Bangladesh Rice Research Institute

Research Achievement 2011 – 2012
(Technology Development)

Sl No.	Technology Developed	How Country/Farmer/User will be benefited
	Plant Breeding	
1.	**BRRI dhan58:** National Seed Board (NSB) of Bangladesh approved release of BRRI dhan29-SC3-28-16-4-HR2 as BRRI dhan58 for Boro season with photoperiod insensitivity, 7-10 days earliness than BRRI dhan29 with similar grain type and 7 t/ha yield potential.  	This variety will improve rice productivity of irrigated ecosystem of Bangladesh.
2.	**BRRI dhan59:** National Seed Board (NSB) of Bangladesh approved release of BW328 as BRRI dhan59 for Boro season. Growth duration of this variety is intermediate between BRRI dhan28 and BRRI dhan29 but can produce 0.6 t/ha higher yield than BRRI dhan28. BRRI dhan59 	This variety will improve rice productivity of irrigated ecosystem of Bangladesh.

3.	**BRRI dhan60:** National Seed Board (NSB) of Bangladesh approved release of BR7323-4B-1 as BRRI dhan60 for Boro season with growth duration intermediate between BRRI dhan28 and BRRI dhan29 but 0.8 t/ha higher yield potential than BRRI dhan28.  	This variety will improve rice productivity of irrigated ecosystem of Bangladesh.
	Hybrid Rice Division	
4.	A total of 363.5 kg of parental lines (A & R) and hybrid seeds of four released hybrid varieties distributed to 7 seed companies along with BADC	Popularization of BRRI released hybrid varieties.
05.	Two promising combinations (Jin23A/PR344R) and (IR79156A/F2277R) were selected for T. Aman season from Observational trial.	New hybrid combinations with desirable grain quality and amylose will fulfill farmers demand
	Biotechnology Division	
06.	Twelve green plants were regenerated from the one crosses.	These line will be used to developed salt tolerant that ultimately benefit the farmers
07.	Twenty seven (27) plantlets were regenerated from BRRI dhan29 after transformed with *GlyI* & *GlyII*. Five putative transformant was confirmed by GUS test.	These lines will be used to developed salt tolerant varieties that ultimately benefit the

		farmers in coastal areas.
08.	Twenty four SSR markers were found homozygous for recipient parent for introgression of *sub-1* gene into BRRI dhan44 variety.	These twenty four SSR markers will be used developed submergence tolerant variety that can be used in submerged areas.
09.	Two backcrosses population were made to identify the QTLs for yield enhancement.	These two backcross population will be used for identify the yield enhancement QTLs.
10.	Thirty five SSR marker were identified for suitable for of QTLs conferring tolerance to salinity.	Selected SSR marker will be used for identify the salinity QTLs for both seedling and reproductive stage.
11.	Three plants having BB resistance genes (x*a13* and *Xa21*) were recovered.	This lines will be used to developed bacterial blight resistant variety that ultimately benefit the farmers
12.	Seventy six (76) polymorphic SSR markers were used to determine genetic diversity of 127 Aus genotypes which were grouped into 9 clusters.	This information can be used to select parent for the development of new varieties.
	Entomology Division	
13.	**Yield loss caused by Rice Hispa** Among the test varieties lowest yield loss was obtained with BRRI dhan42 (4.96%) and BRRI dhan53 (30.75%) by rice hispa at a similar damage level during Aus and Aman season, respectively. Among the BRRI hybrid varieties less yield loss (15.43%) was found in BRRI hybrid dhan2 in Boro season.	The farmers of rice hispa endemic areas might be benefited by cultivating these varieties.
14.	Ev**aluation of Insecticides** A total of 125 insecticides against BPH, 43 against YSB and 32 against RH were evaluated of which 115 against BPH, 22 against YSB and 29 against RH found effective (80% or above mortality or dead heart reduction).	Farmers will be benefited by using these effective insecticides after approval from Pesticide Technical Advisory Committee (PTAC).
15.	**Varietal Resistance** ❑ Out of 106 advance lines 16 were found promising against BPH (score 5). ❑ Three genotypes were found promising against GLH (score 3-5). ❑ Out of four submergence tolerant genotypes one was found promising against GLH and one against BPH (score 3-5). ❑ A total of 18 IRBPHN materials were found promising against BPH (score 3-5).	The materials found promising can be used by Breeding division in resistance breeding programme.
16.	**Effect of climatic factors on YSB and BPH**	Pest status of YSB and BPH in a changing climate situation will be known.
	Training Division	
17.	Program Area : Technology Transfer Program Performing Unit : Training Division	
18.	Total training conducted : 66	1. Knowledge and skill on rice production technologies will be

