

ABOUT BRRI

A very short introduction



BANGLADESH RICE RESEARCH INSTITUTE

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Bangladesh Rice Research Institute
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Prime Minister Sheikh Hasina visited a BRRRI stall in a technology fair in Gazipur on 1 March 2012



On 17 April 2013 US Ambassador Dan Mozena visited BIRRI when he lauded the institute for its contribution in making Bangladesh self-reliant in rice production

INTRODUCTION

Bangladesh Rice Research Institute (BRRI) was established in October, 1970 in Joydebpur, Gazipur. The Institute has an outstanding contribution to the food security of Bangladesh. So far it has developed **67 high yielding rice varieties** including four hybrid ones. 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 43 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 yield of clean rice reached to 4.32 t/ha by 2012-13. In 1970 total clean rice production was about 10 million ton (MT), which was 34.43 MT on 2012-13. 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 on different aspects of rice;
- Establish project areas for demonstration of new rice varieties developed by the institute and organize farmers' training for the cultivation of these 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, nine regional stations, three support service divisions and eight sections with administrative and technical service. Total manpower provision of the institute is 678, of which 248 are scientists. Most of them are highly trained professionals with MS and PhD degrees from home and abroad.

Major Achievement

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

- Released 67 high yielding rice varieties having three times higher yield potential than traditional ones. Out of them 63 are inbred and four are hybrid rice;
- Developed salt, drought, cold and submergence tolerant varieties along with zinc, iron, antioxidant enriched and diabetic-patient friendly rice;
- Developed more than 50 improved technologies on soil, water, fertilizer and cultural practices of rice;
- Developed 39 profitable rice-based cropping patterns for different AEZs;
- Developed and improved 32 agricultural machinery;
- Identified 32 rice diseases (10 major) and 266 species of rice insect pests (20 major) and developed control measures for the major insects and diseases including IPM;
- Achieved the ability to produce about 100 tons of breeder seed per year and supplying them to the farm level through GOs, NGOs and PS;
- Preserved over 7,000 rice germplasm in the BRRI Genebank collected at home and abroad;
- Imparted training to more than 80,000 personnel including scientists, farmers and extension agents from GOs and NGOs;
- Published 261 books, booklets, folders and extension materials;
- 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.

Moreover

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

Outstanding Innovation

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

Among the recently developed varieties BIRRI dhan55 can be cultivated throughout the country in favourable conditions and it yields more than BIRRI dhan28. Side by side, BIRRI dhan56 is a drought tolerant and BIRRI dhan57 is a drought escaping early maturing T. Aman varieties. BIRRI dhan58 is a Boro variety with high yield potential that matures five days earlier than BIRRI dhan29. BIRRI dhan56 can produce desired level of yield even if rainless condition prolongs 14 to 21 days. BIRRI hybrid dhan3 produces 9.0 ton per hectare yield in Boro season. Other than that, BIRRI hybrid dhan1 and BIRRI 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 BIRRI hybrid dhan4, which produces 6.5 ton per hectare yield.

BIRRI's latest innovation includes six high yielding rice varieties named as BIRRI dhan59, BIRRI dhan60, BIRRI dhan61, BIRRI dhan62, BIRRI dhan63 and BIRRI dhan64. Among them BIRRI dhan61 is a salt

tolerant variety for Boro season. BIRRI dhan59 and BIRRI dhan60, released for Boro season, are 10 days earlier than BIRRI dhan29 but they yield as like as BIRRI dhan28. BIRRI dhan62 has been released as the world's first zinc enriched rice variety. It is also remarkable for high protein and early maturing characteristics (Table 1).

Besides, BIRRI dhan51 and BIRRI dhan52 can tolerate flash flood at the vegetative stage. BIRRI dhan50 (Banglamati) is an aromatic high yielding Boro variety, which is similar to Basmati of India and Pakistan. Initiative is underway to export it for foreign currency earning. In addition, BIRRI is doing research for introgression of vitamin A producing beta-carotene gene in BIRRI dhan29, which may be released as a new variety soon. More iron and zinc enriched genotypes have already been developed, which may be released as variety in near future.

On-going Research

If the present population growth rate continues, population of the country will be about 189 million by 2030 and demand for rice will be 18 percent higher than that of the present production level. BIRRI 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) condition;
- Development of deep water rice varieties suitable for varying water depth condition and improvement of management packages for obtaining higher yield;
- Manipulation of planting practices including water, fertilizer and soil health to minimize yield gap;
- Improvement of livelihood of the farming community;
- Utilizing short duration varieties for the north-western Bangladesh;
- 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 BIRRI 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 sheath blight disease management and farmers training for minimizing yield gap; and
- Probability mapping of weather variables.

HOW BIRRI DOES IT?

