible through the diffusion of the new technology, prevented the need for an increase in food grain imports. Without BRRI MVs, Bangladesh could not have met the rice needs of the growing population, and would have been forced to import the additional amount to maintain stability in prices in the domestic market. In fact, since the early 1980s the import of food grains declined steadily and the country achieved self-sufficiency by the 2010s.

BRRI technologies also contributed to the income generation and employment in rural Bangladesh over the past four decades. In areas

where the MV technology has been introduced, the proportion of population living below the poverty line is 31.5% compared to 50% for areas without such technological progress. The net return per agricultural holding using MV technology is about 50% higher than a similar holding using traditional varieties. The expansion of modern irrigation facilities, which concurred with the expansion of MV rice acreage, has also led to increased employment opportunities in non-agricultural activities, with a rise in the income of the rural population. Additional people have been employed indirectly, in fertilizer trade or in the maintenance of pumps and other equipment, for example.

## Rice Seasons

Rice grows under irrigated, rainfed and deepwater conditions in four distinct rice seasons, namely: Aus, transplant Aman (T. Aman), broadcast Aman (B. Aman) or deepwater Aman and Boro.

Aus. Aus is photoperiod-insensitive and grows generally under rainfed condition both as a broadcast and transplanted crop from March to September. Aus covers 1.34 million hectares with about 90.0% planted to modern variety (MV) Aus.

Broadcast Aman. Deep water Aman is planted in two ways: broadcast in March or April alone or sometimes mixed with Aus and transplanted in May following Boro harvest. While Aus is harvested in June and July, B. Aman competes with the monsoon floods at water depths from 0.5 to 4.0 m from June to September and is harvested generally in November and December. About 0.24 million hectare area is planted with different broadcast Aman cultivars.

Transplant Aman. T. Aman is planted from July to September in areas where water depths usually do not exceed 0.5 m. T. Aman is the most important rice crop and covers about 40.85% of the total rice area in Bangladesh. All indigenous T. Aman rice is sensitive to photoperiod, but MV rice transplanted in about 80.0% of the total T. Aman area and is insensitive to sensitive to potoperiod. However, photosensitivity is needed to increase yields of this crop when cropping patterns dictate late planting or famers are forced to go for late planting due to natural calamities.

Boro. Boro grows entirely in the irrigated dry season. Seedbeds are made from October to December. Seedlings are transplanted from December to February and the crop is harvested from late April to June. Nearly 99% of the 5.00 million hectares of Boro is planted with modern varieties. As the winter is relatively free from insects and diseases and because of higher solar radiation and better water management, Boro yields are higher than any other seasons.

## The BRRI Challenge

In 2012-13, Bangladesh produced 34.43 million tons of clean rice for its 150 million people. By 2030, the population may be around 189 million unless controlled the current population growth rate. Thus this will require about 45 million tons of paddy equivalent to 28 million tons of clean rice.

Where will this come from?

An answer to this question can be provided only by strengthening research as well as appropriate rice production technologies. BRRI, dedicated to develop new rice technology, has identified the strategies to meet the challenge of feeding the extra millions that include:

- Conducting research on all aspects of rice;
- Developing climate change resilient rice varieties;
- Establishing project areas to demonstrate appropriate agricultural technology; and
- Imparting training of extension agents and farmers on improved techniques of rice production.

## Board of Management

A board of management holds full responsibility to determine and execute policies and undertakings of the institute within the framework of policy directive issued by the government. The Director General is the executive head and works on behalf of the board of management. At present the board consists of:

### Chairman

**Dr Md Shahjahan Kabir**
Director General, BRRI

### Members

**Nasima Parvin**
Joint Secretary (Implementation-2), Department of Finance,
Ministry of Finance, Bangladesh Secretariat, Dhaka.
Joint Secretary (Research-3 Branch)
Ministry of Agriculture, Bangladesh Secretariat, Dhaka

**Dr Sabina Yeasmin**
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**Tazul Islam Patowary**
Director, DAE

**Dr. Md. Abdul Latif**
Director (Admin and Common Service), BRRI

**Director**
Bangladesh Institute of Nuclear Agriculture (BINA)

**Dr Md Bokther Hossain**
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Kapasia, Gazipur

Member-Secretary
**Dr. Mohammad Khalequzzaman**
Director (Research)

## Research and Support Service

BRRI has 19 research divisions,17 regional stations, six satellite stations, three support service divisions and eight sections with administrative and technical service.

**Research Divisions**

- Plant Breeding
- Biotechnology
- Genetic Resources and Seed
- Grain Quality and Nutrition
- Hybrid Rice
- Agronomy
- Soil Science

- Irrigation and Water Management
- Plant Physiology
- Entomology
- Plant Pathology
- Rice Farming Systems
- Agricultural Economics
- Agricultural Statistics
- Farm Management
- Farm Machinery and Postharvest Technology
- Workshop Machinery and Maintenance
- Adaptive Research
- Training

**Support Service Divisions/Sections**

- Building and Construction
- Publications and Public Relations
- Planning and Evaluation
- Administration
- Accounts and Finance
- Audit Cell
- Dispensary
- Library
- Transport
- Hostel
- ICT Cell

## Regional Stations (RS)

| | |
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BRRI RS, Cox-bazar
BRRI RS, Khagrachari
BRRI RS, Sunamganj

## Satellite stations

Satellite Station, Khulna
Satellite Station, Chittagong
Satellite Station, Patuakhali
Satellite Station, Panchagarh
Satellite Station, Sylhet
Satellite Station, Mymensingh

## Problem-oriented Research

The work of the institute is to organize and manage research on a problem-oriented basis. Scientists follow a 3-step evaluation procedure before finally adopting research programmes. Thus, an interdisciplinary approach is followed to select a particular problem area and accordingly implement the selected programmes through several projects, each of which is performed by one or more divisions of BRRI HQ at Joydebpur, Gazipur and by the professional staff at regional stations. BRRI scientists also expose their research programmes to outside scientists, donors, planners and administrators in the annual research review workshop.

## New Strategic Focus

Recently BRRI has strengthened its rainfed Aus and T. Aman research 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 15% 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 tons. 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, are needed 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. According to Doubling Rice Productivity (DRP) strategies, five fallow areas namely Greater Barishal region, North-eastern Bangladesh predominantly greater Sylhet region, South-west and greater Jashore region, Coastal charland in greater Barishal region and Noakhali district and Chattogram hill tracts especially Kaptai lake areas have been identified which could be brought under cultivation. Special incentive package for providing inputs to the farmers should be ensured. BRRI developed 47 T. Aman, 15 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 biorational pesticide, organic fertilizer to reduce pressure on use of chemicals
- Exploit nano-technologies, artificial intelligence
- 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 high through-put 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 per day 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 develop 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; and

- Train farmers and extension personnel on updated rice production technologies to reduce knowledge gap.

## From Dwarfism to Ecology Oriented

BRRI scientists deviated from the original IRRI concept of dwarfism for high yields and restructured the IR8 plant type to suit local agro-ecology and socio-economic production environment. The new intermediate-height plant gives equally high yield and, at the same time, grows in uncontrolled water better than the semi-dwarf varieties.

Bangladeshi farmers also prefer relatively tall plants to produce cattle feed and roofing materials. BRRI is now expediting research works to develop lodging tolerant rice varieties even though the plant height is a bit taller.

# ACCOMPLISHMENTS

With appropriate management and under favourable soil and environmental conditions, BRRI MVs yield on average 5-6 t/ha in Boro, 3-4 t/ha in Aus, and 4-5 t/ha in transplant Aman seasons compared with 2-3 t/ha of the traditional varieties. A number of BRRI MVs are now widely grown in about 20 other countries including, India, Nepal, Bhutan, Myanmar, Vietnam and West Africa.

BRRI cereal chemists regularly evaluate rice grain quality in terms of taste, cooking quality, milling outturn, aroma, protein and amylose contents etc., helping plant breeders develop varieties with desirable grain quality. A total of 8,889 germplasm, of which about 45% are local cultivars, have been collected and preserved in germplasm centre.

Improved production technologies: Through extensive laboratory, greenhouse and field experimentation BRRI scientists have developed more than 300 crop-soil-fertilizer-water, pest management methods, farm machinery as well as rice-based farming sytems for the cultivation of MVs in various agro-ecological zones of the country.

## Agronomic Practices

Farmers hardly achieve the production potentials for recommended rice varieties because of failure to apply proper cultural practices. For the benefit of the farmers, agronomists manipulate the management practices to create favourable conditions for crop production and to increase yield. Scientists of the Agronomy Division are engaged in finding, verifying and evaluating the following issues:

- Raising quality seedling and nursery management;
- Suitable planting methods for a direct-seeded upland, direct wet seeded rainfed lowland and irrigated rice;
- Variety-wise planting time of rice in different seasons;
- Fertilizer management for a direct-seeded and transplanted rice;
- Increase nutrient use efficiency through different management practices;
- Soil health improvement and green manuring in rice cropping systems;
- Herbicide screening for a direct-seeded and transplanted rice;
- Allelopathic effect of different genotypes in weed suppression;
- Agronomic management for submergence, salinity and drought

tolerant varieties; and
- Crop modeling and resource management.

