Table-2

Research Progress 2012– 2013

SL No	Research Progress	Expected Output
Program Area/Project: Varietal Development Program (VDP)		
1	**Development of Upland Aus Rice** Seed purification of OM1490 was done for Proposed Variety Trial (PVT) to release as variety of direct seeded upland condition.	Development of short duration rice variety (100 days) suitable for dry direct seeded upland condition
2	**Development of Transplant Aus Rice** Pedigree generation was advanced and two short duration entries were selected for evaluation in ALART	Development of high yield potential varieties with short growth duration, good grain qualities and tolerance to major diseases and insect pests
3	**Development of shallow flooded deep water rice** Ten germplasm were selected, 13 crosses were made, 2 crosses confirmed, 28 crosses were bulked from pedigree nursery, 10 advanced lines were selected from OT and 2 advanced lines were selected from yield trial.	Development of rice varieties suitable for shallow flooded deep water environment up to 1m depth
4	**Development of rainfed low land rice (RLR)** Fifteen crosses were made. Nine hundred plant progenies were selected and 95 progeny rows were bulked from pedigree nursery. Three advanced breeding lines were selected from Regional Yield Trials based on medium slender grain type with medium growth duration for trials in the farmersô field. One advanced line has been selected for Proposed Variety Trial in the T. Aman 2013-14 season.	Development of genotypes superior to standard varieties and adaptable to rainfed lowland environment in T. Aman season.
5	**Development of Tidal submergence Tolerance Rice** Pedigree generation was advanced and 30 lines were selected from yield trials up to SYT	Development of high yielding rice varieties with tidal submergence tolerance, intermediate plant height, adaptable to tidal non-saline condition for coastal areas
6	**Development of Salt Tolerant Rice** **Aman:** Three promising salt tolerant lines (IR78761-B-SATB1-28-3-24, IR78761-B-SATB1-28-3-26 and IR78761-B-SATB2-4-25-3) were selected from RYT for ALART. Five *Saltol* introgression lines were selected from SYT. **Boro:** Four lines viz. BR7100-R-6-6, IR59418-7B-21-3, IR78794-B-Sat29-1 and IR89573-84 (BRRI dhan28-Saltol) were selected for ALART.	Salt affected areas will come under modern rice variety cultivation; yield will increase due to salt tolerance ability.

7	**Development of premium quality rice** Sixteen crosses were made, 1452 progenies were selected and 56 progenies were bulked from pedigree nursery. Two advanced breeding lines were selected from RYT based on medium slender grain type with medium growth duration for trials in the farmersô field. Five hundred sixty seven progenies were selected and 93 progeny rows were bulked from pedigree nursery. Four advanced breeding lines from RYT were found promising along with two advanced breeding lines from PVT were evaluated in farmers field in Boro season .	Development of aromatic and non-aromatic fine quality rice with national (Kalizira/Chinigura type) and international (Basmati/Banglamati type) standards for domestic use and export.
8	**Development of Rice varieties for favourable Boro Environment** Two lines have been selected from Secondary yield trial and advanced to RYT	Development of improved genotypes with high yield potential and acceptable grain quality for irrigated ecosystem
9	**Development of cold tolerant rice** Totally 656 progenies and 6 fixed lines were selected. Seven advanced lines from OT, 2 from SYT, 9 from AYT, 1 from PVS were selected. Twenty two entries were found tolerant to cold stress at both seedling and reproductive stages.	Short duration cold tolerant rice will be developed for Boro season
10	**Development of Low Amylose Rice** Three genotypes were selected from OT	Development of high yielding indica rice with low amylose content for domestic use and export
11	**Development of Micronutrient Enriched Rice** National Seed Board of Bangladesh approve release of BR7517-2R-27-3 as BRRI dhan62 as Zinc rich variety. Another two breeding lines, BR7840-54-3-1 and BR7840-54-1-2-5 were evaluated by evaluation committee of NSB for releasing as variety. Around two hundred breeding lines have been selected from different trials for further evaluation.	The released promising breeding lines will help in sustaining increased rice production along with will met nutritional demand of the country
12	**Development of Disease Resistant Rice** Eighty seven crosses were made, 31 were confirmed, 3804 plant progenies, 297 advance lines for BB, Tungro & Blast were selected both for T. Aman and Boro seasons	Development of disease resistant varieties with high yielding genetic background
13	**Development of Insect Resistant Rice** Sixteen promising lines were selected from SYT for BPH and GM.	Gall midge and Brown Plant Hopper tolerant rice genotypes will be developed
14	**Development of Submergence and water Stagnation Tolerant Rice** Twelve germplasm were selected, 11 crosses were made, 18 crosses were confirmed, 306 plant	Development of submergence and water stagnation tolerant rice lines with increased productivity for submergence

