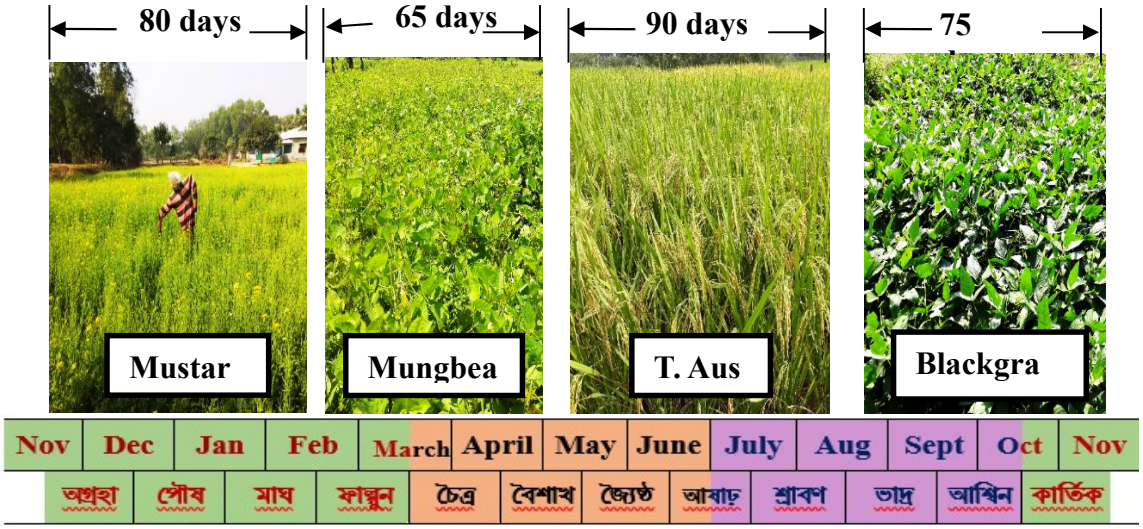
Research Achievement 2021-2022

(Technology Developed)

Sl. No.	Technology Developed during 2021-2022	How Country/Farmer/User will be benefited
	Plant Breeding Division	
1	**BRRI dhan101:** BRRI dhan101 is a bacterial blight resistant rice variety for Boro season. The flag leaf is erect, wide and long, dark green in color. It has non-shattering behavior in the panicle. The grain size and shape of the variety are long and slender and golden in color. Thousand-grain weight of this variety is around 23.1 grams. Its grain contains 25.0% amylose and 9.8% protein. The proposed variety shows highly resistant to BB (BB score-1) in artificial inoculation with virulent BB pathogen. The results of SNP QTL fingerprinting showed that the BB-resistant proposed variety possessed BB-resistant dominant genes Xa21, Xa7 and Xa4. 	Its growth duration is 142 days which is four days earlier than the popular variety BRRI dhan58. The average yield of this variety is 7.72 ton per hectare. If proper management is ensured, it can produce 8.99 ton per hectare yield.

2	**BRRI dhan102:** Zinc enriched rice line IR99285-1-1-1-P2 was approved and released as BRRI dhan102 for Boro season by the National Seed Board (NSB). The results of PVT showed that the yield of BRRI dhan102 is slightly higher than that of BRRI dhan29 (3.82%) in all locations however, BRRI dhan102 (IR99285-1-1-1-P2) produced 8.42% higher yield than BRRI dhan29 in top six locations. The average plant height of BRRI dhan102 is 103 cm. The grain quality of the rice is excellent. The zinc content of the milled rice of the variety is 25.5 mg/kg. The amount of amylose and protein of the variety is 28.0% and 7.5%, respectively. The weight of 1000 grain of BRRI dhan102 is 22.7 grams. The color of grain of the newly developed variety is straw and the milled rice of the variety is long slender and white.  	The growth duration is 150 days. Although the average yield of the variety is 8.1 t/ha. However, with proper care and management, it can produce yield up to 9.6 t/ha under favorable environment. BRRI dhan102 can play a vital role to meet up the 50-70% zinc daily requirement of the people of Bangladesh. BRRI dhan102 is expected to be very popular in the areas where BRRI dhan29 is cultivated and play a major role in increasing overall rice production of Bangladesh.
	Biotechnology Division	
1	Thirteen (13) doubled haploid lines derived from two cross between BRRI dhan29/Kanaklata and MR219/BR16 for developing Low glycemic index (GI) rice variety were grown as two PYT in T Aman 2021 among them five (5) lines were selected.	These lines will be used to develop high yield low GI rice variety that ultimately benefits the farmers
2	During Boro 2021-22, 4 and 13 antioxidant enriched black rice line were selected from PYT and OT respectively. Besides twelve (12) lines were also selected during T Aman 2021.	These lines will be used to develop high yield antioxidant enriched black rice variety that ultimately benefits the farmers