	No. of participants : 1,321 Duration : 1 day to 1 week Participants : Extension personnel of DAE, GO/NGO officers and farmers	enriched. 2. Rice yield and production of the country will be increased.
	Agril. Economics	
19.	**Farm Level Evaluation of Modern Rice Cultivation in Bangladesh** Almost 97% of the total Boro area was covered by modern rice varieties in 2011-12 of which 74% was BRRI varieties. BRRI dhan28 and BRRI dhan29 were the dominant varieties covering 33 and 31% area respectively. In Aus season, modern rice varieties covered about 72% while the coverage of BRRI varieties was 43%. BRRI dhan28, BR2 and BR1 were the dominant varieties covering 15, 7 & 4 percent area respectively. In T. Aman season, the coverage of MVs was 70% of which BRRI varieties covered 44%. BR11 was the prominent variety covering 22% area. Average yield of MV Boro, T.Aman and Aus were 5.04, 3.58 and 3.49 tons per hectare respectively.	Rate of adoption of MVs rice and its performance might assist extension agents in priority setting for varietal promotional programs. Higher adoption of potential variety indicated more area coverage and productivity of that variety, resulted in attaining food self-sufficiency.
20.	**Estimation of Costs and Return of MV Rice Cultivation at Farm Level** Per hectare human labor costs were Tk 37766, 36329 and 44246 for MV Aus, MV T.Aman and MV Boro rice cultivation, respectively. Irrigation costs of MV Boro and MV Aus were Tk 13986 and 2086 per hectare respectively. The yield of MV Aus, MV T. Aman and MV Boro were 3588, 3956 and 5509 kg per hectare, respectively. Farmers received Tk.82035, 74250 and 56252 per hectare gross return from MV Boro, MV T. Aman and MV Aus rice, respectively. Net returns were Tk. -21550, 3892 and -12977 per hectare for MV Boro, MV T. Aman and MV Aus respectively.	The findings would help planners and policy makers to formulate proper guideline for setting procurement price, price support and input subsidy on MVs rice production.
21.	**Hybrid Rice Technology and Its Sustainability at the Farm Level** Area under hybrid rice has been declining in all districts over the period 2002-2011. Area under BRRI dhan29 and other MVs has been fluctuating over the same period. Although, the yield performance (about 7.00 t/ha) of hybrid rice and MVs varied in different districts, the yield of hybrid was higher than BRRI dhan 28 (5.00 t/ha) and BRRI dhan 29 (6.00 t/ha). The higher yield resulted to lower unit cost of production compared to MVs in all districts. Mean difference in all types of costs and return of hybrid and MV rice varieties were statistically significant at 1% level. Result of tobit analysis indicated that contact with the extension service and participation in training was positively significant in continuation of hybrid rice	Higher productivity and profitability of hybrid rice could motivate farmers to adopt this variety on larger areas, which will play crucial role for facing food scarcity challenges.