	progenies along with 6 fixed lines were selected from pedigree nursery. Introgression of *SUB 1* QTL into BRRI RLR varieties viz. BRRI dhan33, BRRI dhan44 and BRRI dhan49 were completed in BC_4F_3 & BC_5F_2 generations. Two hundred ninety four new primers were surveyed between BRRI dhan33 & BRRI dhan52 and 48 primers were found polymorphic. Importantly, four Bangladeshi landrace viz. Kalojoma DG1-349, Putidepa and Damshi were identified as new sources of submergence tolerances and development of mapping population has been initiated.	and water stagnation prone low-lying areas of the country.
15	**Development of Drought Tolerant Rice** Forty three drought tolerant genotypes with 100-120 days growth duration & 12 promising donors were selected. Four genotypes were promoted to ALART from PVS trial.	These genotypes can be adaptable under drought prone environment and can escape and tolerate terminal drought under rainfed condition
16	**International Network for Genetic Evaluation of Rice (INGER)** Twenty five genotypes were selected as parents for hybridization and 66 genotypes were directly used in the yield trials	These genotypes will be used for developing variety
17	**Development of Green Super Rice (GSR)** One advanced line was selected from ALART in T Aman season. Two advanced lines were selected from RYT in Boro season.	These advanced lines will be released as high yielding rice varieties with green super rice traits
18	**Evaluation of Exotic NERICA Germplasm** Six lowland NERICA genotypes were selected in T. Aman 12-13 season and six lowland NERICA genotypes were selected in Boro 12-13 season.	Seed Increase and evaluation of the performance of NERICA varieties under lowland condition of Bangladesh
19	**Pyramiding bacterial blight resistant genes into the genetic background of BR11-derived submergence tolerant rice lines:** Three pyramided lines of BRRI dhan52-Xa21-xa13 were finally selected.	Submergence tolerant & bacterial blight resistant variety (BRRI dhan52-Xa21-xa13) will be developed that will be suitable for submergence & BB prone areas in Bangladesh.
20	**Development of Rice Varieties with Enhanced Submergence Tolerance through Marker Assisted Breeding.** Three Sub1 introgressed best lines of BRRI dhan33 were finally selected. Through conventional breeding pedigree populations were advanced upto F_4 generation.	Submergence tolerant variety (BRRI dhan33l-Sub1) will be developed that will be suitable for submergence prone areas in Bangladesh.
21	**Pyramiding Salinity and Submergence Tolerance Genes into BRRI dhan49 Through Marker- Assisted Selection** Five BC_1F_1 plants were selected based on foreground and background selection and	BRRI dhan49-Saltol-Sub1 line(s) will be developed that will be suitable for saline prone areas.

	backcrossed with BRRI dhan49 to produce BC_2F_1 seeds.	
22	**Development and dissemination of high yielding rice varieties for increasing productivity in salt affected tidal areas** Eleven materials were selected for advance yield trial under actual salinity and submergence conditions.	Development of variety having tolerance to salinity and submergence for salt affected tidal areas of Bangladesh.
23	**Development of Hybrid Rice and Production of Parental Lines** Establishment of test cross nursery for growing 63 test cross progenies. Three promising hybrids were compared with standard checks.	Develop of hybrids having non-sticky cooked rice, good adaptability, tolerance to abiotic stresses suitable and to develop cost effective hybrid seed production technologies.
24	**Development of Arsenic Tolerant Rice** Totally 64 crosses were made, 18 crosses were confirmed, 4731 plant progenies were selected. MARS, StarBonnet and IR71676-90-2-2 showed tolerance to increased level of As under controlled arsenic condition in T. Aman season. While HUA564, HUA565 and BRRI dhan47 were found to give stable yield in differential soil and water arsenic conditions in Boro season.	Development of Arsenic tolerant varieties.
	Hybrid Rice	
01.	Sixteen (16) CMS (A) lines having diverse characters were developed.	This CMS lines will use for new hybrid rice variety development.
02.	CMS multiplication and seed production package development of promising CMS lines and hybrid combinations has been initiated	After study of commercial seed production feasibility the selected combination will submit to Seed Certification Agency (SCA) for variety release purposes.
03	A total of 332.5 kg of parental lines (A & R) and hybrid seeds of four released hybrid varieties distributed to 3 seed companies along with BADC	Popularization of BRRI released hybrid varieties.
	Biotechnology Division	
	Project I: Development of rice variety through tissue culture Expt 1. Development of salt tolerant rice lines through anther culture - Only one and three green plants were regenerated from the crosses BRRI dhan29/FL478 and MR219/IRBB60, respectively	New stress tolerant rice variety will be develop from these lines
	Project II: Field performance of tissue culture derived lines **- Progeny selection**	