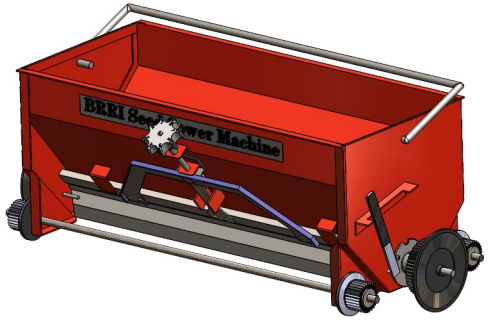
3	A construct was made by using vacuolar ATPase (*PVA1*) from a wild rice, *Porteresia coarctata*	Salt tolerant transgenic rice variety will be developed that ultimately benefits the farmer
4	One hundred and seven F_5 progenies were selected based on aroma, growth duration and plant height from the cross between BRRI dhan87 and Kalijira for the development of high yielding aromatic rice. All tested aromatic lines were confirmed by using functional marker of fragrance gene *BADH2*.	Aromatic rice variety will be developed ultimately benefits the farmers.
5	DNA of 7 aromatic and 2 non-aromatic rice were amplified with a functional marker of *BADH2* gene and sequenced. After sequencing with functional *BADH2* gene, 8bp deletion on exon 7 of chromosome 8 was observed in 5 aromatic rice which is similar with Pakistani Basmati but two aromatic genotypes Raniselut and Tulshimala did not showed the 8bp deletion on exon 7 of chromosome 8 indicating that *BADH2* gene was non- functional due to deletion or insertion of sequence of another region	Basic information of *BADH2* gene sequence of local aromatic rice varieties will be generated
	Hybrid Rice Division	
01.	A total of 2864 kg of parental lines (A & R) and hybrid seeds of seven released hybrid varieties distributed to 24 seed companies along with 120 farmers	Popularization of BRRI released hybrid varieties.
02.	Two potential hybrid combinations were identified form multi-location trials having yield potentiality more than 10.5 t/ha. Gradually it will be submitted to SCA for varietal release process.	New hybrid of promise will be release and fulfill demand of farmers
03.	Two promising restorer lines HRB253-15-7-5-2R (BRRI53R) & HRB257-10-3-3-1R (BRRI54R) were selected from R x R improvement program	These two restorer lines performed well in both Aman and Boro season. Hopefully it will able to produce good heterotic hybrid combinations with short duration and desired grain quality.
04.	F_1 seed production package development of the selected hybrids	Seed production of the newly selected hybrids have been fine tuning and farmers can easily make seed production with this combination
	Rice Farming System Division	
	Title: Four crop cropping pattern for highland in Madhupur Tract soil: Mustard-Mungbean-T. Aus-Black gram **Salient features**	**Benefits of the technology** • Average yield of component crops, mustard, mungbean, T. Aus and blackgram were 1.25 t/ha, 0.90 t/ha, 4.80 t/ha and 0.90 t/ha,

	• Diversified crop cultivation like cereal, pulse and oil crops minimize the risk of crop production as well as increased the total productivity • Crops under the cropping pattern were either less water consuming or rainfed so irrigation water requirement of the cropping pattern were minimum • Two pulse crops in the cropping pattern can contribute to improve soil health • Mustard can mitigate the edible oil demand • Total field duration of the cropping pattern is about 310 days • Land utilization index for improved cropping pattern was 82% which was 148% higher than the existing single T. Aman cropping pattern 	respectively • Rice equivalent yield (REY) of the improved cropping pattern was 14.46 t/ha which was about 240% higher than farmer's existing cropping pattern • Gross margin from the improved cropping pattern was 68,820 Tk/ha/year • The marginal benefit cost ratio of the improved cropping pattern was 1.47 **Extrapolation domain** The technology is suitable in the highland of Madhupur Tract soil where minimum irrigation facilities have prevailed. The cropping pattern can be practiced in clay loam to sandy loam soil. The technology can also be followed in the other high lands in pocket areas with limited irrigation facilities.
	Agronomy Division	
01	**Maximizing yield of some local fine aromatic cultivars through influencing some Agronomic management in Aman seasons** **PI:** Dr. Md Abu Bakar Siddique Sarker **CI:** Romana Aktar, In Bangladesh, still there are huge lands which are covered under locally popular some	**Advantage of the Technology:** About 500 kg to 1 ton per ha. yield advantage of local fine aromatic rice may achieve following by the said agronomic management packages. Less