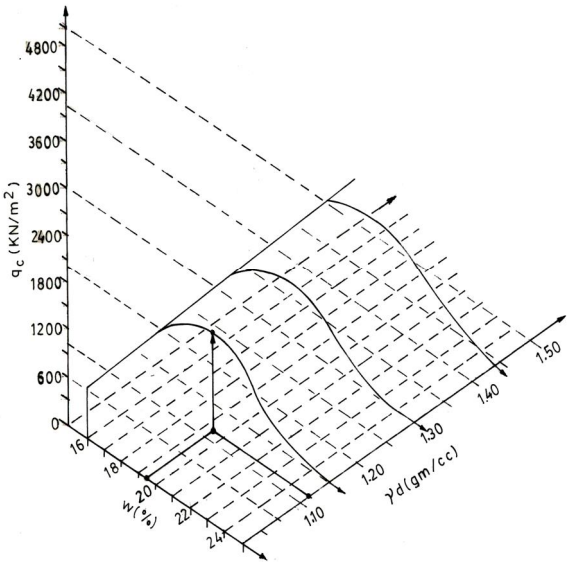
	cultivation. Almost all the producers showed their enthusiasm to continue growing hybrid rice only expecting better yield.	
22.	**Socio-economic assessment/validation of rice technology needed for the farmers in the project areas** In southern region, major cropping patterns were Rabi/Khesari-T.Aus-T.Aman, Rabi-Fallow-T.Aman, Fallow-T.Aus-T.Aman and Boro-Fallow-Fallow, indicating there is a lot of scope to grow rice and other crops in the Boro and Aus seasons. Whereas the major cropping patterns in northern region were Boro-Potato-T.Aman, Boro-Fallow-T.Aman, and Tobacco-Jute-T.Aman. The farmers of Barisal region need mainly insect, disease resistant and longer seedlings varieties along with harvester, transplanter, applicator of USG, dryer etc; while the farmers of Rangpur region need mainly insect, disease and drought resistant varieties with long seedlings, harvester, transplanter, USG applicator and dryer.	If the farmers were ensured with their desired package of crop production, it would increase the productivity of the project areas.
23.	**Effect of Rice Based Technologies on Farm Income under Changing Climate in Drought-Prone Areas (Rajshahi) of Bangladesh** All the technology users reported that they were very enthusiastic to use the given variety for next season. It was found that the average volume of sale of Aman paddy (1.69 ton) was higher after the project intervention compared to than that of (1.09 ton) before the project. Average production of Boro was lower in 2011 (4.08 ton) compared to than that of (5.03 ton) in 2010 due to cold and drought problem. Almost all the producers reported that the seed quality was very good compared to the traditional seed. However, the T. Aman growers received higher gross and net return (Tk. 21339/ha and Tk.8365/ha) after project intervention.	Adoption of modern rice based technologies could improve the production and net return as well as the socioeconomic condition of the rice growers.
24.	**Long term growth analysis of food grains in Bangladesh** During the period of 1971-72 to 1983-84, the growth in area for Aus, Aman and Boro slowed down while the production growth accelerated most likely due to adoption of BRRI developed high yielding rice varieties. At the same time, subsidy on complementary inputs was introduced by the government for enhancing food grain production. There are significant differences in the area, production and yield of different food grains between the period of pre and post establishment of BRRI. The present analysis further showed that, there were structural changes in the area and production of different food grains during the period of 1984/85 ï 2009/10 due to structural adjustment reforms initiated by the World Bank and also due to the continuation of govt. subsidies on inputs in this period.	The results of this study would help the policy makers, researchers and government to take proper policy/plan for achieving food security in Bangladesh.
	Farm Management Division	
25.	**Cost of Production of rice:** The cost of production (variable cost basis) of per kg of rice was Tk. 14.9 in aus, Tk. 12.3 in aman and Tk 12.2 in	This finding may be useful for the policy maker, planners, rice growers and rice research /

	boro season. The BCR was 1.46, 1.71 and 1.64 in aus, aman and boro seasons, respectively.	production farm.
26.	**Laborers' wage rate in rice production farm:** Laborers' wage rate at rice production farm was monitored throughout the year at different locations of Gazipur sadar. The wage rate varies from Tk. 300 to 330 day^{-1}. The wage rate in peak periods of the year was Tk. 460 to 470 in May, Tk. 275 to 330 in July-August and Tk. 320 to 400 in December -January. In Habiganj, Rangpur, Rajshahi, Barisal, Sonagazi, Comilla Satkhira and Khulna the wage was Tk. 200-225, 200-225, 200-230, 225-250, 250-300, 225-250, 250-300 and 300-350, respectively.	The Laborers' wage rates will help to estimate rice production cost and thus determine the retailer price of rice for the market.
	Irrigation & Water Management Division	
27.	**Low cost water distribution pipes for minor irrigation** Polyethylene, plastic and cotton pipes are low cost and alternatives to earthen canal. An engine speed within 1500-1600 RPM is optimum for earthen canal when specific discharge is considered. For polyethylene pipe of 5 and 4 inch diameter, 1450 to 1550 RPM can give optimum discharge. For plastic and cotton pipes 1400-1500 RPM is the optimum speed.  Fig. 1 Irrigation water is distributed through low cost polyethylene pipes.	
28.	**Refined Alternate Wetting and Drying (AWD) irrigation technique** Results showed that application of 5-7 cm irrigation when parched water depth reaches 15 cm below the soil surface is more economic for Boro rice cultivation than the conventional practice. It saved 20-25% irrigation water without sacrificing rice yield. Furthermore, there was an increase in yield of 0.2-0.5 ton/ha. 	