**Major findings**
- When a transplanted plot is damaged by flood, tillers can be separated from undamaged plots keeping 2-3 tillers per hill and re-transplanted in damaged plot at 30-40 DAT;
- Half ton yield advantage over recommended fertilizer rate by using 3.4 g NPK briquette in Boro season though the nutrient amount was less than recommended rate;
- Water hyacinth is allowed to grow in waste water for 20-30 days and then that water might be used for irrigation to obtain similar grain yield of fresh water treated plot;
- Fresh poultry litter and 20-day decomposed poultry litter @ 2 t/ha produces the highest yield advantage with saving 50% chemical fertilizers;
- Green manuring in rice field reduces the amount of nitrogen fertilizer by at least 50 percent; and
- Mefeneset + Bensulfuran Methyl, Bensulfuran Methyl + Acetachlor, Pyrazosulfuran Ethyl are effective for weed control in transplanted rice; and Pendamethylin, Oxadiargyl, Oxadiazone are effective for weed control in upland rice.

**Research thrust.** Following research activities will be emphasized in future: i) Climate change resilient (Submergence, Salinity, Cold and Drought) agronomic practices, ii) Crop modeling and weather parameters, iii) Herbicides residual effect and soil microbial population in plant-soil system.

## Plant Physiology

Plant Physiology Division of BRRI works on various aspects of abiotic stress tolerances and physiological behaviour of growth and rooting in relation to yield, seed viability, lodging, pre-flowering reserve with a vision to develop new plant type concept. With these mandates, plant physiologists have successfully identified and characterized flood, salinity, drought tolerant breeding lines those were subsequently released as flood, salinity and drought tolerant high yielding varieties. This division has developed seedling raising technique in low temperature condition during Boro season. It also developed and modified several methods for screening against salinity, drought, submergence, heat, cold and pre-harvest sprouting.

## Varietal Acheivement including Plant Breeding Division

The major achievements of Varietal Development Program Area

including Plant Breeding Division of BRRI are the development of high-yielding modern rice varieties (MVs) for both favourable and unfavourable ecosystem. BRRI has so far been developed and released 113 MVs (105 inbred and 8 hybrids). Among 105 inbred rice varieties, 99 inbreds were developed by Plant Breeding Division and six inbred varieties were developed by Biotechnology Division. Season-wise counting of these 113 varieties including hybrids and considering overlapping are as follows:

- 1 for Boro, Aus and T. Aman
- 12 for Boro and Aus
- 39 for only Boro season
- 7 for only T. Aus seson
- 6 for B. Aus season
- 2 for both B. Aus and T. Aus
- 47 for T. Aman Season and
- 1 for B. Aman season

Plant Breeding Division has given considerable efforts to develop modern varieties both for favourable and unfavourable areas. Development of climate smart rice varieties with tolerance against abiotic stresses like salinity, submergence, drought, cold etc., is one of the prioritized breeding targets. BRRI has been applying frontier breeding tools like population improvement, genomic selection, marker assisted selection utilizing high through-put molecular markers, genome editing, genomics-phenomics, techniques to development rice varieties with high yield, biotic-abiotic stress tolerances, premium quality and resource saving properties. Recently scientists of Plant Breeding Divisionare working relentlessly to keep pace with international level research combining different scientific approaches like RGA (Rapid generation advance), low density and high-density genotyping, digital barcoding, automation in post-harvest technology etc., to develop sustainable rice varieties for future under the jurisdiction of TRB-BRRI (Transforming rice breeding-BRRI) project. The scientists of this division have supervised MS and PhD students as part of capacity building and provided non-degree training on modern rice breeding and varieties to students, farmers, NARS and international scientists, extension personnel and NGO staffs. The division published articles in scientific journals, annual reports, proceedings, leaflets and bulletins of released varieties.

**Rice growing season-wise achievement of Plant Breeding Division at a glance**

**Aus Season**

- BR21, BR24, BRRI dhan42, BRRI dhan43 and BRRI dhan65 are the rice varieties suitable for the high rainfall upland situation (direct-seeded Aus). BRRI dhan65 is an upland Aus rice variety with around 0.5 t/ha more yield potential than BRRI dhan43. Moreover, this variety has better weed competitiveness than BRRI dhan43 at the earlier growth stages.
- BRRI dhan42, BRRI dhan43 and BRRI dhan83 are the broadcast Aus rice varieties suitable for drought prone areas. BRRI dhan83 is a newly released B. Aus variety with moderate level of drought tolerance at the vegetative stages. The grain colour of this variety is reddish as like the local LIV Kataktara. Under optimum management this variety can produce on an average 4.0 t/ha which is around 1.0 ton higher than BRRI dhan43. This variety is particularly suitable in the charland areas of Noakhali and Feni. Recently BRRI dhan83 has been recommended to cultivate in T. Aus season also.
- BR26, BRRI dhan48, BRRI dhan55, BRRI dhan82 and BRRI dhan98 are the T. Aus varieties. BRRI dhan55 as T. Aus variety is 10 days earlier than BRRI dhan27 and can produce one ton/ha higher yield than that of BRRI dhan27. Under optimum management BRRI dhan55 can produce 5.0 t/ha grain yield in T. Aus season.
- BRRI dhan82 has been developed through pure line selection of NERICA10. Under optimum management BRRI dhan82 can produce 4.5-5.5 t/ha grain yield. The growth duration of this variety is 4-5 days shorter than BRRI dhan48. Eventually cultivation of the T. Aus variety will open up the avenue of in-time cultivation of T. Aman varieties. BRRI dhan98 produces 5.0-5.8 ton per hectare grain yield. The grain is long slender and golden coloured. Its growth duration is 112 days which is similar to BR26. Weight of 1000 matured grain of this variety is around 22.6 gram. The grain contains 27.9% amylose and 9.5% protein. The cooked rice is non-sticky.
- BRRI dhan27 is a T. Aus variety suitable for non-saline tidal wetland areas of greater Barishal region. BRRI dhan48 is the most popular T. Aus variety with 5.5 t/ha grain yield potential and 110 days average growth duration. BRRI dhan85 is the latest T. Aus variety suitable for comparatively low land areas of greater Cumilla region. The grain yield potential of BRRI dhan85 is 5.5 t/ha.
- BRRI dhan106 is a high-yielding T. Aus rice variety suitable for non-saline tidal areas in Bangladesh. Its average yield is 4.79 ton per hectare which is 17.4 percent higher than the check variety BRRI

dhan27. If proper management is ensured, it can produce 5.49 ton per hectare yield. The special feature of the new variety is having lodging tolerance ability. The grain size and shape of the variety is medium bold and golden in color. Its growth duration is 117 days, thousand-grain weight of this variety is around 24.5 grams which will be accepted by the farmers of Barishal regions. Its grain contains 27.2% amylose and 8.5% protein. The cooked rice is fluffy.

**Aman Season**

- BRRI dhan49 is a popular T. Aman variety with Nizersail type grain quality with seven days earlier growth duration than BR11 and 5.5 t/ha grain yield potential.
- BRRI dhan70 and BRRI dhan80 are the long slender aromatic rice varieties for T. Aman season with shorter duration (130 days) and 5.0 t/ha grain yield potential.
- BRRI dhan90 is a high yielding premium quality T. Aman variety. The grain size and shape of this variety is as like as BRRI dhan34. The average yield potential of this variety is 5.0 t/ha and average growth duration is 122 days. Importantly, BRRI dhan90 is 21 days is earlier than BRRI dhan34 but can produce 1.0-1.4 t/ha more grain yield. The clean rice of this variety can be used for preparing special festival cuisines like polao and paes.
- BRRI dhan91 is semi-deepwater B. Aman rice variety with special adaptive capacities under up to 1.0-meter height flood water. This variety is a moderate photo-sensitive variety with average 156 days growth duration, which is 10-15 days earlier than the local deepwater cultivar like Fulkuri. The grain yield potential of BRRI dhan91 is 3.0 t/ha.
- BRRI dhan93 and BRRI dhan94 are the modern T. Aman varieties with 134 days growth duration. The average yield potentials of these varieties are 5.8 t/ha. BRRI dhan95 is another modern T. Aman variety with 125 days growth duration and average yield potential 5.7 t/ha. All these three varieties have Indian Swarna-type grain qualities and adaptive capacities. Therefore, these three varieties can be cultivated in the Swarna-growing border areas of the country.
- BR22, BR23 and BRRI dhan46 with strong photoperiod sensitivity are suitable for late transplanting in Aman Season after the recession of the flood water.
- BRRI dhan44, BRRI dhan52, BRRI dhan76 and BRRI dhan77 are the T. Aman varieties suitable for tidal non-saline areas of greater Barishal region.
- BR25, BRRI dhan32, BRRI dhan33, BRRI dhan39 and BRRI dhan75 are the short to medium duration photo-insensitive rice varieties. BRRI

dhan75 is a high yielding and short duration T. Aman rice variety with 5.0 t/ha yield potential. The cooked rice of this variety has slight aroma.