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

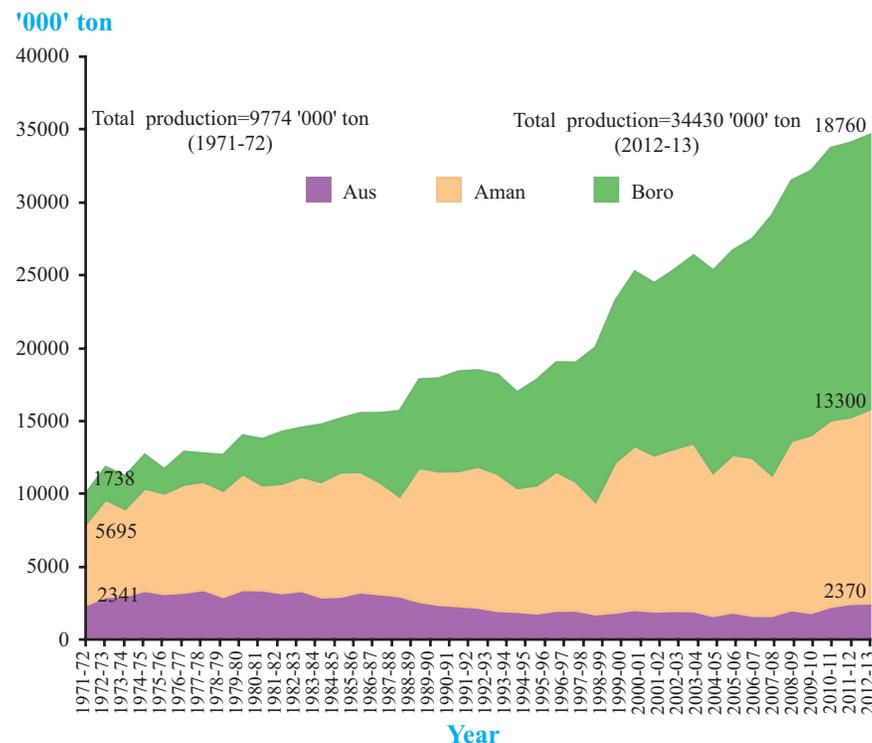
The programme areas are: Varietal development, crop-soil-water management, pest management, rice farming systems, farm mechanization, socioeconomics and policy and technology transfer.

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, some 10.43 million hectares, and it is the main source of cash income for many farmers. Also, special rice varieties are essential for socio-religious functions. BIRRI, as a pioneer institution of its kind, has been dealing with rice since 1970 and showing the nation the way forward to food security. BIRRI variety, occupying 80% of total rice area, accounts for 91% of the total rice production.



Rice production in Bangladesh from 1971-72 to 2012-13

Contributions to the Nation

Since its establishment, BIRRI 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, BIRRI 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 34.43 million tons annually in 2013. 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 and eventually increased to more than 10 million tons by 2013. In absolute terms, the output from MV rice met the food requirements of almost 150 million people annually during 2012-13. 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 equipments, 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 1.02 million hectares with about 74.17% planted to modern variety (MV) Aus.

Broadcast Aman. Deep water Aman is planted in two ways: broadcast in March or April alone or some times 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 7.33% of the total rice area is planted to this group of photoperiod-sensitive rice.

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 44.3% of the total rice area in Bangladesh. All indigenous T. Aman rice is sensitive to photoperiod, but MV rice transplanted in 3.98 million hectares (75.84% of the total T. Aman) is insensitive to slightly sensitive to photoperiod. However, this characteristic is needed to increase yields of this crop when cropping patterns dictate late planting.

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 91.77% of the 4.08 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, unless checked, may be

around 189 millions. 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.



Minister for Agriculture Matia Chowdhury is addressing scientists and other personnel at the BRRI Annual Research Review Workshop held on 9 February 2014

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 Jiban Krishna Biswas

Director General, BRRI

Members

Dr A K G Md Enamul Haque

Ex Director General, BRRI

Dr B A A Mustafi

Ex Director (Admin and Common Service), BRRI

Dr Abul Kalam Azad

Member Director (Crop)

Bangladesh Agricultural Research Council, Farmgate, Dhaka

Md Abbas Ali

Director (Food Crop)

Agricultural Extension, Khamarbari, Dhaka

Director (Research)

BRRI

Deputy Secretary

Ministry of Finance, Bangladesh Secretariate, Dhaka

Deputy Secretary (Research)

Ministry of Agriculture, Bangladesh Secretariate, Dhaka

Dr Md Ansar Ali

CSO, Plant Pathology Division, BRRI

Senior Scientist

Dr Tamal Lata Aditya

CSO, Plant Breeding Division, BRRI

Senior Scientist

Sudhir Chandra Nath

Programme Head, Agriculture and Food Security Programme

BRAC Centre, 75 Mohakhali, Dhaka 1212

Al-haj Md Motahar Hossain Mollah

S/O. Moulana Mozaffar Ali Mollah

Vill: Khodadia, Post+Upazila: Kapasia, Gazipur

Member-Secretary

Dr Md Shahjahan Kabir

Director (Admin and Common Service), BRRI

Research and Support Service

BRRRI has 19 research divisions and nine regional 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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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 BRRRI HQ at Joydebpur, Gazipur and by the professional staff at regional stations. BRRRI scientists also expose their research programmes to outside scientists, donors, planners and administrators in the annual research review workshop.