	During T.Aman/2012, 18 plants were selected and 115 lines were bulked from 204 pedigree lines. In Boro/12-13, 624 pedigree lines were transplanted for further evaluation. 268 plants were selected and 27 lines were bulked **Observational trails** During T. Aman/12, 19 anther culture derived advanced breeding materials were grown with standard checks for observational trials. Seven(7) materials were selected depending on the duration and comparable yield with checks. During Boro/12-13, 139 materials were grown with standard checks. Thirteen (13) materials were selected depending on the duration and yield compare to checks.	New rice variety will be develop from these lines New rice variety will be develop from these lines
	Project III: Application of DNA markers **Gene pyramiding for resistance to Bacterial blight (BB)** A cross (BRRI dhan29/IRBB60) was made to pyramid two BB resistance genes (x*a13* and *Xa21*) in popular varieties BRRI dhan29. After molecular confirmation, BB screening was carried out on BC_5F_1 progenies and 3 resistant lines were selected and bulked. **Identification of yield enhancement QTLs** Three sets of population (BRRI dhan28/*Oryza rufipogon (Ac.no.105890),* BRRI dhan28/ *Oryza rufipogon(Ac.no.103404) and* BRRI dhan29/*Oryza rufipogon (Ac.no.103404)* were developed to identify and introgress high yield QTLs for enhancing grain yield of elite Bangladeshi rice variety. Phenotypic data on yield and yield component of all three populations was recorded. 67 polymorphic markers were amplified for genotyping of 238 individuals of BRRI dhan28*3/ *O. rufipogon* (Ac. No. 105890) population 27 polymorphic markers were amplified for genotyping of 210 individuals of BRRI dhan28*3/ *O. rufipogan* (Ac. No. 103404)	New BB resistance rice variety will be developed from these lines. Yield enhancing QTLs will be identified

	population. 18 polymorphic markers were amplified for genotyping of 208 individuals of BRRI dhan29*3/ *O. rufipogan* (Ac. No. 103404) to get molecular data for identifying yield enhancing QTLs. **Identification of QTLs for salinity tolerance at both seedling and reproductive stage** Eleven (11) polymorphic SSR markers were amplified for genotyping of F_2 population of BRRI dhan29/IR4630-22-2-5-1-3. **Diversity analysis in Aus genotypes using SSR markers** Seventy six (76) polymorphic SSR markers were used to determine genetic diversity of 127 Aus genotypes which were grouped into 9 clusters. All BRRI varieties grouped in same cluster. Most robust marker was found RM286 since it provided the highest PIC value (0.926) **Introgression of *sub1* gene into BRRI dhan44 through Marker Assisted Backcross Breeding** Back ground selection was carried out in BC_4F_1 generation with 31 SSR markers for Introgression of *sub1* gene into BRRI dhan44	QTLs for salt tolerance will be identified Genetically diverged parents will be used for breeding program Submergence tolerance variety will be developed with BRRI dhan44 background
	Project IV: Development of transgenic rice BRRI dhan28 and BRRI dhan29 rice varieties were used for transformation with gene construct having *GlyI and GlyII*. Four (4) putative transgenic plants from BRRI dhan29 were confirmed by GUS test, hygromycin screening and PCR. BRRI dhan29 and BRRI dhan28 were used for transformation with gene construct *AeMDHAR*. About 40 and 12 putative transgenic plants were regenerated from BRRI dhan29 and BRRI dhan28, respectively. TPSP gene construct was used to transform into BRRI dhan28 and BRRI dhan29 rice varieties. A total of twenty seven selected plants from the hygromycime containing (50mg/l)) medium were	Salt tolerant rice lines will be developed through transformation Salt tolerant rice lines will be developed through transformation