- BR10, BRRI dhan30 and BRRI dhan31 have been developed for rainfed lowland rice environment. These varieties are weakly photo-sensitive and have the yield potential 5.0-6.0 t/ha. Beside these, BR10, BR23 and BRRI dhan30 are the T. Aman rice varieties with special adaptation ability under the water stagnant areas of southern region of Bangladesh.
- Three submergence tolerant varieties such as BRRI dhan51, BRRI dhan52 and BRRI dhan79 has been developed which can survive against 2-3 weeks of submergence.
- Four varieties viz. BRRI dhan56, BRRI dhan57, BRRI dhan66 and BRRI dhan71 have been developed for T. Aman which are suitable for drought-prone areas of Bangladesh.
- Two Zinc (Zn) enriched varieties i.e. BRRI dhan62 and BRRI dhan72 (short duration) with 20.0 and 22.8 ppm Zn, respectively have been developed for T. Aman season.
- Another four varieties BRRI dhan40, BRRI dhan41, BRRI dhan53, BRRI dhan54 and BRRI dhan73 are the salinity tolerant varieties for T. Aman with 8 dS/m salinity tolerance at reproductive stage.
- BRRI dhan78 is dual tolerant T. Aman variety with tolerance against both submergence and salinity. The growth duration of this variety is 133-136 days with grain yield potential 5.5-6.0 t/ha.

**Boro Season**

- BRRI dhan58 is a high yielding Boro variety. BRRI dhan58 is the first variety developed through tissue culture process from BRRI dhan29 which is7-10 earlier than BRRI dhan29 with more or less similar yield potential. The growth duration of BRRI dhan58 is 150-155 days and grain yield potential 7.0-8.0 t/ha. Interestingly, BRRI dhan58 can be cultivated after potato harvest in late Boro season and in the shrimp Gher of Southern region during Boro season.
- The division has developed BRRI dhan47, BRRI dhan61 and BRRI dhan67 for Boro season which can tolerate 12-14 dS/m salinity at seedling stage and also withstand 6-8 dS/m salinity during whole life cycle. Newly released BRRI dhan97 and BRRI dhan99 is suitable for Boro season which can tolerate 14 dS/m salinity at seedling stage and also withstand 8-10 dS/m salinity during whole life cycle.
- Nonetheless, Five Zinc (Zn) enriched varieties i.e. BRRI dhan64, BRRI dhan74, BRRI dhan84, Bangabandhu dhan100 and BRRI dhan102 with 25.5, 24.2, 27.6, 25.7 and 25.5 ppm Zn, respectively developed for Boro season. The average yield of newly released BRRI dhan102 is

8.1 t/ha, however, with proper management, it is possible to get yield up to 9.6 t/ha under favorable environment. Eventually it can play a vital role to meet up the 50-70% zinc requirement of the people of Bangladesh.

- BRRI dhan50 popularly known as Banglamati (Basmati type) and BRRI dhan63 (slender balam type) are the high yielding Boro rice varieties with premium quality for favourable ecosystem.
- The MVs like BR17, BR18 and BR19 are suitable for haor areas (depressed basins) in Boro season of Bangladesh. In addition, BR18, BRRI dhan36, BRRI dhan55 and BRRI dhan69 possess cold tolerance at vegetative stages and are suitable for cold stress prone areas of northern region of Bangladesh.
- BRRI dhan55 is a moderately cold, salinity and drought tolerant variety. This variety can be cultivated in the Boro areas with moderate level of salinity, water shortage and cold problems. BRRI dhan55 is 5 days later than BRRI dhan28 but can produce 1.0 t/ha higher grain yield.
- BRRI dhan59 and BRRI dhan60 have in-between growth duration compared to BRRI dhan28 and BRRI dhan29 have been developed for Boro season. Both of the varieties have yield potential ranging from 7.1-7.3 t/ha. Importantly, BRRI dhan60 has extra-long slender grain.
- BRRI dhan68 has been developed as standard Boro rice with medium bold grain, lodging tolerance and 13% more grain yield potential than BRRI dhan28 but with around one-week later growth duration. BRRI dhan69 is low input potential Boro rice varieties with 7.0 t/ha grain yield potential. Importantly BRRI dhan69 has moderate level of cold tolerance during reproductive stages,
- The growth duration of BRRI dhan81 is 140-145 days and yield potential 6.0-6.5 t/ha. This variety containing high protein (10.3%) has all the premium quality rice characteristics except aroma. The variety can be exported as the grain size and shape of this variety is long slender as like as Basmati rice. Moreover, the size and shape of clean rice is as like as local Zira cultivar and therefore, the variety has demand in the local market as well. The growth duration of BRRI dhan88 is 140-143 days and grain yield potential 7.0 t/ha. This variety is particularly suitable as short duration Boro variety.
- BRRI dhan101 is the first BB (Bacterial Blight) resistant Boro rice variety. The grain of the variety is long-slender and golden in color. For being a BB resistant variety, the field appearance of this variety is clean. Growth duration of this variety ranges between 135-152 days with an average of 142 days, which is four days earlier than the popular variety BRRI dhan58. The average yield of this variety is 7.72

ton per hectare. However, it can produce 8.99 ton per hectare yield under optimum management. Thousand-grain weight of this variety is around 23.1 grams. Rice kernel is long-slender and white. Its grain contains 25.0% amylose and 9.8% protein. The cooked rice is non-sticky. The variety showed strong resistance to BB (BB score-1) under artificial inoculation with virulent BB pathogens. QTL fingerprinting with functional SNP markers for the BB resistance detected three dominant BB resistant genes Xa21, Xa7 and Xa4 in this variety.

- BRRI dhan104 is a high yielding premium quality Boro rice variety. Its average height is 92 cm and growth duration 147 days. This variety can produce 7.29 tonnes per hectare yield. In combination of favorable environment with proper management, this variety has the potential to yield up to 8.71 tonnes per hectare. Thousand-grain weight of this variety is around 21.5 grams. Rice kernel is extra-long-slender basmati type and white. Its grain contains 29.2% amylose and 8.9% protein. The cooked rice is non-sticky. This is an important basmati type aromatic rice variety of BRRI.
- BRRI dhan105 is a low glycemic index (GI value 55.0) i.e., diabetic rice variety suitable for Boro season. So, it is expected to gain wide acceptance as a diabetic rice due to its low GI properties. The average grain yield of the variety is 7.6 t/ha. If proper management is provided, it can produce 8.5 t/ha grain yield. Its growth duration is 148 days. The thousand grain weight of this variety is 19.4g. The amylose content of BRRI dhan105 is 27.0% and protein content is 7.3%. The grain size and shape of this variety is long slender and the colour of the milled rice is white. The cooked rice is non-sticky and tastes good.

## Biotechnology

Biotechnology Division is one of the major components of rice varietal development programme area in BRRI. Since its inception, the division has been working for generating rice breeding lines through different biotechnological tools. Its major thrust includes the varietal development activities for high yield, quality, stress tolerance and biofortification of rice. Currently, it is mainly involved in rice tissue culture, genetic transformation, marker assisted selection (MAS), gene pyramiding, quantitative trait loci (QTL) identification and deoxyribonucleic acid (DNA) finger printing of the modern rice varieties, advanced breeding lines and local land races.

**Major achievement**

- Methods and protocols have been established on culturing explants, such as seed, embryo, young panicle and anther of indica rice;
- Higher regeneration rates from callus of rice tissue culture have been achieved in both indica and japonica rice by using various salts of sodium;
- DNA finger printing was done on 50 BRRI released varieties to protect bio-piracy;
- Efficient genetic transformation system was established for Bangladeshi rice genotypes;
- Two bacterial blight resistant genes (xa13 and Xa21) have been pyramided in BRRI dhan29;
- Molecular characterization of 127 local Aus germplasm has been completed;
- Sub1 gene has been introgressed into BRRI dhan44 for submergence tolerance; and
- Confined green house facilities were developed for transgenic research.

**Future plan**

- Development of skilled manpower in modern biotechnology for carrying out frontier research programmes to meet the future need;
- Introduction and validation of transgenic rice events: Biofortified rice, biotic and abiotic stress tolerant rice;
- Identification, introgression and validation of agronomicaly important QTLs for high yield, biotic and abiotic stress tolerant rice;
- Positional cloning and sequencing of the target QTL region leading to the development of gene based markers;
- Molecular characterization of existing germplasm, land races and related varieties for identification and usage in breeding programme;
- Exploring and using of available QTLs through MAS in popular rice varieties;
- Development and introduction of transgenic rice having useful genes for nutritional important, and biotic and abiotic stress tolerant;
- Construction of cDNA/genomic library to characterize important genes; and
- Development of short duration, stress tolerant, fine grain, high nutritional qualities rice varieties through tissue culture.

## Pest Management

Entomology. Scientists are at work to introduce an integrated pest management programme for more economical and effective control of pests. Because of its hot and humid climate, Bangladesh has an ideal habitat for many kinds of rice pests. With the introduction of modern varieties and climatic change, some minor insects, such as green leafhoppers, gall midge, brown planthoppers, whorl maggot, thrips and caseworm, and diseases such as leaf scald, sheath rot, tungro, bacterial blight and sheath blight have assumed major importance and seriously reduce rice yields.

BRRI entomologists have identified about 50 rice genotypes as sources of resistance to green leafhopper and more than a thousand lines against brown planthopper. Mass rearing technique of biocontrol agent, Trichogramma zahiri for rice hispa egg has been developed. Several sources of resistance have also been identified against rice thrips, gall midge, whorl maggot, leaf rollers and rice hispa. By now, 266 arthropod species have been collected from the rice fields of Bangladesh. Among them, 232 have been identified as the rice pests. Moreover, 192 predators and 183 parasitoids of rice insects pests have been recorded.