	fine aromatic rice varieties especially at Dinajpur region. But yield of these varieties is very low and diseases especially BLB and blast infestation is very high. Lodging is the common problem which also significantly hamper the yield. To realize the potential yield and benefit is therefore, a thorough out study of the individual some agronomic factors together with their possible combinations under a given environmental site like BRRI, Gazipur has been done in continuous two Aman seasons with the objectives of : to study the effect of some Agronomic management and recommended the most appropriate Agronomic management packages for yield maximization of some local fine aromatic popular varieties Total seven locally popular fine aromatic rice varieties (Kalo Malshira, Kalo Shailla, Cini Gura, Gobindha Voaug, Kathari Voaug, Tulshi Mala, Kalo Jira) and BRRI dhan34(Check) were tested under four different agronomic managements packages. Agronomic management sensitivity was observed among the some tested local fine rice varieties, but some varieties have not affected on grain yield production. BRRI dhan34 and Tulshi Mala have higher sensitivities to Agronomic management and produced higher grain yield in respective to other tested varieties. Kalo Malshira and Gobidha Voaug have less management sensitivity on grain yield production, as a result similar yield was found at all Agronomic managements. Among the tested Agronomic management combination, the best yield performing Management combination was: 1. Seeding on 4th week of July and transplanting by 15-20 days old seedling with 1 or 2 seedling per hill following 25 x 20-cm spacing on 1st week of August. 2. Recommended rate of PKSZn fertilizer but 30% less N (urea) need to applied. 1% MoP solution need to spray upon the leaf on 30 DAT and PI stage.	disease infestation and lodging will be occurred. As a result, farmer will be benefited about twenty-five to thirty thousand taka per ha. **Beneficiary of the Technology:** All Local fine aromatic rice producing farmers of Bangladesh especially Dinajpur, Naogoan, Rajshahi region will be benefited.
02	**Maximizing yield of BRRI developed short duration T Aman varieties (like BRRI dhan71) through influencing some Agronomic Critical Factors at BRRI farm Gazipur.** To realize the potential yield of rice and its benefit, Agronomic Critical factors or practices i.e. plant spacing, intermittent drying and wetting of field, young seedling, frequent weeding and addition of compost have importance. The increased yields also depend on other factors: careful and timely transplanting of seedling; preparation and management of the soil; control over irrigation water; quality of the soil itself and varieties appropriate for the specific growing areas. The new sets of technique may	Thouse farmer of Bangladesh who is cultivating short duration T Aman varieties will be benifited more than 1 t/ha grain yield than their exsisting ractice. As a result, there cost of cultivation will be minimized and BCR will be higher. Aditional rice will be added in national production.

	change the traditional management practices to bring out the unexploited potentiality of rice production in Bangladesh. This study of the individual factor together with their possible combinations under a given environmental site like BRRI, Gazipur has been examined with the objective of: to find out and recommended the most appropriate Agronomic critical factors packages for yield maximization of BRRI developed short duration T Aman varieties. For obtaining higher yield (>6 t/ha) of short duration T Aman variety like BRRI dhan71: will be needed to seeding with in 2nd week of July and transplanting with in 1st week of August with 20-25 days old seedling and 1-2 seedling per hill. Following Spacing should be 25 x 15 cm and STB fertilizer management would be followed and additionally 1% MoP solution to be spray on 25 and 40 DAT. To maintain good growth, additional 1 t/ha varmi compost should be applied just before transplanting. Other recommended agronomic management would be followed when necessary.	
03	**Maximizing yield of BRRI developed medium duration T Aman varieties (like BRRI dhan87) through influencing some Agronomic Critical Factors at BRRI farm Gazipur.** This study of the individual factor together with their possible combinations under a given environmental site like BRRI, Gazipur has been examined with the objective of: to study the effect of Agronomic most critical factors for yield maximization of BRRI developed medium duration varieties and to find out and recommended the most appropriate Agronomic critical factors packages for yield maximization(> 6 t/ha) of BRRI developed medium duration varieties. Medium duration T Aman variety like BRRI dhan87 will be needed to seeding with in 1stdd week of July and transplanting before 1st week of August with 25 days old seedling and 1-2 seedling per hill. Following Spacing should be 25 x 15 cm and STB fertilizer management would be followed and additionally 1% MoP solution to be spray on 30 and 45 DAT. To maintain good growth, additional 1 t/ha varmi compost should be applied just before transplanting. Other recommended agronomic management would be followed when necessary.	Thouse farmer of Bangladesh who is cultivating medium duration T Aman varieties will be benifited more than 1 - 1.5 t/ha grain yield than their exsisting practice. As a result, there cost of cultivation will be minimized and BCR will be higher. Aditional rice will be added in national production.