New Strategic Focus

Recently BRRRI 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 20% areas of Boro rice (Around 0.9 Mha) can be shifted to Aus rice areas. In order to compensate the reduced amount of Boro production, the

cumulative Aus areas should be increased to 1.8 Mha and the total production of Aus will have to be 5.2 million metric 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. Some fallow areas in South and North-eastern region should be brought under cultivation. Special incentive package for providing inputs to the farmers should be ensured. BRRI developed 28 T. Aman, eight Aus rice varieties, another 12 Boro rice varieties which are also good for cultivating as T. Aus. More promising Aus and Aman rice varieties having short duration, biotic and abiotic stress tolerances, and good yield potential should be developed. Suitable cropping patterns based on different ecosystems by the inclusion of 1-2 non-rice crops between Aus and Aman rice should also be developed. Shifting irrigated Boro culture to dry-direct seeded aerobic culture could also be the critical factor to reduce pressure on water consumption during Boro season. Mechanized crop establishment and suitable varieties having aerobic adaptation, cold tolerance and short duration will be required for aerobic culture during Boro season. Considerable amount of water can also be saved popularizing AWD practice across the country through appropriate policy interventions.

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

- Develop and adopt new plant type, hybrid, super hybrid rice and C4 rice for breaking yield ceiling of existing varieties;
- Develop sustainable disease and insect management packages and gene pyramiding of resistance for the development of varieties;
- Develop nutrient and water use efficient short and long duration varieties for maximum yield per day with appropriate management technologies;
- Develop climate smart, facultative, green saving rice and sustainable crop management technologies;
- Develop economically profitable farming systems technologies to farmers for adoption of climate change;
- Utilize alternative energy sources in farm machineries and water management for rice production;
- Develop policy research for sustainable rice production to ensure food security of the nation;

- Adopt conservation and precision agriculture, web-based fertilizer management and crop modeling based carbon trading;
- Use bio-informatics, next generation sequencing and phenotyping;
- Digitalize knowledge transfer system for rice production technologies.

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

- Identify major regional, physical, technical and socio-economic rice production problems to develop more site-specific technologies;
- Develop short and long duration varieties for irrigated, rainfed upland and lowland favourable ecosystems and sustainable production technologies;
- Develop climate smart varieties for higher yield 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.

SPECIALITIES OF BRRI VARIETIES

BR3 (Biplob) is a variety suitable for cultivation in Boro, Aus and T. Aman, demonstrated its superiority to all other MV rice in the 1974 (wet season) International Rice Yield Nursery (IRYN) trial, when it ranked first among 36 test varieties. The trial organized by IRRI was conducted at 18 countries on three continents under diverse soil and climatic conditions. BR4 (Brrisail), developed for the T. Aman season, ranked first in average yields in the similar trial in 1976. The following year, BR4 and two advanced lines, BR51-46-5 and BR52-87-1, captured the first three positions. These two lines were released in 1981 as BR10 and BR11 respectively, for cultivation in the T. Aman season.

The MVs developed in the 1980s and 1990s, are suitable for varying ecosystems, and have a wide range of disease and insect resistance. BR11 produced 15 t/ha in the International Rice Testing Programme (IRTP) trials in Mexico in 1976. BRRI released BR12 (Moyna), BR14 (Gazi), BR15 (Mohini) and BR16 (Shahibalam) for cultivation during the Boro and Aus seasons. BR14 is also good for Aus and Boro seasons.



Selection of breeding lines in the field

BR16, in addition to its long slender and white grain, is a variety with low glycemic index (GI), which is good for diabetic patients.

In 1983, BRRI released three Boro varieties, namely, BR17 (Hashi), BR18 (Shahjalal) and BR19 (Mangol) specifically for the *haor* (depressed water bodies) areas of Bangladesh. BR20 (Nizami) and BR21 (Niamat), released in 1986, are direct-seeded upland Aus varieties and are suitable for cultivation in the high rainfall zones giving, on average, 1 t/ha yield advantage over the local improved Aus varieties.

BR22 (Kiron) and BR23 (Dishari), released for the T. Aman season in 1988, are the first photoperiod-sensitive BRRI varieties. Life cycles of photoperiod-sensitive varieties depend on sowing or planting time. Accordingly, when BR22 and BR23 are seeded in the first week of July and planted in the first week of August, ripe in 150-155 days, yielding 5.0-5.5 t/ha. They yield at least 3.0-3.5 t/ha even when planted as late in the last week of September. BR22 and BR23, as the high yielding varieties, were a breakthrough in rice cultivation for the flood prone low land ecosystem.

BRRRI dhan27 were developed for the non-saline tidal areas and suitable for cultivation in Aus season and BRRRI dhan30, BRRRI dhan31 and BRRRI dhan32 for rainfed lowland areas. Table 1 presents the specialities of the rest of the BRRI varieties.