Stem borers, brown planthopper, rice hispa, rice leaf rollers, gall midge and rats have been identified as the most damaging insect and vertebrate pests of rice. The magnitude of yield loss due to pest infestation in farmers' fields has been assessed carefully. Sampling methods for determining the economic threshold levels of some of the major pests have been developed. Entomologists helped plant breeders in developing rice varieties with resistance or tolerance to major insects, such as, brown planthopper, rice stem borers, rice hispa, white-backed planthopper and green leafhoppers. Technologies, based on the integrated pest management (IPM) approach, have been developed to control major insects. Insecticides belonging to 43 generic groups that are effective against different insects have been identified. Simple techniques for controlling rats by trapping have been revised.

Plant Pathology. Plant Pathologists have identified 32 rice diseases in Bangladesh. These diseases are caused by fungi, bacteria, viruses, nematodes and mycoplasma. Ten of them were recorded as major in the past. Recently, false smut is being included in the major group as the previously recorded major diseases leaf scald and stem rot are being shifted to minor disease group. At present, blast, sheath blight (ShB), bakanae, false smut (FS), brown spot (BS), seedling blight (SB), bacterial blight (BB), tungro and ufra are considered as the major rice disease in Bangladesh. Races and/or pathotypes of bacterial blight (16 race) and

blast (267 race) have been identified. Major resistance (R) genes Xa21, xa13 and xa5 for BB and Pish, Pita, Pita-2 and Pi9 for blast have been detected through molecular markers and pathogenecity test. Introgression of these R-genes in the background of mega varieties including aromatic rice is in progress through marker assisted selection (MAS) and pathogenecity test. A set of standard differential isolates for blast and BB has been developed for resistance screening. International differential set of monogenic lines (ML) for BB and blast is available and is used in Plant Pathology Division for resistance studies. To identify disease resistance sources, the division has screened INGER materials obtained from IRRI against bacterial blight, blast and tungro as routine work since 1978. In addition, native germplasm, advanced breeding lines and exotic disease resistant materials have been tested against major rice diseases. Blast resistant genes Pish, Pita and Pi9 have been detected in native germplasm using diagnostic marker and pathogenecity test. Rayada and Bajail found resistant to ufra while Kumragoir resistant to tungro. New chemicals evaluation and advisory-clinical services are the routine work of the division. Epidemiological studies of the diseases in relation to climate change are another research thrust. Integrated rice disease management packages (cultural agronomic practices, botanical, bio control agents and chemical) have been developed for most of the major diseases except BB and false smut. However, research focuses on the false smut disease and gene pyramiding for BB and blast resistances have been given the highest priority.

## Soil Science

BRRI Soil Science Division has been working for the last 50 years with the aim to maintain rice soil health, environment with higher crop productivity. It was identified that balanced chemical fertilizer and integrated nutrient management practices improve soil carbon stock, soil health and boost rice yield and reduced greenhouse gas emission. To ensure healthy rice soil environment for sustainable rice production, BRRI Soil Science Division has-

- Developed balanced chemical fertilizer doses for BRRI released rice varieties in favorable and unfavorable ecosystems of Bangladesh
- Introduced integrated plant nutrition system (IPNS) and integrated nutrient management practices for maintaining soil health with maximum yield benefit
- Developed rice cropping pattern based fertilizer recommendations in different AEZs of Bangladesh
- Developed technology for efficient nutrient management in rice production such as urea deep placement for N management,

recycling of rice straw for K, and use of poultry manure for P management.

- Developed technologies for N management in rice with Azolla, leaf color chart and Sesbania
- Developed BRRI-organic fertilizer technology for reducing N and P chemical fertilizer use to maintain a healthy soil environment in sustainable rice production
- Developed an eco-friendly technology with intermittent irrigation for reducing greenhouse gas (GHG) emissions and arsenic uptake in rice
- Developed urea deep placement technology for reducing greenhouse gas emission from rice cultivation
- Developed nutrient management technologies in conservation agriculture for improving soil health
- Developed critical limit (CL) of different nutrients for soil and rice crop
- Assessed soil carbon stock, soil microbial properties and soil health index of different agro ecological zones (AEZ) of Bangladesh
- Developed salinity management technologies for coastal belt in Bangladesh
- Studied and amelioration techniques of heavy metals such as As, Pb, Cd, Cr, Cu etc. pollution in rice soil
- Developed soil health card and computer based fertilizer application for farmers
- Developed soil fertility map of BRRI HQ and BRRI regional stations

Research thrust. The division is also working on nano fertilizer, biocoated fertilizer, biofertilizer, sensor based soil and plant nutrient detection to increase nutrient use efficiency and reduce greenhouse gas emission from rice soil environment.

## Irrigation and Water Management

Efficient utilization of irrigation water is essential for sustaining increased agricultural production. The rising cost of fuel, oil and irrigation equipment demands optimal water use to make the facilities economically viable. Adequate information is being generated to help farmers and to operate the systems at a high level of efficiency. Specific experiments are underway to:

- Study groundwater status, including research potential;
- Study the impact of supplemental irrigation on rice cultivation;
- Develop techniques for conserving rainwater;
- Study constraints to effective utilization of water at the farm level;
- Evaluate the performance of the existing irrigation systems and suggest improvements;

- Study the impact of different levels of fertilizer-water interactions on the rice yield;
- Develop practically useful criteria and a suitable method for improved allocation and equitable distribution of irrigation water to increase irrigation efficiency and service area per unit volume of available water; and
- Test and validate the optimum levels of soil, water and crop management systems in selected project sites to increase annual crop production.

## Rice Farming Systems

BRRI farming systems scientists worked with on-farm cropping systems research and development activities in Bangladesh until 1984 and since then have been working with rice farming systems (RFS) to increase farmers' incomes and production. Three components such as crop, livestock and fishery are included in the programme.

RFS scientists conduct site-specific research on a priority basis in different agro-ecological environments- rainfed lowland, coastal saline, irrigated, low rainfed Barind tract, acid upland soil, tidal submergence and deep water. They have already developed appropriate technologies for these environments, except for saline areas. These technologies have been incorporated in multilocation trials and production programmes in different upazilas throughout the country.

BRRI scientists have been successful in developing (a) Rice-Fish farming system for the deepwater areas, (b) appropriate timing of crop establishment and suitable varieties and management practices for the Rice-Wheat cropping systems, and (c) cropping systems for incorporating short-duration pulses and oilseeds in between two MV rice crops for diversified farming and balanced human and livestock nutrition. BRRI socio-economists have conducted various surveys and assessed the impact of the diffusion of MV rice technologies on rice production as well as farmers' income and poverty alleviation.

## Agricultural Machinery

Farm machinery and post-harvest technology. Farm Machinery and Post-harvest Technology Division of BRRI has been engaged in research, development and adaptation of appropriate farm machinery and post-harvest technologies. So far, more than 33 farm machinery and post-harvest technology have been released for different agricultural operations to make crop production profitable. BRRI aims to introduce economically viable technology packages by-

- Developing seeder, weeder, USG applicator, prilled urea applicator and low-cost dryer;

- Improving harvesting, threshing, cleaning, parboiling and milling machinery and technologies;
- Developing suitable renewable energy technologies using rice by-product; and
- Improving storage practices and structures.

**Workshop machinery and maintenance.** BRRI agricultural engineers have developed prototypes for seed drill, low-lift pump, thresher, tubewell strainer and animal drawn land preparation equipment. Water management engineers have developed technologies and cropping patterns that permit more efficient water use and increased crop production at the tail end of the command areas of irrigation projects that suffer from irregular water supply.

Basic and adaptive research is conducted for mechanisation of agriculture in Bangladesh. Agricultural machines from the developed countries do not usually fit into the socio-economic infrastructure of Bangladesh. This necessitates the development and adoption of appropriate agricultural machinery suitable for local conditions. Keeping this in view BRRI aims at developing machinery to:

- Make them economically attractive to local farmers;
- Encourage local manufactures of the economically viable machinery;
- Supplement animal power to farm operations for increasing agricultural production; and
- Develop machinery for effective utilization of mechanical, human and animal power.

## Genetic Resources and Seed

Germplasm conservation. Traditional Bangladeshi varieties have evolved over centuries of agro-climatic and biological stresses. Such materials must be conserved for future use in breeding programme for development of improved varieties. BRRI's objective is to collect and conserve local, exotic and improved varieties, important breeding lines of O. sativa and O. glaberima and wild species. Accordingly, 8,889 varieties and lines have already been collected and entered into the accession list of BRRI Genebank and the process of collection is continuing. Dinajpur Kataribhog (Acc. no. 4791) and Bangladesh Kalijira (Acc. no 247) from BRRI Rice Genebank are ranked as GI (Geographical Indication) products of Bangladesh.

Breeder seed unit. Now, breeder seed unit (BSU) maintains the present seed flow of minimum 130 tons of breeder seeds per year along with up hold the highest standard of the seed quality.

Rice seed network. BRRI Genetic Resources and Seed (GRS) Division has developed a Rice Seed Network with the partnership of

GO-NGO-private sector seed producing organizations for rapid dissemination of BRRI developed varieties, which is an ideal example of public-private partnership. There are about 1000 Seed Net partners of BRRI to distribute breeder seeds across the country to meet the demand. In the network, the number of the partner organizations involved was three in 1998, which increased to 412 in 2008 and 996 in 2021. Similarly, the supply of formal seed has increased from 5% to about 43% which is an ultimate effect of network based functioning.

## Technology Transfer

BRRI effectively uses several tools for the transfer of rice technologies.