	Soil Science Division	
	Updating the Critical Limit of P, K, S and Zn for Soils and Rice The estimated value of critical limit of P, K, S and Zn for rice were 8.7 mg kg^{-1}, 0.095 meq 100 g $soil^{-1}$, 15 mg kg^{-1} and 0.70 mg kg^{-1}, respectively.	The critical limit used in the recommendation plans needs to be updated due to changes in cropping intensity, use of HYV and changes in climatic conditions. The technology will help formulate an optimum fertilizer dose for deficient nutrients for rice crops for achieving satisfactory crop yield.
	Plant Physiology Division	
1	Two breeding lines (BR10540-4-1-2-4-1 and BR10538-2-1-2-3-2) performed better under controlled drought condition recommended for ALART.	Development of drought tolerant variety.
2	For cold tolerance, BR11894-R-329 was found tolerant at vegetative phase, while BR10717-5R-82, BR11894-R-110, BR11894-R-134, BR11894-R-169, BR11894-R-299 and BR11894-R-309 were found as moderately cold tolerant at reproductive phase.	Development of cold tolerant variety.
3	One line (BR9390-6-2-1B) for deep water ecosystem and two breeding lines (BR11032-4R-31 and BR11046-4R-95) for insect resistance demonstrated strong sensitivity to photoperiod.	Development of strongly photosensitve variety.
4	BRRI dhan89, BRRI dhan86, BRRI dhan69, BRRI dhan60 and BRRIdhan50 were found to be particularly vulnerable to preharvest sprouting.	Avoiding yield loss due to preharvest sprouting under unfavorable environment.
5	In comparison to rice, Uri dhan has more veins and a denser vascular bundle with well-organized and highly composed mesophyll cells.	Basic research for development of C4 rice.
6	The initial Fv/Fm of PSII under high salinity stress were significantly low for tolerant line but close to normal for sensitive line. However, for the tolerant line, it steadily grew and was kept close to normal until 3 days after the stress application, whereas for the sensitive line, it gradually decreased.	Basic research for development of C4 rice.
	Entomology Division	

1	**Biopesticide (Neemazole 1.2%) for management of brown planthopper (BPH) in rice field**. The biopesticide namely Neemazal 1.2 EC was found effective to control BPH in rice field. The active ingredient of Neemazole is azadirachtin 1.2% which is widely distributed and used as biopesticide in different countries. This biopesticide showed the similar impact compared to chemical insecticide such as chlorpyrifos against BPH in rice field.	Reduced chemical insecticide use in BPH management. It will reduce environment pollution. Reduce import of chemical pesticide and save foreign currency.
	Farm Mechanization & Post Harvest Technology Division & Workshop Machinery & Maintenance Division	
1	Design and development of a manual seed sower machine for raising mat type seedling 	Seedlings should be prepared in mat type method for machine transplanting. Uniformly spreading of seeds is essential in mat type seeding. If the seed is not spread evenly, the number of missing hill may increase during machine transplanting. Spreading the seeds by hand is a labor intensive, time consumed operation. In view of this, BRRI seed sower machine has been developed using locally available raw materials. The seed bed can be prepared in less time and cost in uniform density using BRRI seed sower machine. This machine can dispense germinated seeds into each tray in a less than one second, whereas hand spreading needs more than two minutes. The machine is capable of sowing 95 to 160 grams germinated seeds in each tray. With the help of the machine, seedling rate can be easily controlled for different varieties of rice. BRRI seed sower machine is a sustainable technology in technically and economically considering