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

Designation	Season	Height (cm)	Life cycle (day) ¹	Size and shape (milled rice)	Varietal speciality	Average yield (t/ha)	Year of recommendation
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
		100	140			4.5	
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

Table 1. Continued.							
Designation	Season	Height (cm)	Life cycle (day) ¹	Size and shape (milled rice)	Varietal speciality	Average yield (t/ha)	Year of recommendation
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 <i>haor</i> (depressed) areas	6.0	1985
BR18 (Shahjalal)	Boro	115	170	Medium bold	Suitable for <i>haor</i> (depressed) areas, cold tolerant	6.0	1985
BR19 (Mangol)	Boro	110	170	Medium bold	Suitable for <i>haor</i> (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
BRR1 dhan27	Aus	140	115	Medium bold	Suitable for Barisal tidal areas	4.0	1994
BRR1 dhan28	Boro	90	140	Medium slender	Early maturing, suitable for low laying areas, less water requiring	6.0	1994
BRR1 dhan29	Boro	95	160	Medium slender	Very high yield potential and requiring available water	7.5	1994
BRR1 dhan30	Aman	120	145	Medium slender	Weakly photoperiod sensitive	5.0	1994
BRR1 dhan31	Aman	115	140	Medium bold	Suitable for southern region	5.0	1994
BRR1 dhan32	Aman	120	130	Medium bold	Medium duration, low input variety	5.0	1994
BRR1 dhan33	Aman	100	118	Short bold	Blackish spotted paddy; early maturing	4.5	1997
BRR1 dhan34	Aman	117	135	Short bold	Aromatic; Antioxidant enriched	3.5	1997

Table 1. Continued.							
Designation	Season	Height (cm)	Life cycle (day) ¹	Size and shape (milled rice)	Varietal speciality	Average yield (t/ha)	Year of recommendation
BRR1 dhan35	Boro	105	155	Medium bold	Resistant to brown planthopper	5.0	1998
BRR1 dhan36	Boro	90	140	Long slender	Cold tolerant	5.0	1998
BRR1 dhan37	Aman	125	140	Medium slender	Aromatic	3.5	1998
BRR1 dhan38	Aman	125	140	Medium slender	Aromatic	3.5	1998
BRR1 dhan39	Aman	106	122	Medium slender	Early maturing	4.5	1999
BRR1 dhan40	Aman	110	145	Medium bold	Salt tolerant	4.5	2003
BRR1 dhan41	Aman	115	148	Long slender	Salt tolerant	4.5	2003
BRR1 dhan42	Aus	100	100	Long slender	Drought tolerant, suitable for rainfed areas	3.5	2004
BRR1 dhan43	Aus	100	100	Medium bold	Drought tolerant, suitable for rainfed areas	3.5	2004
BRR1 dhan44	Aman	130	145	Medium bold	Suitable for coastal non-saline tidal-prone areas	5.5	2005
BRR1 dhan45	Boro	100	140	Long bold	Early maturing	6.5	2005
BRR1 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
BRR1 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
BRR1 dhan48	Aus	105	110	Medium slender	Early maturing	5.5	2008
BRR1 dhan49	Aman	100	135	Medium slender	Seven-day earlier than BR11, Nizersail type grain	5.5	2008
BRR1 dhan50 (Banglamati)	Boro	82	155	Long slender	Premium quality rice, slightly aromatic	6.0	2008
BRR1 dhan51	Aman	90	142	Medium slender	Submergence tolerant	4.5	2010
BRR1 dhan52	Aman	116	145	Medium bold	Submergence tolerant	5.0	2010
BRR1 dhan53	Aman	105	125	Medium slender	Tolerates 8 dS/m salinity in seedling and reproductive stages	4.5	2010
BRR1 dhan54	Aman	115	135	Medium slender	Tolerates 8 dS/m salinity in seedling and reproductive stages	4.5	2010
BRR1 dhan55	Boro	100	145	Long slender	Moderately tolerant to salt, drought and cold	7.0	2011
	Aus	100	105			5.0	
BRR1 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
BRR1 dhan57	Aman	115	105	Long slender	Drought escaping, tolerates rainless condition for 10-14 days at the reproductive stage without losing much yield	4.5	2011

Table 1. Continued.

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

¹Life cycles vary with seeding date.



BRRRI Director General and Director (Admin) are checking a false smut infected plot on a field visit at Rajshahi

ACCOMPLISHMENTS

With appropriate management and under favourable soil and environmental conditions, BRRRI 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 BRRRI MVs are now widely grown in about 20 other countries including, India, Nepal, Bhutan, Myanmar, Vietnam and West Africa.

BRRRI 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. Over 7,000 germplasm, of which about 5,000 are local, have been collected and preserved in germplasm centre.

Improved production technologies. Through extensive laboratory, greenhouse and field experimentation BRRRI scientists have developed crop-soil-fertilizer-water and pest management methods as well as rice-based cropping patterns 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;



Raising quality seedling for Rice Transplanter

- 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 mandate, plant physiologists have successfully identified and characterized flood,



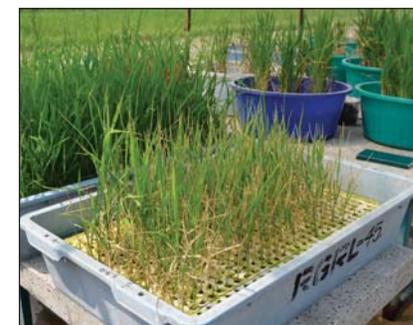
Before submergence



During submergence



Glass house for high temperature tolerance study



Salinity screening in nethouse

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.