Adaptive Research Division (ARD) and Training Division are mainly involved in technology transfer process in collaboration with Department of Agricultural Extension (DAE) and other GOs and NGOs providing extension services.

The ARD plays the vital role in transferring BRRI released rice varieties and other potential rice based technologies to the farmers through the following options.

- Seed production and dissemination programme (SPDP). Newly released varieties and technologies are demonstrated at farmers' field with the help of DAE. The produced rice grains could be used as seeds for next season cultivation and the seeds are disseminated among the neighbouring farmers through motivation.
- Adaptive trial. Promising lines and technologies are validated at farmers' field under varied agro-ecological conditions to recommend the most potential varieties and other suitable technologies for the targeted areas and farmers.
- Field day. ARD is used to organize 'field day' at sites of demonstration on the performance of rice varieties and other technologies suitable for targeted areas. It is one of the most rapid and vital techniques of technology diffusion.
- Farmers training. ARD is also used to conduct a day-long Rice Production Training for the farmers on different aspects of rice production technologies to improve the knowledge level and skill of farmers. It also enhances technology dissemination.
- BRRI scientists regularly meet extension personnel in different meetings and workshops for exchange of ideas and feedback that helps technology dissemination. Besides, ARD scientists frequently visit farmers' fields throughout Bangladesh and the scientists have the opportunity to find out the field problems on the spot of farmers' field and place of extension service providers and able to prescribe instant solution to the field problems.
- Training of varying duration plays another key role in the transfer of

rice production technology. BRRI has so far trained about 80,000 extension and research personnel and farmers by 2014. Many of the trained personnel possess the capability of organizing and executing short-term training programmes for field-level workers.

- BRRI-DAE workshop. Research-Extension Workshop is a vital occasion to communicate the latest research findings among DAE personnel and other extension service providers. Scientists can get feedback of existing rice technologies for fine-tuning from DAE personnel and other GOs and NGOs. Both scientists and DAE personnel are able to formulate the effective tools for dissemination of potential technologies according to the needs of the target areas and farmers.
- All sorts of information on rice and rice based technologies are now available on Bangladesh Rice Knowledge Bank (www.knowledge.bank-brri.org).

## Publications and Public Relations

Publications and Public Relations Division (PPRD) serves as the facilitator of all the activities related to distribution of BRRI information. It represents the good image of BRRI to the internal and external publics using various ways and means.

Publications of research findings are used as very effective tools in the dissemination of information. PPRD publishes BRRI annual report in English on the advances in rice research. It regularly publishes reports, workshop proceedings, technical bulletins and newsletters on experimental findings. Besides, BRRI scientists publish a large number of research articles in journals, workshop proceedings and popular articles in newspapers annually. Bengali language booklets Adhunik Dhaner Chash, Dhan Chasher Somoshya and Dhan Gobeshana Samachar, a rice reporter, are published to instruct agricultural extension agents reminding them of their duties and responsibilities so that farmers can grow a good rice crop. Copies of these publications are supplied to rice scientists, libraries and extension personnel throughout the country. Other publications in both English and Bengali also report new events, advances and achievements of rice research. The national language publications are meant for transferring rice technology to the farmers and extension agents. BRRI has so far issued 261 volumes of different publications.

PPRD cooperates with the national television and radio in their farm broadcasting programmes and invites farmers to participate in farmer rallies and farmers' trainings held in farmers' own plots and nearby venues to acquaint them with, and encourage them to use MV rice technology. PPRD also facilitates BRRI activities related to preparing

documentary short films, videos and an online hub of information called BRKB (www.knowledgebank-brri.org) to disseminate rice production technologies. It provides information on rice culture, replies to queries, maintains regular book exchange programmes and entertains visitors.

## BRRI Library

The BRRI library assists scientists with a collection of updated information on rice research and production technology. At present, its monographic collection stands at 18,005 (including 402 MS and PhD thesis/dissertations). It subscribes 10 Indian journals and available locally published journals. It receives about 400 titles of foreign and local journals/newsletters as complementary basis including the ones obtained under exchange programme.

Realizing the needs of researchers, the library has developed a rich collection of bibliographic CD-ROM databases in the field of agriculture. Currently it has the following databases:

- Commonwealth Agricultural Bureau (CAB) Abstract: It is the largest database covering international issues in agriculture, forestry and allied discipline in the life sciences, plant breeding, intellectual property rights and cytogenetics.
- Crop Science Database;
- Agricultural Economics Database;
- Nutrition Database;
- Soil Science Database;
- Pests Database; and
- Plant Genetics and Breeding Database.

The library is a registered member of AGORA (Access to the global online research in agriculture since 2004 (FAO project).

BRRI library regularly subscribes 12 national daily newspapers for news clippings. It also subscribes one weekly, The Economist, one Fortnightly, Amar Bari Amar Khamar and two monthly magazines, Reader's Digest and Krishi Kotha for references on current affairs.

## The Socio-economic 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; and
- GIS unit of BRRI continuously preparing digital maps, interpolation, contouring, raster creation, data management etc and analyze the effect of climatic factors and groundwater and topographic condition on rice production of Bangladesh.
- Adopt precision agriculture and automations solutions for choosing right varieties
- Provide varietal information to all stakeholder i.e. farmer, researcher and extension official through web and mobile profiler app
- Disseminating statistical method in almost all aspects of agricultural research; and
- GIS unit of BRRI continuously preparing digital maps, identified suitable Boro rice cultivation area based on groundwater level in Natore and Rajshahi districts. Effect of rainfall and maximum temperature on Amna rice in Bangladesh.

interpolation, contouring, raster creation, data management etc and analyze the effect of climatic factors and groundwater and topographic condition on rice production of Bangladesh.

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. In that case, the government would have to spend Tk 2,110 billion in foreign exchange over the 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.

## Farm Management

The Farm Management Division is a research division that has also the responsibilities to manage the BRRI farm. This division conduct research related to the management aspects of agricultural farm, especially for rice production. It extends support services to other BRRI divisions for research management and coordinates policies regarding labour and farm management. It also maintains irrigation drainage system and flower garden etc. The duties and responsibilities of this division are mainly divided into research, rice production and support services. Table 2 presents the land and labour strength of BRRI.

## Farm Management

The Farm Management Division (FMD) was established at the inception of BRRI in 1970. This Division is one of the components of the Socio-Economics and Policy Program Area of BRRI, and carries out research in addition to management and services support for the institute such as, fixing labor wages, providing cost and return analysis for HYV rice cultivation, weed control methods and economics, HYV rice seed production for dissemination of varieties, management of irrigation networks, maintenance of the BRRI office premises, land and labor management for smooth conduct of field research at BRRI, etc. Table 2 presents the land and labor strength of BRRI.

## Achievement

- The optimum combination of steeping for 12 hours and hatching for 12 hours is an appropriate method of seed processing before sowing in puddled seedbeds. This enhances seed germination and increases the number of seedlings for transplanting. This cuts down the cost of rice production and benefits rice farmers financially.
- The yield of rice depends largely on the age of the seedlings at transplanting time. Many rice farmers are not aware of the need to transplant seedlings of an optimum age. In Aus and T. Aman seasons, transplanting 15 to 20 d old seedlings gives the best results in terms of tiller and panicle production and ultimately yield of rice.
- In Bangladesh, various types of mechanical tillers have replaced the age old country plough for tillage. These are quite useful in land preparation and affordable to meet labor shortages. However, most

farmers resort to excessive tillage to control weeds, which damages the plough pan and affects soil quality. In most areas of Gazipur, just one ploughing and manual removal of weeds or herbicide application followed by one more ploughing and laddering are sufficient to prepare land for rice production.

- Invasion of paddy fields by algae is a perpetual problem of rice production in Bangladesh. Algae are commonly present in irrigation water and generally they multiply fast in paddy fields. Algae hamper seedling growth mechanically by disturbing rice roothold, biochemically by inhibiting gas exchange with the atmosphere and nutritionally by competing for soil nutrients which ultimately affect rice yield. Spraying a copper sulfate solution (100 g copper sulfate/10 L water/ha) to the paddy field 25 days after rice transplanting can control algae and improve rice growth and yield.
- Different methods of labor supervision viz. direct supervision, indirect supervision; job contract and contractors laborers were evaluated. Contractor's laborers could complete the operations of rice production with shorter time but the quality of work was better in the direct supervision method.
- Demographic backgrounds of laborers affect the rice production practices. Early hours of the day (6-8.40 am) and younger laborers (18-32 years) are more efficient for field works. Literate laborers (can read and write) are better for research farm. Eighteen to 32 year's age groups of labors are more efficient than older for rice cultivation. Male laborers are more efficient for harvesting and females are for weeding and winnowing.
- Comparison of transplanting and drum seeding method showed that drum seeded method of sprouted seeds could increase 5-8% rice yield, require 10-15% less labor and mature about 7-10 days early.
- Comparison of sowing of dry seed, germinated seeds and transplanting method showed that sowing practice could save time and labor. The yield was slightly higher in transplanted practice.
- Fifteen days to 20 days old seedling produced the highest number of tiller and panicle per hill. The plants those are produced from younger seedlings translocated more carbohydrates from source to sink might be the reason of higher yield in younger seedling used plot.
- The seed quality such as germination percentage (GM %), seedling vigor index (SVI), high density grain (HDG %), shoot dry weight (SDW) and root dry weight (RDW) were significantly reduced due to rainfed/unavailable moisture during ripening phase.
- 60 g MOP + 60 g Thiovit in 10 L water apply in 5 decimal area at

milking and dough stages of rice plant along with BRRI recommended fertilizer gave the lowest incidence (18%) of grain spot of rice.