	Fig. 2 AWD with 15cm parched water depth.	
29.	**Farm reservoir for irrigation in the coastal area at Sonagazi** Rainwater harvesting in a farm reservoir with 25 cm high embankment conserved more water than without embankment. T. Aman ï irrigated Tomato cropping sequence is more profitable than other cropping sequences in the coastal saline area. Rabi crop cultivation with pond water is also profitable in costal saline area of Sonagazi.  Fig. 3 Rainwater gazi	Farmers can harvest the benefit by increasing irrigated area of Rabi crops in the coastal region.
30.		
	Agril. Statistics Division	
31.	**Development and validation of producer and consumer preference model to rice varieties** **Description:** In T.Aman season, BR11, BR22 and BRRI dhan32, in Boro season, BR16, BRRI dhan28 and BRRI dhan29 and in Aus season, BR9, BR16 and BR20 were found to be more preferable and cultivable varieties due to higher yield among the producers and producer cum consumers. Pure consumers were found to prefer rice varieties on the basis of tastiness, fine rice and availability of the varieties. BRRI variety contributes about 90% of total production but it does not reflect in field label because of BRRI variety sale in different brand name, namely BRRI dhan28 sale as Nizersail and BRRI dhan29 as Jhingasail and Minikit etc	Three mathematical models have been developed for producer, consumer and producer cum consumer preference to rice varieties and these three models uses to determine factors affecting producerôs decision on varieties for rice cultivation and can provide an indication of the factors affecting consumersô preference to rice varieties. Also, determine factors affecting producer cum consumerôs preference to rice varieties. Therefore, farmer and researcher will take decision that which crop and what condition they will grow the rice.
32.	**Distribution of Arsenic (soil and water) in gangetic flood plain** **Description:** The average As content in grain was 0.31 mg/kg at command area level and at upazila level it was 0.40 mg/kg,	This will help to delineate the safe area for rice production and

	while groundwater As level was 178.6 ppb and 126.3 ppb, respectively. Out of 490 upazila 68 are at high risk, 103 are at medium risk, 130 are at low risk and 189 upazila are risk free. About 46% of the total area of Bangladesh As concentration is below 10 εg l^{-1}. Approximately, 72% area of Bangladesh arsenic concentrations is within 50 εg l^{-1}. About 14% area of Bangladesh appears it low As risk with arsenic concentrations in water between 50 εg l^{-1} to 100 εg l^{-1}. About 9% area falls under medium risk and about 6% under high risk.	therefore, researcher will take decision to develop appropriate mitigation plans for the arsenic affected areas of Bangladesh.
33.	**Change in area and production of rice, wheat and maize in Bangladesh** **Description:** Thirty (30) years (1980-2010) time series data of rice, wheat and maize obtained from BBS was used for this study. Change in area, production and yield, instability, testing dependency (correlation & regression analysis), growth rate in area, production and yield of the above cereal crop was analyzed by SPSS program.	Identify the nature of change, instability/stability, growth rate and degree of relationship in area, production and yield of rice, wheat and maize to know the situation of the above cereal crop. Therefore, farmer and researcher should give more attention that which crop and what condition they will grow the above cereal crop.
34.	**Sampling Protocol for soil and water sampling for assessing Arsenic status in South-West Bangladesh** **Description:** Combining the total As of grain and water (drinking water and water for rice cooked) more than 800 and 700 ppb, respectively in command area level and upazila level consumed per person per day. This may accumulate at least a small amount of As in human body. Thus, consumption of rice containing a small amount of As per day may lead to accumulation of large amount of As in human body in the long run.	This will help to improve knowledge of the geographical distribution of contamination of soil and irrigation water with arsenic; Therefore, researcher will take decision in order to target arsenic management strategies to the most contaminated areas.
	Adaptive Research Division	
35.	**Advanced Lines Adaptive Research Trial (ALART):** The Adaptive Research Division (ARD) evaluated the following 6 set of ALART in different agro-ecological regions of Bangladesh in different seasons during 2011-2012. • **ALART, T.Aus, 2011.** One advanced line along with BR26 and BRRI dhan48 were evaluated. OM1490 was found suitable in T. aus season for proposed variety trial (PVT). • **ALART, B. Aus, 2011.** Three advanced lines along with BRRI dhan43 and a local check were evaluated. Here also OM1490 was found suitable in B. aus season for proposed variety trial (PVT).	It is an important step before releasing a new variety Farmers will be benefited for its better yield (4.1 t/ha) and shorter growth duration (102 days) which will help the farmers to cultivate aman rice in time. Farmers will be benefited for its reasonable yield and shorter growth duration (101 days) which will help the farmers to