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.



BIRRI Scientists are at work in biotechnology lab and field

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 BIRRI released varieties to protect biopiracy;
- Efficient genetic transformation system was established for Bangladeshi rice genotypes;
- Two bacterial blight resistant genes (*xa13* and *Xa21*) have been pyramided in BIRRI dhan29;
- Molecular characterization of 127 local Aus germplasm has been completed;
- *Sub1* gene has been introgressed into BIRRI dhan44 for submergence tolerance; and
- Confined green house facilities were developed for transgenic research.



BIRRI transgenic greenhouse

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 agronomically 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.

BIRRI 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,



A group of trainees is taking a look on a pot experiment

Trichogramma zehiri 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 devised.

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)



Plant Pathologists are at work in the field and greenhouse

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

BRRRI Soil Science Division has been working for the last 43 years with the aim to maintain rice soil health having high crop productivity. It was identified that the annual production of rice reduced from 6.4 to 1.0 t/ha over the last 27 years in the unfertilized soil under perpetual wet land condition. Besides this, soil organic carbon, total N, available nutrients such as P, K, S, and Zn reduced by 24, 25, 64, 31, 12, and 70% respectively from initial soil during the last 36 years. Overall soil fertility degrades from 60 to 64% during the last 10 years. However, balanced phosphorus nutrition management improves rice soil P status from 9.8 to 19.0 mg/kg. To ensure healthy rice soil environment for sustainable rice production, BRRRI Soil Science Division has-

- Developed balanced fertilizer doses for BRRRI released rice varieties in favourable and unfavourable ecosystems of Bangladesh;
- Developed 14 rice cropping pattern based fertilizer recommendations in different AEZs of Bangladesh;



Greenhouse gas emission measurement experiment at BRRRI

- Introduced integrated plant nutrition system (IPNS) and integrated nutrient management (INM) practices for maintaining healthy soil with maximum yield benefit;
- Developed technology for efficient nutrient management in rice production such as urea super granule (USG) for N management, recycling of rice straw for K, and use of poultry manure for P management;
- Studied risk of heavy metal such as arsenic (As) contamination in rice and it was recorded that As content in rice grain (cultivated in As contaminated area) did not cross the food permissible level. Grain and straw arsenic uptake by the popular BRRRI rice varieties were screened and minimum uptake of As was found in BRRRI dhan47 and BRRRI dhan50;
- Alternate wetting and drying for rice cultivation can be a sound technology for rice growing in such area where As content is high;
- Developed soil health card, computer based fertilizer application, which updated by the rice crop manager and salinity alleviative technology has been made available to the farm level; and
- Continued studies on rice soil biology and green house gas emission.

Research thrust. To maintain a healthy soil environment for sustainable rice production, BRRRI Soil Science Division is going to prepare a bio-fertilizer containing environment friendly microbes, which will reduce 30% use of chemical N and promote rock phosphate for rice cultivation. The division is also working to

develop more effective technology to reduce green house 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.



BRRRI experiment with solar pump

Rice Farming Systems

BRRRI 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.

BRRRI 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. BRRRI 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 BRRRI 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. BRRRI 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. BRRRI agricultural engineers have developed prototypes for seed drill, low-lift pump,



Field demonstration of Combine Harvester

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 BRRRI 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.



BRRRI Genebank



Rejuvenation and characterization of rice germplasm

BRRRI'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, over 7,000 varieties and lines have already been collected and entered into the accession list of BRRRI Genebank and the process of collection is continuing.

Rice seed network. BRRRI 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 BRRRI developed varieties, which is an ideal example of public-private partnership. There are about 750 Seed Net partners of BRRRI 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 750 in 2012. Similarly, the supply of formal seed has increased from 5% to about 40% 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.



BRRI organized field level farmers' training programme



Training classroom

- *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-brrri.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

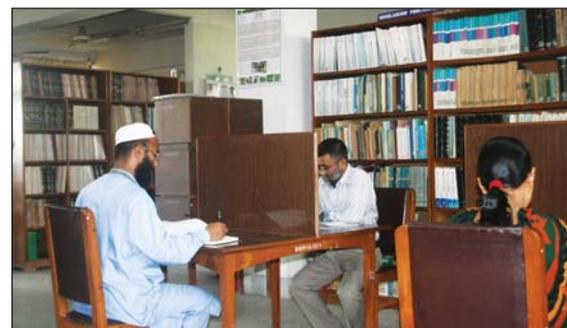
farmer rallies and farmers' trainings held in farmers' own plots and nearby venues to acquaint them with, and encourage them to use MV rice technology. PPRD also facilitates BRRI activities related to preparing documentary short films, videos and an online hub of information called BRKB (www.knowledgebank-brrri.org) 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.



Inside BRRI library

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

BRRRI 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

BRRRI 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 BRRRI released varieties;
- Studying stability analysis of BRRRI released varieties;
- Estimating sampling technique for rice yield components;
- Providing training programmes for manpower development of BRRRI scientists on statistical analysis, computer processing and data analysis;
- Disseminating statistical method in almost all aspects of agricultural research; and
- GIS unit of BRRRI 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.