- STB dose with one t ha-1 Poultry manure is better fertilizer management practice for the maximization of rice yield.
- In the short duration T. Aman varieties, the spacing of 15cm × 15cm and 20cm × 15cm is better whereas in short duration Boro varieties, 20cm × 20cm and 25cm × 15cm spacing is better for transplanting of rice.
- Short duration T. Aman rice varieties produced higher yield when transplanted during 31 July to 16 August which was 15 December to 16 January in Boro season.

## Agricultural Statistics

Agricultural Statistics Division is involved in research and statistical consulting for BRRI. Because of its activities, the collaborative work with other divisions gives scientists a wide range of opportunities to work and to learn practical applications of statistical principles from direct experience. The vision of the division is to improve and develop statistical standard, design, methods and application in agricultural research for rice production and for sustainable food security. And the mission is to:

- Provide proactive support by designing and delivering innovative programmes that enable the institute to attract, maintain and develop world class scientists;
- Provide high quality research programmes through adoption of different training methods and comprehensive statistical programmes in line with the researchers requirements;
- Improve statistical standards and application in agricultural research; and
- Disseminate statistical method in almost all aspects of agricultural research.

ICT cell. Realizing the present demand of GIS and MIS and ICT in agricultural sector, BRRI took initiative to establish GIS and MIS unit on 5 June 2000 and 13 June 2000 respectively comprising of ten members. Consequently a GIS lab was established. Also, BRRI formulated ICT cell on 22 April 2010 including eight members consequently an ICT training lab was established. ICT cell manages and maintains whole ICT network of BRRI and is working regularly to update information, secure network and develop whole network management system (NMS). At present, GIS unit, MIS unit and ICT cell are an integral part of Agricultural Statistics Division of BRRI.

## Achievement

- Developed dynamic Mobile apps "BRRI Rice Doctor", "Rice Knowledge Bank (RKB)" and "Modern Rice Nursing".
- e-Nothi Management System introduced at BRRI HQ and all regional station for initiating and issuing various file and official letter through this system.
- e-GP system introduced at BRRI.
- BRRI has Awarded National ICT Award-2016 at Digital World 2016 for ICT Excellence through Innovative Service Delivery.
- Developed a dynamic web application Bangladesh Rice Knowledge Bank (BRKB) with the latest information of modern rice and rice-related information.
- BRRI has developed the web portal (www.brri.gov.bd) with both Bengali and English languages.
- Created individual e-mail account into the BRRI domain for all scientists and officers.
- Local Area Network (LAN) has established and maintained for all scientists and officers of BRRI.
- Established Local Area Network (LAN) connectivity at five regional stations i.e. Rangpur, Barisal, Sonagazi, Comilla and Habigonj and provided 2 Mbps full-duplex, dedicated internet bandwidth at four regional stations.
- Developed own Facebook group "BRRI Networks" which included all scientists and officers of BRRI in this group. Besides, BRRI has an official Facebook page.
- Introduced video conferencing system at BRRI. also skype account has provided to all divisional, regional and section heads of BRRI for research and administrative activities.
- Introduced online application system at BRRI.
- Introduced e-Learning platform 'Muktopaath' (www.muktopaath.gov.bd) at BRRI.
- Visit the BRRI website, english domain (www.brri.gov.bd) as well as the Bangla domain has been registered for BRRI.
- Identification of Meteorological Drought Prone Area in Bangladesh using Standardized Precipitation Index
- Growth and trend analysis of area, production and yield of rice: A scenario of rice security in Bangladesh
- Development a Platform for BBRI Developed Management Information System (MIS)
- Development a web application to calculate the Stability Index for BRRI Stability Model
- Development Digitalized Budget Management System of BRRI
- Developed a R Program to calculate the Stability index using BRRI developed Stability Model.

## Activities

- Explore mechanism for profiling rice varieties with respect to environmental suitability, physical and physiological characteristics, yield potential and tolerance to abiotic and biotic stresses;
- Present electronically and disseminate the newly developed smart profiled varieties information through a dynamic web application and mobile app to stakeholders;
- Develop the new version of RKB mobile apps.
- Manage, maintain and host mobile and web app at server.
- manage and maintain ICT at Bangladesh Rice Research Institute
- Establish e-Governance at BRRI.
- Operating Management Information System (MIS) of BRRI;
- Managing BRRI network and internet connectivity;
- Provide ICT related support services to other divisions such as hardware, troubleshooting-related problems; and
- Provide computer services to administration and accounts for maintaining personnel history and payment.

## Work in progress

- Develop smart profiling of rice varieties in Bangladesh
- Develop sensor-based rice pest management through Artificial Intelligence (AI) technology of BRRI.
- Develop "BRRI Alapon" Telephone Directory Mobile App of BRRI
- Develop vehicle Requisition Management System of BRRI
- Develop vehicle Requisition Management System of BRRI
- Develop new version of rice knowledge bank (RKB) mobile Apps
- Dynamics of Multi-trait stability index (MTSI) for identifying the most stable genotypes of three rice growing season in Bangladesh

## On-going project

- Training on Innovation, Service Process Simplification (SPS) and e-Nothi management for enhancing capacity of BRRI employee.
- Managing MIS software and data entry operations;
- Developing separate web page of headquarters and all regional stations;
- Developing individual web page for all officials and scientists of headquarters and all regional stations; and
- Starting the process to increase bandwidth connectivity from 8 Mbps to 12 Mbps as per requirement of BRRI officials and scientists.

## Technical Cooperation

International level. BRRI, through a memorandum of understanding with International Rice Research Institute (IRRI), receives technical

assistance on rice research. BRRI exchanges breeding materials and research information with 73 rice growing countries in the world, including Africa Rice Center (AfricaRice). BRRI offers technical assistance as a member of many national and international committees.

BRRI scientists have established direct contact with Chinese counterparts and cooperated with each other under a technical assistance programme. Several BRRI scientists have already visited China to study its breeding objectives and water and azolla management systems. Several Chinese delegations have also visited BRRI.

BRRI has had same level of relationship with some other countries inlcuding Philippines, Japan, Korea, Australia, Malaysia, India and USA.

As a member of the International Network for Genetic Evaluation of Rice (INGER), coordinated by IRRI, our scientists participate in seminars, workshops, training programmes and monitoring tours to establish effective links with many countries around the world. BRRI benefits from different programme by receiving a large number of elite breeding lines from rice breeders of all participating countries for testing under Bangladesh environments and to use some as parents in BRRI's breeding programmes. BRRI also benefits by having its elite lines tested by rice breeders in many countries, which help it more accurately and quickly judge their performances, speeding up the process of varietal development for the future.

National level. BRRI cooperates in appropriate programmes with agencies such as the on-farm research of the Bangladesh Agriculture Research Institute (BARI). Bangladesh Agricultural Research Council (BARC), Bangladesh Jute Research Institute (BJRI), Bangladesh Water Development Board (BWDB), Bangladesh Institute of Nuclear Agriculture (BINA), Bangladesh Agricultural University (BAU), Dhaka University (DU) and Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) etc. In this work, particular emphasis is placed on adaptive and cropping pattern research and development in farmers' fields. BRRI scientists are members of national committees such as the intensive crop programmes for increased production and the National Seed Board for releasing varieties of all crops.

BRRI scientists visit farmers' fields and give on-the-spot advice. Our scientists also analyze soil and examine disease and insect samples sent to them and prescribe immediate or long-term remedial measures. BRRI produces breeder seed for recommended rice varieties and supplies this to the Bangladesh Agricultural Development Corporation (BADC), private seed entrepreneurs and NGOs for seed multiplication and distribution to the farm level.

## Funding Sources

Local needs and salaries of officers and staff are met from our annual revenue budget. BRRI has a budget provision of about Tk 785.70 million for 2012-13, including Tk 174.20 million in foreign exchange.

However, for the purchase of laboratory equipments, construction facilities, training scientists and to meet costs of expatriate scientists, BRRI receives grants-in-aid from several organizations and sources. Some of them are as follows:

- Asian Development Bank (ADB);
- Canadian Government through the Canadian International Development Agency (CIDA);
- International Development Research Council (IDRC);
- Ministry of Overseas Development Administration, UK;
- JICA, Japan;
- Agency for International Development (AID), USA;
- International Fund for Agricultural Development (IFAD);
- Korea International Cooperation Agency (KOICA);
- Bill and Melinda Gates Foundation;
- IRRI; and
- Norway Embassy.

# BRRI REGIONAL STATIONS

Besides the headquarters at Joydebpur, 36 km north of Dhaka, where the main research programmes originate, BRRI has set up 11 regional stations (RS) to conduct location-specific research.

**Barisal.** BRRI RS, Barisal (41 ha), situated in Sagardi and Char Badna areas, tests varieties for salt and tidal submergence tolerance. The submerged area in Char Badna farm is gradually rising and reclamation will proceed accordingly.

The soil pH here is 6.6 and contains 2.6% organic matter. The average annual rainfall is 1800 mm.