	transferred to earthen pot after acclimatization.	Salt and drought tolerant rice lines will be developed through transformation
	Entomology Division	
	1. Project: Survey and Monitoring of Rice Arthropods	
	Pest Monitoring at BRRI Farm: Data collection and reporting from 5 different habitats (seed bed, ratoon, grass fallow and irrigated and upland rice) of Aus, Aman and Boro seasons have been accomplished. Å In Aus 2012, GLH was the dominant pest in seed bed, upland and irrigated rice. RB was dominant in rice ratoon and irrigated rice Å LBB, spider, carabid and damselfly were the dominant predators. Å In Aman, RH, GLH were the dominant pests in irrigated rice Å LBB, spider, carabid and damselfly were the dominant predators in all the habitats	Incidence pattern of insect pests and their natural enemies would be known.
	Insect pest and natural enemies in light trap: Data have been collected from Gazipur, Barisal, Rajshahi, Comilla and Habiganj. During July 2012 to April 2013, YSB was dominant in Barisal and Comilla; and GLH in Habigonj. Among the natural enemies, green mirid bug in Barisal and carabid beetle in Comilla and Habigonj were the dominant species.	These results will help to create a data base on insect pests and their natural enemies to develop a forecasting system.
	Monitoring migratory behaviour of planthoppers (part of the 'Collaboration network for the management of migratory rice planthoppers and associated virus diseases of rice in Asia' project): Pennsylvanian light traps were operated at three locations (Dobila, Ghargram, Washin) of the project area throughout the year to record the rice planthoppers and natural enemies incidence. Besides, the planthoppers incidence were also monitored weekly by yellow sticky traps during T. aman/2012 and Boro/2013 season at Ghargram, Dobila and Washin in Tarash, Sirajgonj. The collected data (from light trap and field) were uploaded to the AMIVS hub regularly as per project requirement and the	Å Peak incidence period of planthoppers would be determined which will help farmers to take timely measure to control those and avoid 'hopper burn' situation. 4. Migratory behaviours of planthoppers will be known.

	uploaded information were monitored/ shared by the collaborating countries (Korea, Myanmar, Cambodia, China P.R., Indonesia, Japan, Laos PDR, Malaysia, Philippines, Thiland, Vietnam, Bangladesh and Nepal).	
	2. Project: Studies on rice insect pest ecology	
	Identification of BPH biotype and Resistant Sources in Rice Cultivars in Bangladesh: The insect (BPH) DNA were extracted from different BPH populations and preserved in -200°C for further studies. The PCR optimization is going on with these DNA samples.	Biotype(s) of BPH present in Bangladesh will be known.
	Effect of climatic factors on predators (a parts of 'Climate change impacts, vulnerability and adaptation: Sustaining rice production in Bangladesh' project.): Model analysis has been carried out to predict the influences of temperature and rainfall on GMB and LBB.	Effect of climate change on the population build-up of predators will be known.
	Pest and natural enemy incidence in different rice based cropping pattern: A survey is going on in rice based cropping patterns.	Pest and natural enemy in interaction in different cropping patterns will be known.
	3. Biological Control of Rice Insect Pest	
	Adult longevity of *Trichogramma zahiri* at different constant temperatures: The adult longevity of male and female *T. zahiri* decreased from 3.87 to 1.1 days and 4.01 to 1.17 days respectively when temperature increased from 18 to 34^{o}C.	Optimum temperature for the adult longevity of *T. zahiri* in different constant temperatures would be known which will help to rear the parasitoid in the laboratory.
	Multiple parasitism of *T. zahiri*: After three hours of initial parasitization, percent single parasitism decreased and multiple parasitism increased to a high level of 66.25%.	The tendency of the parasitoid *T. zahiri* for parasitization with more multiple eggs in a host will help positive manipulation of its use in host scarcity situation.
	4. Project: Crop Loss Assessment	
	Relationship between RH damage and yield loss: BRRI dhan56 and BRRI dhan57 suffered lower yield loss in Aman and Boro season respectively.	The farmers of hispa prone areas will be benefited by using these varieties.
	5. Project: Evaluation of chemicals and botanicals against rice insect pests	
	Evaluation of chemicals:	