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 BRRRI farm. This division conduct research related to the management aspects of agricultural farm, especially for rice production. It extends support services to other BRRRI 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 BRRRI.

Location	Total land (ha)	Cultivable land		Labour (no.)		Total
		Area (ha)	% of total land	Muster roll		
				Regular	Irregular	
HQ Gazipur	76.83	44.45	57.9	354	6	360
Comilla	24.68	16.03	65.0	29	-	29
Habiganj	35.03	25.90	73.9	24	12	36
Sonagazi	45.77	35.90	78.4	27	-	27
Barisal	41.10	10.74	26.1	22	1	23
Rajshahi	13.24	8.92	67.4	25	-	25
Bhanga	11.46	9.55	83.3	13	-	13
Rangpur	6.07	4.05	66.7	26	-	26
Kushtia	0	0	0	11	-	11
Satkhira	20.00	8.10	40.5	9	2	11
Total	274.18	163.64	59.7	540	21	561

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 a dynamic website (<http://www.brri.gov.bd>) which has been made by HTML;
- Updates BRRI website regularly in Bangla and English;
- Established router in the server room and VPN (Virtual Private Network) was also configured for using every module of Management Information System (MIS);
- Created individual e-mail ID into BRRI domain for all scientists and officials as per requirement of MoA;

- Provided internet connection in 300 computers for officials and scientists; and
- Included PDS (Personal Data Sheet) of officials and scientists at BRRI website.

Activities

- Operating Management Information System (MIS) of BRRI;
- Managing BRRI network and internet connectivity;
- Providing ICT related support services to other divisions such as hardware, troubleshooting-related problems; and
- Providing computer services to administration and accounts for maintaining personnel history and payment.

Work in progress

- Data entry of seven modules for different management information systems (LMIS, RMIS, IMIS, TMIS, VMIS, PMIS, HRMIS) out of 9 (LMIS, RMIS, IMIS, TMIS, VMIS, PMIS, HRMIS, FMIS (CPF, Pension and Gratuity) and FMIS (Parole, Budget and Audit) module has been constructed;
- Making robust WMS (Website Management System) for technical, non-technical users to improve performance;
- Setting up an antivirus security protection for updating the server dynamically with 300 users and their personal computers; and
- Adopt agricultural database management systems (DBMS) by using updated software and database programme (SQL Server 2005 express edition/2008/2010 version and Oracle 9i/10g/11i version).

On-going project

- 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;
- Hosting BRRI website into BCC server (Bangladesh Computer Council); 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). BRRRI offers technical assistance as a member of many national and international committees.

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

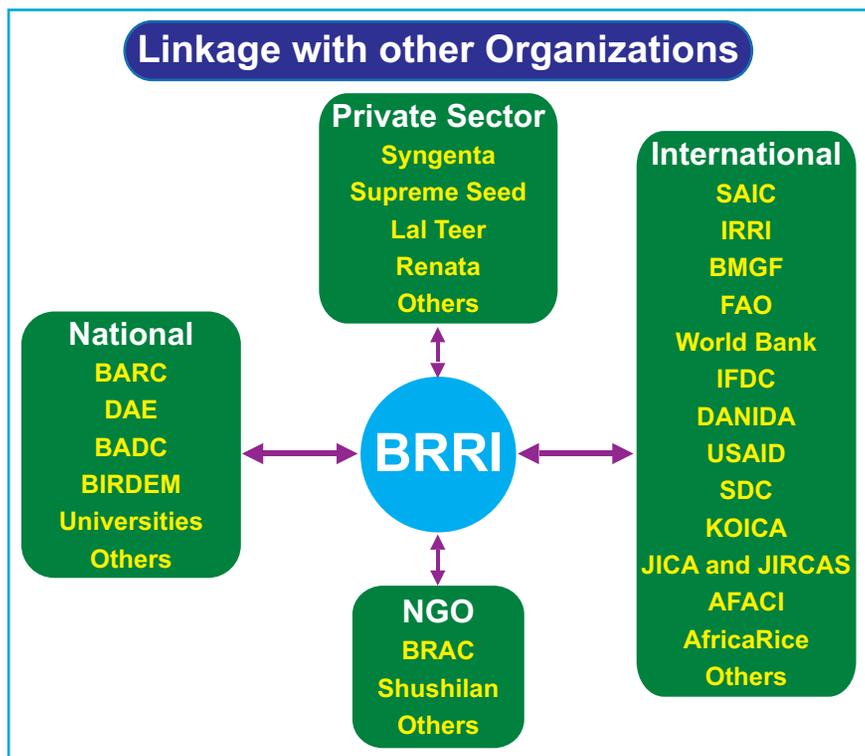
BRRRI has had same level of relationship with some other countries including Philippines, Japan, Korea, Australia, Malaysia, India and USA.

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. BRRRI 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 BRRRI's

breeding programmes. BRRRI 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. BRRRI 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. BRRRI 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.

BRRRI 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. BRRRI 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. BRRRI 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, BRRRI 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.