		cost reduction, time saving, and evenly controlled seeding. Seed sower machine is very useful for popularizing rice transplanter at farm and local entrepreneur level. If initiatives may be taken to demonstrate and popularize the rice transplanter and seed sowing machine in together as a package form both government and private sector, it will open a new era in mechanized rice transplanting.
	Agricultural Economics Division	
1	Farm-level Adoption and Evaluation of Modern Rice Cultivation in Bangladesh • Overall adoption of modern variety was 93.27, 88.02, and 99.52 percent in the Aus, T. Aman, and Boro seasons, respectively, with BRRI varieties covering around 74.48, 55.18, and 61.76 percent. • With a greater incentive distribution, BRRI dhan48 placed first (49.41%) in the Aus season in terms of area coverage, followed by BRRI dhan28 (6.7 %). • Adoption of hybrid varieties was about 24.72% in the Boro season. • T. Aman season had a 20.11% coverage of Indian varieties. • Boro season's most adopted varieties were BRRI dhan28 and BRRI dhan29, which covered 41.25 percent of the area. • In the Aus season, BRRI dhan82 produced the maximum yield (4.33 ton/ha), whereas, in the T. Aman and Boro seasons, it was BRRI dhan87 (4.72 ton/ha) and BRRI dhan92 (6.69 ton/ha), respectively. In the Boro season, Hybrids produced 7.27 tons per hectare on average.	Researchers, extensionists' and policymakers may use this information to formulate appropriate policies for enhancing food grain production.
2	Estimation of Costs and Return of MV Rice Cultivation at Farm Level • Per hectare, gross margin of rice cultivation in the T. Aman season (Tk. 64,650) was higher, followed by Boro (Tk. 54,573) and T. Aus season (Tk. 34,064). • Similarly, per hectare net return from T. Aman (Tk. 32,391) was higher, followed by Boro (Tk. 18,182) and Aus paddy (Tk. 3,338). • Overall, rice cultivation was profitable in the current year due to the higher yield and market price.	The findings would help policymakers to fix the public procurement price, guarantee the support prices as well as provide the input subsidies to promote rice production for farmers' well-being.

	The gross profit ratio is 28 for T. Aman, for T. Aus is 23, for Boro is 26. A high-profit ratio is an indication that the farmers are selling their produce at a high profit level.	
3	Adoption determinants and profitability of stress-tolerant rice in selected areas of Bangladesh • Almost 9.25% of the dry season area in the study region was planted with salt-tolerant rice cultivars, while the remaining area was cultivated with other types. • The average rice yield of the saline-tolerant variety was 3.95 t/ha, which was lower than other cultivars (4.18 t/ha). • The BCR of salinity-tolerant rice cultivars was 1.12, and 1.18 for other cultivars. The rice cultivation experience, schooling year, farm size, market demand, eating quality, training, extension service, participation in the field demonstration program, membership of any agricultural organization, and the severity of salinity had a statistically significant effect on adoption decision of climate resilient rice cultivars	Findings of the study will help the researcher and policymaker to develop rice varieties and effective extension systems for the stress-prone ecosystem of Bangladesh.
4	Drivers influencing adoption decision of aromatic rice in some selected areas of Bangladesh: An econometric approach The farmers in Naogaon had greater gross return (Tk. 1,69,917.5/ha) than the farmers in the Jashore area (Tk. 1,65,099/ha). The average BCR was 1.35, meaning the cultivation of aromatic rice is profitable. Education, farm size, price difference, market demand, eating quality, extension service, and credit are all positive and significant means increasing uses of these factors would boost the adoption of more aromatic cultivars in the study region.	Rice breeders can use the information from this study to develop and disseminate suitable aromatic varieties for the concern areas.
5	Understanding climate variability, adaptation and market insights of rice in *haor* ecosystems • About 91% and 96% of farmers of haor areas from Netrokona and Sunamganj districts, respectively, believe that they have a perception about climate change in their areas. • Temperature, the intensity of daytime heat, unpredicted rainfall, changes of monsoon season, occurrences of drought, long summer season, etc. have increased in the study	Researchers, extension personnel and policymakers may use this information to formulate appropriate policies for reducing the vulnerability of rice production in the Haor region of Bangladesh

	areas over the last 20 years. • Typically, long-duration rice varieties in those areas face the loss from the flash flood, but, this year, almost all of the cultivated varieties were affected as the flood occurred in late March when the crop was in the booting to ripening stage. • Shifting of harvesting maturity, early transplanting, taking loan, migration etc. were identified as major adaptation strategies.	
6	An economic investigation of rice seed production status in a selected area of Bangladesh • Good quality seed alone can increase the yield by 15-20%. • In Boro season, Contract growers (CGs) used 27 kg seed per hectare while non-CGs used 28 kg on average. • In Aman season, CGs used 27 kg seed per hectare while non-CGs used 33 kg on average. • Total cost of contract growers and non-contract growers was Tk 2,05,237 and Tk 2,07,054, respectively in Boro season while in Aman season it was Tk 1,94,965 and Tk 1,80,018, respectively. In Boro season, per kg cost of rice seed production was Tk 30.33 for CGs and 29.93 Tk for non-CGs while it was Tk 34.54 for CGs and Tk 32.27 for non-CGs in the Aman season.	The government, policymakers, researchers, and extension workers may use this information to formulate appropriate policies to disseminate modern rice seed technology which will help to increase farmers' production, and income.
7	Spatial price dynamics of rice in Bangladesh: Evidence from time-series analysis • Major 12 spatially separated wholesale rice markets are found as co-integrated from 2012 to 2020. • Mainly bidirectional causality directions have been observed among those markets, but in few cases, unidirectional causal relationships have been evident which are not in line with the surplus, deficit and/or central characteristics of those studied markets. Moreover, poor price transmission and high and persistent volatilities have been identified among 12 major wholesale rice markets in the country. All these findings highlight the inevitability of public interventions in the rice market of Bangladesh.	The findings of this study would help them (policymakers) understand the inevitability of government interventions in the rice market of Bangladesh.