		cultivate aman rice in time.
	• **ALART (PQR), T.Aman, 2011.** Three advanced lines along with BRRI dhan37 and BRRI dhan38 were evaluated. Based on the growth duration (130-139 days), grain yield (4.44-4.65t/ha) and farmersô opinion, two advanced lines BR7465-1-4-1 and BR7875-*5 (NIL)-52-HRI were considered for Proposed Variety Trial (PVT), if disease reaction of those lines was accepted by the pathologist.	Market value of premium quality rice is higher. So it will fulfill the demand of consumers as well as farmers.
	• **ALART (RLR), T. Aman, 2011.** Two advanced lines along with BR11 and Guti Swarna were evaluated. Based on the growth duration (128 days), grain yield (4.27t/ha) and farmersô opinion, BR7465-1-2-4 was considered for Proposed Variety Trial (PVT), if disease reaction of the line was accepted by the pathologist.	Short durations aman variety will be very much suitable for farmers to cultivate rabi crops before boro crops.
	• **ALART (PQR), Boro 2012.** Three advanced lines along with BRRI dhan50 were evaluated. Based on the growth duration (144-148 days), grain yield (6.53-6.58t/ha) and farmersô opinion, two advanced lines BR7358-5-3-2-1 and BR7358-30-3-1 were considered for Proposed Variety Trial (PVT), if disease reaction of those lines were accepted by the pathologist.	Market value of premium quality rice is higher. So it will fulfill the demand of consumers as well as farmers.
	• **ALART (Micronutrient), Boro 2012.** Four micronutrient dense advanced lines along with BRRI dhan28 and BRRI dhan29 were evaluated. Based on the growth duration (149 days), grain yield (6.42t/ha) and farmersô opinion, micronutrient dense BR7840-54-1-2-5 was considered for Proposed Variety Trial (PVT).	Micronutrient dense genotype is important which is specially needed for the children in rural areas who used to suffer from malnutrition and also for pregnant woman.
36.	**Advanced Lines Adaptive Research Trial (ALART):** The Adaptive Research Division (ARD) evaluated the following 6 set of ALART in different agro-ecological regions of Bangladesh in different seasons during 2011-2012.	It is an important step before releasing a new variety
	• **ALART, T.Aus, 2011.** One advanced line along with BR26 and BRRI dhan48 were evaluated. OM1490 was found suitable in T. aus season for proposed variety trial (PVT).	Farmers will be benefited for its better yield (4.1 t/ha) and shorter growth duration (102 days) which will help the farmers to cultivate aman rice in time.
	• **ALART, B. Aus, 2011.** Three advanced lines along with BRRI dhan43 and a local check were evaluated. Here also OM1490 was found suitable in B. aus season for proposed variety trial (PVT).	Farmers will be benefited for its reasonable yield and shorter growth duration (101 days) which will help the farmers to cultivate aman rice in time.
	• **ALART (PQR), T.Aman, 2011.** Three advanced lines along with BRRI dhan37 and BRRI dhan38 were evaluated. Based on the growth duration (130-139 days), grain yield (4.44-4.65t/ha) and farmersô opinion, two advanced lines BR7465-1-4-1 and BR7875-*5 (NIL)-52-HRI were considered for Proposed Variety Trial (PVT), if disease reaction of those lines was accepted by the	Market value of premium quality rice is higher. So it will fulfill the demand of consumers as well as farmers.