IRRI representative Dr Paul Fox visits golden rice experiment in a contained BRRI screen house

BRRI REGIONAL STATIONS

Besides the headquarters at Joydebpur, 36 km north of Dhaka, where the main research programmes originate, BRRI has set up nine 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 p^H here is 6.6 and contains 2.6% organic matter. The average annual rainfall is 1800 mm.

Comilla. BRRI RS, Comilla is located at Champaknagar on both sides of the Dhaka-Chittagong highway, about 1 km west of Comilla railway station.

Of the 29 ha of farmland, about 22 ha are used for growing crops. The soil is silty clay loam to clay acidic with 5.8 p^H and is typically suitable for transplanted rice. Organic matter content of the Comilla soil is 1.6 percent. The annual rainfall of this station is around 2000 mm.

The Comilla regional station conducts general purpose research on rice and is mainly a followup of headquarter's research with emphasis on local adaptations. The station has also its own research programme on breeding, soil fertilization cultural practices, seed production and varietal dissemination.

Bhanga. BRRI RS, Bhanga was established in 1983 to conduct research in deepwater rice areas. The station (11 ha) is located at Bhanga, a Gangetic alluvium land in Faridpur district.

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 p^H 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 p^H 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 p^H 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, Sathkhira) 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, Sathkhira 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



Demonstration of direct seeded rice technology

remaining 43.85 acres of land containing construction, ponds etc will be divided equally among the three institutes.

BRRI RS, Sathkhira started its activities on 1 August 1999 in a rented house near Sathkhira 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 does not have its own farm area yet. The experiments are conducted in farmers' fields and 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 six districts (Kushtia, Jhenaidah, Meherpur, Chuadanga, Rajbari, Magura).

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

BRRRI 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, BRRRI has initiated research and development programmes with the following major objectives:

- Development of varieties and associated technologies suitable for the unfavourable fragile ecosystem, considering the climate change and temperature zone;
- Development of arsenic tolerant rice and management;
- Improvement of nutritional quality of rice with high zinc, iron and vitamin A and low glycemic index;
- Development of aromatic and sticky rice;
- Pyramiding of *sub-1* and saltol for tidal, stagnant and saline water;
- Pyramiding of disease and insect tolerance;
- Region specific cultural practices validation, scale up and dissemination;
- Soil health improvement to address soil degradation for higher productivity;
- Extension of BRRRI developed agricultural machinery;
- Improvement and adaptation of rice transplanter;
- Development and adaptation of mini combined harvester for wetland;
- Mechanization of rice production through development of low-cost farm machinery;
- Impact of climatic change on crop production practices;
- Development of insect-pests resistant varieties;
- Identification of weather effects on the incidence and damage of insects and diseases;
- Enhancing technology village programme for piloting BRRRI recommended technologies;
- Enhancing Bangladesh Rice Knowledge Bank (BRKB) based rice production technology dissemination and strengthening training programmes;
- Development of MVs capable of yielding 8-10 t/ha;
- Development of MVs with high-quality grains for export;

- Refinement of crop, soil, water, fertilizer and pest management techniques for high yield targets;
- Development and adoption of hybrid rice technology;
- Maximizing rice production of different unfavourable environments-deep water, rainfed, saline and hill areas;
- Accelerating technology transfer to end users;
- Strengthening socio-economic and policy issues related research to ensure profits from rice cultivation for small and marginal farmers;
- Determination of genetic coefficient of BRRRI varieties;
- Risk analysis of BRRRI released varieties under changing environment;
- Probabilistic determination of climatic variables;
- Determination and prediction of climate change behaviour on rice yield in Bangladesh; and
- Forecasting of rice area, production and yield in Bangladesh.



Zinc enriched BRRRI dhan62

Recognition

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

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

List of Project

Title	Implementing agency	Duration	Estimated cost (In lakh taka)	Progress up to June 2014		2014-15 ADP allocation (In lakh taka)	Source of fund
				Financial (%) (In lakh taka)	Physical (%)		
Farm Machinery Technology Development and Dissemination (1st Revised) (BIRRI Part)	BIRRI (Lead agency- BARI, Associate agency- DAE)	1 Jul 2010- 30 Jun 2015	1708.95	1365.94 (79.93%)	88.05	338.00	GoB
Enhancing Quality Seed Supply (2nd Revised) (BIRRI Part)	BIRRI (Lead agency- BADC, Associate agency-BARI)	1 Jan 2011- 30 Jun 2016	5284.00	2157.74 (40.84%)	41.00	2104.00	IDB and GoB
Mujibnagar Integrated Agricultural Development Project (1st Revised) (BIRRI part)	BIRRI (Lead agency- BADC, Associate agencies-DAE, BARI, DAM)	1 Jul 2011- 30 Jun 2016	945.00	445.39 (47.13%)	86.08	150.00	GoB
Integrated Agricultural Productivity Project (IAPP) (1st Revised) (BIRRI part)	BIRRI (Lead agency- MoA, Associate agencies- DAE, BADC, SCA, BARI, BFRI, DOF, DLS)	1 Jul 2011- 30 Jun 2016	1908.96	1082.46 (56.70%)	56.81	411.00	GAFSP Trust Fund/WB and GoB
Integrated Agricultural Development Project in Pirojpur-Gopalganj-Bagerhat (IADPPGB) (BIRRI Part)	BIRRI (Lead agency- DAE, Associate agencies- BADC, BARI, SRDI, DAM)	1 Jul 2012- 30 Jun 2017	691.91	152.60 (22.05%)	49.66	200.00	GoB
Total			10538.42	5204.13 (49.38%)		3203.00	
On-going Non-development Programme							
Strengthening of Research Activities of Biotechnology Division at BIRRI	BIRRI	1 Jul 2013- 30 Jun 2016	224.00	45.00 (19.19%)	20.00	88.00	GoB
Removal of Water Logging from Research Plots at BIRRI HQ, Gazipur and Strengthening Research Activities at BIRRI RS, Comilla	BIRRI	1 Jul 2013- 30 Jun 2016	742.00	125.00 (16.85%)	17.00	342.00	GoB
Total			966.00	170.00 (17.60%)		430.00	