8	Market concentration of popular rice brands in Bangladesh • In the upazila level markets, BR28 is the most popular rice brand contributing about 40% of the available rice, followed by Minikit (17.7%), Swarna (14.5%), and BR29 (12.1%). • In the city markets, the contribution of Minikit is the highest (33.5%), followed by BR28 (19.4%), Zira (19.2%), and Nazir (8.5%). • The traders are highly concentrated on producing the top 4 rice brands without exercising any competition in the market.	The findings of this study would deliver the message that producing rice brands by over-polishing and receiving returns from by-products are indeed a double-edged benefit for millers, whereas consumers are paying more for finer polished rice without considering its nutritional value. Therefore, strong market regulations, notably on rice milling and branding, should be enforced to protect against adverse health conditions and financial losses, and also to ensure food and nutrition security in Bangladesh
9.	Comparative advantage of export potential aromatic rice (BRRI dhan50) variety in selected areas of Bangladesh • In an import parity situation, DRC values were 0.65 and 0.73, respectively, when head rice recovery was 56 and 52%. • On the other hand, in the export parity situation, DRC values were 0.91 and 1.06, respectively, when head rice recovery was 56 and 52%. This implies that Bangladesh has a comparative advantage in exporting the potential aromatic rice like BRRI dhan50 at export substitution with head rice recovery at 56%. When head rice recovery has 52% and below, BRRI dhan50 does not have a comparative advantage at export substitution.	The findings of the study would help policymakers to formulate proper policy related to aromatic rice production for international trade commercially.
	Agricultural Statistics Division	
	Improvement of BRRI Stability model by incorporate multiple factors	Utilizing a multi-trait stability index, Scientists and researcher will assess the performance of rice varieties across different factors
	Favorable and Unfavorable Rice Cultivation Area Mapping of Bangladesh	Easily find out favorable and unfavorable area for rice cultivation in Bangladesh as well as that's area estimate.

	Develop a computer program using R to calculate the Stability Index for BRRI stability model	Under this computer program users can calculate the Stability Index for BRRI stability model with less labour, cost and time
	Digitalized budget management system of BRRI	Users (BRRI authority) can generate budget related all report with less labour, cost and time
	Digitalized quota management system of BRRI	Users (BRRI authority) can generate quota related all report with less labour, cost and time
	Sensor-based rice pest management through Artificial Intelligence (AI) technology of BRRI.	Farmer will get instant feedback using image analysis technology through AI and MLM tool. Time, Cost and Visit (TCV) will be less and quality (Q) will be increased. It will adopt precision agriculture and automations solutions to increase rice yield. It is also focusing significant improvement of rice productivity through this tool.
	Farm Management Division	
	Project: Rice production management	
1	Expt. 1. **Integrated nutrient management for yield maximization of rice.** Findings: Grain yield, tiller number, panicle number, plant height and grain number were significantly affected by the different integrated nutrient management during both T. Aman and Boro season. This study indicates STB dose with one t ha-1 poultry manure is better for maximization of rice yield. Further research may be needed to find out the suitable integrated fertilizer management.	This finding may be useful for the rice growers and researchers/ production farm.
2	Expt. 2**. Efficacy of mechanical seedling transplanter and deep placement of mixed fertilizer on rice yield** Findings: Mechanical transplanting with 80% urea fertilizer is recommended with BRRI recommended hand transplanting practice. Urea saving is additional benefit with time savings and low transplanting cost when transplanted with rice transplanter cum fertilizer applicator.	These finding may be useful for the rice growers and researchers
3	Expt. 3. **Effect of Foliar Application of Silicon on Yield of Aromatic Rice** Findings: Silicon application might not have so significant effect on growth and yield of	This finding may be useful for the rice growers and researchers/ production farm.