	pathologist. • **ALART (RLR), T. Aman, 2011.** Two advanced lines along with BR11 and Guti Swarna were evaluated. Based on the growth duration (128 days), grain yield (4.27t/ha) and farmersô opinion, BR7465-1-2-4 was considered for Proposed Variety Trial (PVT), if disease reaction of the line was accepted by the pathologist.	Short durations aman variety will be very much suitable for farmers to cultivate rabi crops before boro crops.
	• **ALART (PQR), Boro 2012.** Three advanced lines along with BRRI dhan50 were evaluated. Based on the growth duration (144-148 days), grain yield (6.53-6.58t/ha) and farmersô opinion, two advanced lines BR7358-5-3-2-1 and BR7358-30-3-1 were considered for Proposed Variety Trial (PVT), if disease reaction of those lines were accepted by the pathologist.	Market value of premium quality rice is higher. So it will fulfill the demand of consumers as well as farmers.
	• **ALART (Micronutrient), Boro 2012.** Four micronutrient dense advanced lines along with BRRI dhan28 and BRRI dhan29 were evaluated. Based on the growth duration (149 days), grain yield (6.42t/ha) and farmersô opinion, micronutrient dense BR7840-54-1-2-5 was considered for Proposed Variety Trial (PVT).	Micronutrient dense genotype is important which is specially needed for the children in rural areas who used to suffer from malnutrition and also for pregnant woman.
	Workshop Machinery & Maintenance	
37.	**Cone penetration (cp) model**  	From this model, it would be possible to determine cone penetration resistance at any point by knowing relative moisture content and dry density. In tillage, cone penetration resistance measurements are to detect compact layers, predict plow drought, the performance of cultivator tines etc. We can develop machinery considering soil, predicted draft force based on the pertinent cone penetration resistance data.
	Regional Station Rangpur	
38.	Stagnant flood tolerant (Medium Stagnant Water Tolerance) entries were identified	Medium stagnant and flash flood affected farmers will cultivate and help to enhance production of rice and play role in improvement of farmersô livelihood.

39.	Integrated fertilizer management practice for premium quality rice.	Identified suitable ratio of fresh poultry liter which will fill up as another organic fertilizer option and farmers get benefited.
40.	Water management for quality rice seedling production in winter	By using the technology farmers can protect the seedlings from cold weather during Boro season and they will get quality and healthy seedlings in winter.
41.	Nutrient management and their application time of Submergence tolerant varieties	Flash flood affected farmers will be benefited by using this nutrient management and their application time technology to enhance production of rice in submergence prone areas in Bangladesh.
42.	Study on tillage/crop establishment and weed management options on maize in rice-maize system	There is no yield penalty in zero tillage practice and its economics. So farmers will be benefited economically by cultivating rice and maize in zero tillage instead of conventional tillage.
43.	Optimum plant population on rabi maize cultivation.	Farmers will be benefited from maintain optimum plant populations of rabi maize by which maize yield and economy will be increased.
44.	Weed growth in minimum tillage condition and control of weed by herbicide sources under Conservation Agriculture (CA) based dry direct seeded rice followed by Rice - Wheat-Mungbeen cropping systems	Farmers will advantageous from this cropping pattern and tillage condition and weed control options under minimum tillage condition by reducing cultivating cost.
45.	Nursery management for enhanced survival of SUB1 introgressed genotypes of rice for submergence- prone areas	By using this technology farmers will aid to increase the yield of submergence tolerant varieties by reducing mortality of rice plant.
46.	Optimizing number of seedlings/hill and spacing for transplanting of stress tolerant rice genotypes.	Identified suitable number of seedlings/ hill and spacing to enhance the productivity and income of stress tolerant rice genotypes user
47.	Crop diversification and weed control options through direct seeding short duration variety to escape marginal drought in high and medium high land due to low rainfall in NW region of Bangladesh	Identified dry direct seeded rice with short duration variety and crop diversification is a suitable technology for northern part of Bangladesh to overcome climate change situation and which will increase income and improve livelihood of poor farmers of NW of Bangladesh.