**Comilla.** The BRRI Regional Station, Cumilla established in 1970 is located at Champaknagar, about 1 km west of the Cumilla railway station. The Station has an area of 23.75 ha of which about 18.56 ha is used as experimental fields. The Station is situated in the Old Meghna Estuarine Floodplain agro-ecological zone (AEZ-22). The soil is silty clay loam to clay, acidic (pH 5.8) with an organic matter content of 1.6%. The land is typically suitable for wetland transplanted rice. The average annual rainfall recorded at the weather center of the Station is around 2000 mm. The research focus of BRRI Regional Station, Cumilla is to develop and test modern rice varieties and production technologies for favorable ecosystems. The Station has its own research programs, and

additionally, provides scientific and logistics support for regional R&D work by different research divisions under the various program areas of BRRI. The station is led by Chief Scientific Officer, 1 Principal Scientific Officer, 3 Senior Scientific Officer, 4 Scientific Officer with 25 support staffs.

The major achievements of BRRI R/S Cumilla are: In 1994, BRRI dhan32 is developed for medium low land T. Aman rice variety. In 2017, water stagnant tolerant rice BRRI dhan85 is developed for Aus season in Cumilla region. A short duration green super rice (GSR) BRRI dhan75 is also developed for Aman season. A rice tungro disease management technology and the causing factors are recently developed by the scientist of BRRI Cumilla which is one of the devastating rice diseases in Cumilla region. Every rice seasons, new high yielding rice varieties are distributed for free seed and demonstration due to quick dissemination of the new varieties in the farmers level. On an average, 120 experiments, 90 hybridization crosses and 3000 advanced line selection are conducted every year from plant breeding, plant pathology, soil science, agronomy and rice farming system. According to the farmers demand, about 35 metric tons of truthfully level seeds are produced and distributed to the farmers. Besides, more than 30 metric tons Breeder seeds of different rice varieties are produced and distributed to government, private, NGOs, stakeholders, seed growers. Every year about 300 farmers, 25 Agriculture Extension Officers are trained up and 1 workshop, 1 agriculture fair are organized and about 10 to 20 thousands leaflets/booklets about rice production, rice blast & tungro disease management technology are distributed to the farmers and extension personnel's due to technology dissemination.

**Habiganj.** Established on 36 ha in 1934. After independence BRRI RS, Habiganj has been conducting research on deepwater and Boro rice. The soil is highly acidic with 4.5 pH and contains 3.9 percent organic matter.

The soil is also extremely heavy containing 80 percent clay. The average annual rainfall is 2,330 mm.

**Rajshahi.** BRRI RS, Rajshahi (13 ha) was established in 1978 to develop high-yielding rice varieties associated with two extreme conditions- drought and cold especially suitable for northern districts. The station conducts on-farm research trials on cropping patterns and adaptive research trials in farmer fields to solve the specific problems of farmers of the Barind tract of northern Bangladesh. The soil pH is 7-8 and contains 1 percent organic matter. The average annual rainfall of 1200 mm is the lowest among the BRRI regional stations.

**Rangpur.** BRRI RS, Rangpur was established in 1991 to address mostly the environmental issue of low temperature stress on Aman as

well as on Boro rice. The station acquired its farm land of 6.7 hectares about 7 km to the south of Rangpur town.

**Sonagazi.** BRRI RS, Sonagazi (43 ha) was established in 1976. Located at Char Chandia union under Sonagazi upazila of the Feni district, the farm lies outside the coastal embankment and test MV rice to see their adaptability in the T. Aman and Aus seasons. The soil is sandy clay loam with 7.0 pH value and 1.4% organic matter. The average annual rainfall is 3,058 mm.

Bangladesh has about 0.8 million hectares of saline-affected land, and this is mostly in the coastal belt. Generally the coastal belt is a single-cropped T. Aman area. Some parts of the land remain fallow for about six months in a year.

**Sathkhira.** The regional station in Khulna (now BRRI RS, Satkhira) was established under strengthening of Rice Research Programme. ECNEC approved the station on 18 April 1985 and sanctioned 13 new posts for this station. The activity of the station started in 1996 in a rented house at Nirala, Khulna. An inter-ministerial meeting was held at Dhaka on 25 April 1999 and according to the decision of this meeting BRRI, BARI and BINA got the Benerpota experimental farm in total 113.85 acres of land. Another meeting was held at Benerpota, Satkhira on 6 August 1999 in presence of all DGs of concerning institutes. BRRI got 32 acres of cultivable land; BARI and BINA got 19 acres each. The remaining 43.85 acres of land containing construction, ponds etc will be divided equally among the three institutes.

BRRI RS, Satkhira started its activities on 1 August 1999 in a rented house near Satkhira town. Land demarcation and research activities will start as early as possible.

**Kushtia.** BRRI RS, Kushtia was established in 1996. It represents Agro-ecological Zone (AEZ) 11a, which is the low rainfall area of the country. The soil of Kushtia is light and sandy loam to loam in high and medium high lands and silty loam to clay loam in medium low to low lands. Rice based double and triple cropped lands dominate the area. The station has recently acquired its own farm area. However, the experiments are conducted in its own farm area as well as at the experimental farm of the Irrigation Extension Training Centre (IETC) of Bangladesh Water Development Board (BWDB), Kushtia widely known as Baradi farm. Several experiments are conducted under different programme areas in this station. Its research area includes fine districts (Kushtia, Jhenaidah, Meherpur, Chuadanga & Magura).

**Sirajganj.** BRRI Regional Station, Sirajganj was established in 2017. Located at Konabari Mouja of Kamarkhand upazila of the Sirajganj district, 12 km away from the city of Sirajganj. The Station is mandated to conduct research on rice production technologies suitable for the

Korotoya-Bangali Floodplain (AEZ-4) and Level Barind Tract (AEZ-25) of the Jamuna Basin in the districts of Pabna, Sirajganj, Bogura and Joypurhat where mainly rice based single/double cropping is practiced. The soils in this region are sandy loam to loam on the medium high lands and silty loam to clay loam on the medium low and low lands. The major specific objectives of the Station are to work for solutions to rice production problems prevailing in the Chalan Bil region including the char areas, especially the management of the nomadic rice plant hoppers. In addition, the Station conducts research under the various BRRI program areas such as, Varietal Development, Crop-Soil-Water Management, Pest Management, Socio-Economics and Policy and Technology Transfer.

**Gopalganj.** Bangladesh Rice Research Institute (BRRI), Regional Station, Gopalganj was established in 2018 and situated at 22°56'48'' N latitude and 89°49'24'' E longitude and 4.0 m above the sea level. It has been researching deep-water and saline ecosystems. In 2018, 4 hectares of land were acquired in Bhetdhar mouza of Gobra union under Sadar Upazila of Gopalganj district for BRRI regional Station, Gopalganj. The station is situated near Ghonapara on Gopalganj-Tungipara road and is 7 km away from Gopalganj town. The station represents the Agro-Ecological Zone-14 in the Gopalganj-Khulna Beel area. The soil is silty loam to clay loam, peat soil with 6.6-7.0 pH. The organic matter content of the Gopalganj soil is 1.7-2.0 percent. The main cropping pattern of this district is Boro-Fallow-Fallow.

## Facts and Figures

The rice-growing environments in Bangladesh are very diverse, varying from the drought-prone high lands in the north-west through the flood-affected central region to the coastal saline zone in the south. The diversity is indicated by the thirty major agro-ecological zones (AEZ) which the country has been divided on the basis of land and soil types, hydrology and climate. This diversity in the rice-growing environments makes the task of BRRI scientists more challenging.

The institute is well equipped with research facilities including laboratories, greenhouses and experimental fields. BRRI has a modern germplasm bank, eight major laboratories with sophisticated equipments, two greenhouses, a transgenic greenhouse and a 45 ha test fields in and around its headquarters in Gazipur. Moreover, it has a number of sites in different agro-ecological zones throughout the country. The test sites include advanced line adaptive research trial (ALART), proposed variety trial (PVT), regional yield trial (RYT) and seed production and dissemination programme (SPDP) etc.

# LOOKING AHEAD

BRRI scientists are very much aware that the demand for food in Bangladesh will continue to increase as the population increases by nearly 2.10 million every year. Bangladesh must, therefore, maintain a steady yearly increase in rice production. By the year 2030, total rice production in the country must be doubled from the present level just to maintain self-sufficiency in food. To enable the country to achieve this target, BRRI has initiated research and development programmes with the following major objectives:

- Harnessing frontier technologies like genome editing, genetic transformation, haplotype-based breeding, speed breeding coupled with genomic prediction, bioinformatics, high through-put phenomics, artificial intelligence, digitization, etc. techniques in variety development
- Accelerating genetic gain of BRRI breeding programmes @ 2.0% per year for the both favourable and unfavourable areas
- Breaking yield ceiling through the development of MVs capable of yielding more than 12.0 t/ha
- Development and scaling up of super hybrid rice technology
- Development of nutraceutical healthier rice like low GI, anti-oxidant rice
- Improvement of nutritional quality of rice with high zinc, iron and vitamin A
- Development of premium quality rice varieties with national and international standards for meeting up local and export markets
- Development of sticky rice varieties for the Jhum areas and for the export perspectives
- Development of multiple stress tolerant varieties
- Pyramiding of disease and insect tolerances leading to pest resistant varieties
- Development of mitigation and adaptation technologies in relation to climate change
- Development of location and genotype specific technologies with low-cost perspectives
- Development of climate change model for agricultural mitigation and Adaptation
- Development of biorational pesticide, organic fertilizers and nano technologies
- Validation and scaling up of the region-specific technologies including varieties and managenment practices
- Soil health improvement to address soil degradation for higher productivity