	rice in Bangladesh situation. Silicon increases rice resistance to lodging and drought and dry matter accumulation. It can positively affect the activity of some enzymes involved in the photosynthesis in rice as well as reduce the senescence of rice leaves and protects the plant against pests and diseases.	
	Project: Labor Management System	
4	Expt. 1. **Monitoring labor wage rate at different locations of Bangladesh** Findings: Laborer's wage rate differs according to the location of the work. The lowest wage rate was found in Habiganj, Satkhira, Sirajganj and Sonagazi areas (450-500 tk per day). The highest wage rate was observed in Cumilla (800-850 tk per day). Working hour also different based on location.	This finding may be useful for the rice growers and researchers.
	Project: Rice Seed Production	
5	Expt.1. **Performance of Boro varieties in seed production plots during 2021-22** Findings: Yield of the varieties ranged from 3.69 t ha^{-1} to 7.46 t ha^{-1} and 4.86 t ha^{-1} to 7.72 t ha^{-1} in T. Aman and Boro varieties, respectively. Among T. Aman varieties, BRRI dhan49 (7.46 t ha^{-1}) yielded the highest whereas BRRI dhan89 gave the highest yield (7.72 t ha^{-1}) among Boro varieties.	This finding may be useful for the rice growers and researchers.
6	Expt. 2. **TLS and Breeder seed production of different rice varieties during 2021-22** In total13,837 kg TLS of which 1837 kg, 5083 kg and 6917 kg was produced in Aus, Aman and Boro seasons, respectively. A total of 7,855 kg breeder seed was produced under the supervision of FMD during T. Aman and Boro season of 2021-22. Total 2718 kg breeder seed of three T. Aman varieties (BRRI dhan30, BRRI dhan49 and BRRI dhan98) and 5137 kg breeder seed of two Boro rice varieties (BRRI dhan92 and Bangabandhu dhan100) was produced. Also10,650 kg seed was distributed by FMD during Aus, T. Aman and Boro seasons, respectively to DAE, researchers, different research division and regional stations of BRRI, seed producers, different agricultural organizations and agencies, and alsofarmers.	This finding may be useful for the rice growers and researchers.
	Project: Management and utilization of resources.	
7	Expt.1. **Management and utilization of land, labour and other resources.**	This finding may be useful for the rice growers

	Findings: A total of 82.44 ha of land were utilized by different research divisions in different season at BRRI HQ of which 6.17 ha in Aus, 37.46 ha in T. Aman and 38.81 ha in Boro season. Including regional stations, BRRI had 717 labours of which 497 regular and 220 irregulars at the start of the reporting time (1ST July, 2021). At the end of the reporting period (30th June 2022) the number of labours reduced to 705 of which 487 were regular and 218 were irregular. Total labour utilization in different divisions in BRRI, HQ was 1,91,869 mandays of which 52.39 %, 44.79 % and 2.81 % were utilized for research, support service and holidays, respectively. Total labour wages were 11,19,61,815/- of which Tk. 5,85,67,775/-, Tk. 5,01,53,440/- and Tk. 32,40,600/- were paid to the labourers for research work, support service, leaves and holidays, respectively. This division manages the BRRI flower garden to maintain the aesthetic view of the office campus, arrange beautification of BRRI premises and playground during different observation of national or international and organizational events.	and researchers.
	Adaptive Research Division	
	ARD of BRRI is not directly related to technology development. However, ARD is associated with technology development through conducting Advanced Lines Adaptive Research Trial (ALART) and recommended the advanced genotype(s) for proposed variety trial (PVT). Thus, ARD is playing vital role and putting significant contribution to develop rice variety. ARD also validates and disseminates the rice related technologies developed by BRRI others division through public private partnership.	ALART is an important step of varietal development program.
	Training Division	
I	1. Technology Transfer through training	Knowledge and skill of the trained personnel of the subject matter will be increased.
	Total training conducted : 42 No. of participants : 949 Duration: 1 day to 2 month	1. Knowledge and skill of the participants on rice production technologies will be enriched. 2. Rice yield and production of the country will be increased.