Proposed Project for the Financial Year 2014-15 to 2018-19

Title	Estimated cost (In lakh taka)	Duration	Priority	Duration (Short/Medium/ Long)	Status/Comment
Crop Intensification Through Fallow Land Utilization in Greater Sylhet Region (Coordinated Project, Lead agency- DAE)	800.00	Jul 2014 to Jun 2019	High	Medium	Listed in Green Page of 2014-15 ADP Book & MTBF
Magura-Jessore-Narail-Khulna-Sathkhira Integrated Agricultural Development Project (Coordinated Project, Lead agency- BADC)	1466.00	Jul 2014 to Jun 2019	High	Medium	Listed in Green Page of 2014-15 ADP Book & MTBF
Strengthening Research Activities of Bangladesh Rice Research Institute (BIRRI)	36182.43	Jul 2014 to Jun 2019	High	Long	Listed in Green Page of 2014-15 ADP Book & MTBF
Germplasm Evaluation and Conservation of Rice Heritage in Bangladesh	7217.00	Jul 2014 to Jun 2019	High	Long	For New Project
Development of Short Duration Aus and Aman Rice Varieties	1260.00	Jul 2014 to Jun 2019	High	Medium	For New Project
Strengthening Genetic Engineering Research in BIRRI	1150.00	Jul 2014 to Jun 2019	High	Medium	For New Project
Strengthening of Information and Communication Technology (ICT) and Database Management of BIRRI	1431.00	Jul 2014 to Jun 2018	High	Medium	For New Project
Rice Disease Resistance and Management for Enhancing Rice Production in the Face of Climate Change	153.97	Jul 2014 to Jun 2019	High	Short	For New Programme
Natural Enemy Conservation Through Eco-engineering and Integrated Management of Major Rice Insect Pests	65.00	Jul 2014 to Jun 2018	Less	Short	For New Programme
Sustainable Water Management for Increasing Rice Production in Unfavourable Environment	50.00	Jul 2014 to Jun 2017	Less	Short	For New Programme
Development of Soil and Fertilizer Management Packages for Rice Based Cropping Pattern in Saline, Haor and Char Lands Ecosystems of Bangladesh	200.00	Jul 2014 to Jun 2019	Less	Short	For New Programme
Improvement of Farmers' Livelihood Through Cropping Systems Research and Development in the Central and Southern Regions of Bangladesh	1125.48	Jul 2014 to Jun 2019	Medium	Medium	For New Project

Source: Planning and Evaluation Division, BIRRI, Gazipur

Major Achievement

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

- Released 67 high yielding rice varieties having three times higher yield potential than traditional ones. Out of them 63 are inbred and four are hybrid rice;
 - Developed salt, drought, cold and submergence tolerant varieties along with zinc, iron, antioxidant enriched and diabetic-patient friendly rice;
 - Developed more than 50 improved technologies on soil, water, fertilizer and cultural practices of rice;
 - Developed 39 profitable rice-based cropping patterns for different AEZs;
 - Developed and improved 32 agricultural machinery;
 - Identified 32 rice diseases (10 major) and 266 species of rice insect pests (20 major) and developed control measures for the major insects and diseases including IPM;
 - Achieved the ability to produce about 100 tons of breeder seed per year and supplying them to the farm level through GOs, NGOs and PS;
 - Preserved over 7,000 rice germplasm in the BIRRI Genebank collected at home and abroad;
 - Imparted training to more than 80,000 personnel including scientists, farmers and extension agents from GOs and NGOs;
 - Published 261 books, booklets, folders and extension materials;
 - Developed and utilized Bangladesh Rice Knowledge Bank (BRKB), an online information hub of BIRRI technologies;
 - Developed stability model for BIRRI varieties;
 - Developed producer and consumer preference model for BIRRI 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.
- Moreover*
- Rate of return per one taka investment in rice research and development is Tk 46;
 - Nineteen BIRRI developed rice varieties are cultivated in 14 countries of the world;
 - GIS unit of BIRRI is now enriching about 500 digital maps including suitable areas for BIRRI varieties and other agriculture related data.