- Development of appropriate farm machinery with local environment suitability, reasonable price and their up scaling through PPP
- Impact assessment of climatic change on crop production practices
- Enhancing dissemination of Bangladesh Rice Knowledge Bank (BRKB) based rice production technology and strengthening training programmes
- Maximizing rice production of different unfavourable environments namely deep water, rainfed, coastal saline and non-saline, haor, water logging, drought-prone, flood-prone, hill, etc. areas
- Accelerating technology transfer to end users
- Determination of genetic trends of BRRI breeding programmes and stability parameters
- Weather forecast-based agro-advisory services to the grass root levels
- Forecasting of rice area, production and yield in Bangladesh
- Assisting government in policy formulation and socio-economic issues

**Table 1. Characteristics of BRRI developed varieties, 1970-2023.**

| Designation | Season | Height (cm) | Life cycle (day)[1] | Size and shape (milled rice) | Varietal specialty | Average yield (t/ha) | Year of recomm endation |
|---|---|---|---|---|---|---|---|
| **Inbred rice varieties** | | | | | | | |
| 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 | |
| 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 |

| Designation | Season | Height (cm) | Life cycle (day)[1] | Size and shape (milled rice) | Varietal specialty | Average yield (t/ha) | Year of recommendation |
|---|---|---|---|---|---|---|---|
| **Inbred rice varieties** | | | | | | | |
| 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 |
| 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 (Banglamati) | 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 |

| Designation | Season | Height (cm) | Life cycle (day)[1] | Size and shape (milled rice) | Varietal specialty | Average yield (t/ha) | Year of recommendation |
|---|---|---|---|---|---|---|---|
| **Inbred rice varieties** | | | | | | | |
| BRRI dhan54 | Aman | 115 | 135 | Medium slender | Tolerates 8 dS/m salinity in seedling and reproductive stages | 4.5 | 2010 |
| BRRI dhan55 | Boro | 100 | 145 | Long slender | Moderately tolerant to | 7.0 | 2011 |
| | Aus | 100 | 105 | | salt, drought and cold | 5.0 | |
| 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 |
| 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 mg/kg), high protein (9%) and early maturing | 3.5 | 2013 |
| BRRI dhan63 | Boro | 86 | 148 | Basmati type slender | Slender and long | 7.0 | 2014 |
| BRRI dhan64 | Boro | 110 | 152 | Medium bold | Zinc enriched | 6.5 | 2014 |
| BRRI dhan65 | Aus | 88 | 99 | Medium slender | Drought tolerant | 3.5 | 2014 |
| BRRI dhan66 | Aman | 120 | 113 | Medium long bold | Drought tolerant | 4.5 | 2014 |
| BRRI dhan67 | Boro | 100 | 143 | Medium slender | Salt tolerant | 6.0 | 2014 |
| BRRI dhan68 | Boro | 97 | 149 | Medium bold | Green leaf at maturity | 7.3 | 2014 |
| BRRI dhan69 | Boro | 105 | 153 | Medium bold | Flag leaf erected | 7.3 | 2014 |
| BRRI dhan70 | Aman | 125 | 130 | Long slender | Aromatic | 3.0 | 2015 |
| BRRI dhan71 | Aman | 108 | 115 | - | Drought tolerant | 5.5 | 2015 |
| BRRI dhan72 | Aman | 115 | 130 | Long slender | Zinc enriched | 6.00 | 2015 |
| BRRI dhan73 | Aman | 120 | 125 | - | Salt tolerant | 5.5 | 2015 |
| BRRI dhan74 | Boro | 120 | 125 | - | Zinc enriched | 5.5 | 2015 |
| BRRI dhan75 | Aman | 110 | 115 | Long slender | Early maturing | 5.0 | 2016 |
| BRRI dhan76 | Aman | 140 | 163 | - | Suitable for non-saline tidal low land | 5.0 | 2016 |
| BRRI dhan77 | Aman | 140 | 155 | bold & white | Suitable for non-saline | 5.0 | 2016 |
| BRRI dhan78 | Aman | 118 | 135 | Medium slender | Suitable for slender saline tidal prone zone/Area Flag leaf erected | - | 2016 |
| BRRI dhan79 | Aman | 112 | 135 | Long slender | - | 5.5 | 2016 |
| BRRI dhan80 | Aman | 120 | 130 | Long slender lick jasmine type | - | 5.0 | 2017 |
| BRRI dhan81 | Boro | 100 | 143 | Long slender | Antioxidant | 6.5 | 2017 |
| BRRI dhan82 | T. Aus | 110 | 102 | Medium slender | Short duration | 4.7 | 2017 |
| BRRI dhan83 | - | 105 | 103 | Medium bold | Short duration | 3.8 | 2017 |
| BRRI dhan84 | Boro | 96 | 141 | Medium slender | Zinc enriched (27.6 mg/kg) | 6.5 | 2017 |
| BRRI dhan85 | T. Aus | 110 | 107 | Medium long slender | Short duration, Water logging tolerant | 4.5 | 2017 |
| BRRI dhan86 | Boro | 95 | 140 | Long slender | - | 6.5 | 2017 |
| BRRI dhan87 | Aman | 122 | 127 | Long slender | - | 6.5 | 2017 |
| BRRI dhan88 | Boro | 96 | 142 | Medium slender | Suitable for haor areas | 7.0 | 2018 |
| BRRI dhan89 | Boro | 106 | 156 | Medium bold | - | 8.0 | 2018 |
| BRRI dhan90 | Aman | 110 | 122 | Short bold | Aromatic; protein enriched | 5.0 | 2019 |
| BRRI dhan91 | Aman | 180 | 156 | Medium bold | Semi-deep water rice | 3.5 | 2019 |
| BRRI dhan92 | Boro | 107 | 160 | Long slender | Suitable for barind areas | 8.4 | 2019 |
| BRRI dhan93 | Boro | 117 | 135 | Medium bold | Leaf deep green, reddish colour grain | 5.8 | 2019 |
| BRRI dhan94 | Aman | 118 | 134 | Medium bold | Leaf colour is deep green reddish colour grain | 5.9 | 2019 |
| BRRI dhan95 | Aman | 120 | 125 | Medium bold | Leaf colour deep green, grain deep red | 5.8 | 2019 |

| Designation | Season | Height (cm) | Life cycle (day)[1] | Size and shape (milled rice) | Varietal specialty | Average yield (t/ha) | Year of recommendation |
|---|---|---|---|---|---|---|---|
| **Inbred rice varieties** | | | | | | | |
| BRRI dhan96 | Boro | 87 | 145 | Short bold | leaf deep green, stem is strong | 6.5-7.0 | 2020 |
| BRRI dhan97 | Boro | 100 | 152 | Medium bold | Salt tolerant | 4.89 | 2020 |
| BRRI dhan98 | Aus | 103-106 | 112 | Long slender | long aromatic and | 5.09 | 2020 |
| BRRI dhan99 | Boro | 94 | 155 | Long slender | Salt tolerant | 5.4 | 2020 |
| Bangabandhudhan100 | Boro | 101 | 148 | Medium Slender | Zinc enriched | 8.8 | 2020 |
| BRRI dhan101 | Boro | 110 | 142 | Long slender | Bacterial blight resistant | 7.72 | 2021 |
| BRRI dhan102 | Boro | 103 | 150 | Long slender | Zinc enriched, 25.7 mg/kg Zn | 8.1 | 2022 |
| BRRI dhan103 | Aman | 125 | 130 | Long slender | Yield potential 8.0 t/ha | 6.2 | 2022 |
| BRRI dhan104 | Boro | 92 | 147 | Extra-long slender | Basmati-type with aroma and non-sticky cooked rice | 7.30-8.71 | 2022 |
| BRRI dhan105 | Boro | 100 | 151 | Medium slender | Low GI diabetic rice | 7.6-8.5 | 2023 |
| BRRI dhan106 | Aus | 123 | 117 | Medium bold | Suitable for Non-saline tidal area | 4.8-5.5 | 2023 |
| Hybrid rice varieties | | | | | | | |
| BRRI hybriddhan1 | Boro | 110 | 155 | Long slender | Late maturing | 78.5 | 2001 |
| BRRI hybriddhan2 | Boro | 105 | 145 | Medium bold | Early maturing | 8.0 | 2008 |
| BRRI hybriddhan3 | Boro | 110 | 145 | Medium bold | Early maturing | 9.0 | 2009 |
| BRRI hybriddhan4 | Aman | 112 | 118 | Medium slender | Early maturing | 6.5 | 2010 |
| BRRI hybriddhan5 | Boro | 110 | 145 | Medium Slender | Slender and long | 8.5-9.0 | 2016 |
| BRRI hybriddhan6 | Aman | 110 | 110-115 | Long slender | Slender and long | 6.0-6.5 | |
| BRRI hybriddhan7 | Aus | 104 | 105-110 | Long slender | Suitable for Chattogram, Khulna and Rangpur, Slender and long | 6.5-7.0 | 2020 |
| BRRI hybriddhan8 | Boro | - | 145-148 | Long slender | High yield potential | 10.5-11 | 2022 |

1Life cycles vary with seeding date.