	Participants: Extension personnel of DAE, GO/NGO officers and farmers.	
	Regional Station Habiganj	
	Double transplanting of Boro rice is a good technology for escaping flash flood in haor areas.	Double transplanted rice matured earlier (7-10 days) than normal transplanted rice. It saved Boro rice from early flash-fiood in haor areas without sacrificing yield.
	Regional Station Rangpur	
1	Optimizing planting time on grain yield of rice	Farmers of norther region of Bangladesh will be benifitted by early transplanting of BRRI dhan75 at 20th of July in high to medium land. They will get highest grain yield (5.46 t/ha) and make sure to grow rabi crops such as potato, mustard and other high value vegetables or spices. This technology helps to increase total crop production, creating early seasonal employment opportunity of agricultural labourers and ensure fodder for livestocks. Thus, this technology can contribute to uplift socio-economic condition of rice farmers.
	Regional Station Satkhira	
1	Multi-location Trial for Blast Resistant Rice (MLT-Blast)	The entry, HGB 21 gave higher yield over the highest yielder BRRI dhan29 but was statistically similar. HGB 21 matured five days earlier than BRRI dhan29.
2	Confined Yield Trial for High Iron and Zinc Rice (CFT-HIZR)	The entry, IR 133904 TR-B-B 3-B-28 gave higher yield over the highest yielder BRRI dhan28 but yield was statistically similar

3	Advanced Line Adaptive Research Trial (ALART) for Zinc Enriched Rice (ZER)	In ALART-ZER, the entry BR9674-1-1-5-2-P4 gave higher yield than the checks BRRI dhan49
4	Advanced Line Adaptive Research Trial (ALART) for Blast Resistant Rice (BRR)	In ALART (BRR), the entries, BR(Path)12452-BC3-42-22-11-4 & BR(Path)13784-BC3-61-1-6-HR3 performed statistically better over BRRI dhan28 & BRRI dhan88
5	Assessment of specific and general adaptability for selection of suitable hybrid rice genotypes under saline prone areas for boro season	At Assasuni, Kaliganj and Debhata highest yield was observed by BRRI hybrid dhan5 (7.40 t/ha), BRRI hybrid dhan3 (6.90 t/ha) and IT (6.83 t/ha), respectively. The mean results shown that BRRI hybrid dhan5 followed by BRRI hybrid dhan4 performed better over the company hybrid varieties
6	Effect of missing nutrient on rice production in southern coastal area during T. Aman 2021 and Boro 2021-22	The missing element trial including soil analysis is needed to continue over several years for a complete fertilizer recommendation. Apparently, balanced fertilization is needed for higher yield in all the situations. Nitrogen is the most limiting nutrient followed by Sulphur, potassium, phosphorus, and zinc in Boro season.
7	Varietal effects on rice yield and greenhouse gas emissions under different fertilizer management in the coastal ecosystems of bangladesh in Boro 2021-22	BRRI recommended dose and INM treatment gave higher straw yield compared to broadcast PU. We could not get any additional advantage using a higher dose of N fertilizer (120 kg N ha–1) as broadcast compared to UDP. Our previous study showed almost similar results in which UDP significantly increased rice yield compared to PU

8	Effect of different healthy seedling raising techniques of rice during Boro 2021-2022 season	At 30 and 40 DAS, maximum seedling strength (19.96 and 20.43) and at 10 DAT, minimum seedling mortality (0.52) were observed when seedlings were covered with polyethene keeping round shape opening (Table 27). From the field trial, no significant difference was found in case of plant height, growth duration and grain yield.
9	Stability Analysis of BRRI Varieties at Satkhira	
10	Head-to-head adaptive trial (HHAT) of Modern Rice Varieties	In HHATs for short duration, conducted at Keshabpur, Jashore, Bangabandhu dhan100 (6.27 t ha-1) gave the highest yield followed by BRRI dhan28 (5.81 t ha-1), BRRI dhan81 (5.8 t ha-1) and BRRI dhan84 (5.64 t ha-1)
11	Production program of BRRI released rice varieties in the southern coastal gher-ecosystem of Bangladesh	BRRI dhan67 (6.31 t/ha) was the highest yielder followed by BRRI dhan97 (6.11 t/ha), BRRI dhan99 (5.95 t/ha) and BRRI dhan28 (5.82 t/ha), respectively
12	Development and Validation of Early Warning System for Rice Blast	No blast disease was observed in this experiment. However, the date of seeding/ date of transplanting affects grain yield significantly. The yield of BRRI dhan28 was 6.38 t/ha, 5.98 t/ha, 5.26 t/ha & 4.92 t/ha on 5/12/2021 (S1), 15/12/2021 (S2), 25/12/2021 (S3) & 5/1/2022 (S4). The S1 was significantly different from S2, S2 is also significantly different than S3, and S3 was also significantly different than S4 in case of BRRI dhan28