	One hundred fifty five commercial formulations of insecticides were evaluated against BPH, RH, YSB and LF of which 108 were found effective.	Effective insecticides were recommended for registration by PTAC and commercial use for farmers.
	6. Project: Integrated Pest Management	
	Selection and Application of BPH Management Technologies in Sirajganj: To validate the component technologies in the T.Aman season, two experiments were set up at Kanchaneswar and found that insecticide sprayed with single & double nozzle sprayer increased yield 5.87 and 14.76% respectively.	Farmers will be benefited by applying insecticide against BPH with double nozzle sprayer.
	7. Project: Integrated Pest Management Contd	
	Validation of BRRI recommended practices for the management of major insect pests of rice: To control the major insect pests of rice prophylactic use of insecticide, BRRI recommended practices and farmers practices were demonstrated at the farmer field of Rangpur region and found that prophylactic use of insecticide had no effect on yield rather it reduced natural enemies in rice field.	Farmers conception/perception will be improved a judicial use of chemical pesticides.
	8. Project: Host Plant Resistance	
	A total of 172 materials were screened against BPH, WBPH, GLH to identify tolerant/resistance materials. Among there one material has found promising against WBPH & GLH and three materials against BPH.	Promising materials will be used for resistance breeding purpose.
	Farm Management Division	
	3.1. Project: Rice Production Management	
	• Expt. 1. **Sources of N and methods of weed control in respect to labor utilization for rice cultivation.** **Performance of USG plot with Super clean+** **HW was better.**	Efficient N management and weed control.
	• Expt. 2. **Productivity and profitability of rice as affected by spacing and seedling number in relation to labor utilization.**	Transplanted 1-2 seedling per hill with a spacing of 15 cm X 15 cm performed better.
	• Expt. 3. **Effect of quality seed and farmer's seed for seed production and; yield gap between quality seed used plot and farmers' seed used plots.** **Variety:** BRRI dhan47, BRRI dhan28 and BRRI dhan29	Performance of breeder seed used plots may be better than other seeds but performance of seeds from different locations may be varied.

	Seed: TLS, Breeder, Farmersô seed from Satkhira, Barisal, Chittagong and Coxes Bazar.	
	3.2. Project: **Cost of production**	
	• Expt. 1. **Cost and return of HYV rice cultivation at BRRI Gazipur Farm.**	The cost of production per kg of rice highest in aus season followed by aman season and lowest in boro season.
	3.3. Project: Survey and development of **data base for labor management**	
	• **Expt. 1.** Labor efficiency as affected by direct supervision for rice cultivation	Labors work more efficiently when supervised directly but no significant difference with 80% direct supervision.
	• Expt. 2. **Monitoring the laborers' wages rate for rice cultivation around BRRI Farms.** The peak period was in May ï June'2012 (Tk. 400-450 man day^{-1}) but in July-August'2012 it was Tk. 350-400 man day^{-1}. In December-January the rate was Tk. 400-450 man day^{-1}.	The average wage rate through out the year may be Tk. 325-350.
	• Expt 3. **Survey the performance of BRRI laborers** .	The work performance of BRRI laborers can be identified for improving the efficiency of labors.
	3.4. Project: Management and utilization of land and other resources. • Ten activities were done on seed production, irrigation, drainage, beautification etc. These are the continuous routine activities	These are for the better outcome from farm land and researches.
	Agronomy Division	
1.	Tray soil management for raising seedling for rice transplanter **Progress:** For getting good quality seedling and better field performance, farmers should be used a media containing 25% cow dung or rice husk or poultry manure mixture with 75% soil.	Develop techniques for better seedling raising by tray method
2	Determination of seedling age for rice transplanter **Progress:** Seedling with 3 leaf stage and 12cm height might be achieved from 12 to 16 days old seedling during aman and 25 to 30 days old seedlings in boro season for transplanting using rice transplanter	Appropriate seedling age for machine transplanting
3.	Effect of time of planting on growth and yield of	Suitable time of planting and

	advanced lines both in Aman and Boro seasons **Progress:** In 06 August planting almost all lines gave highest yield and among the promising lines, IR82635-B-B-75-2 gave the highest grain yield (5.68 t/ha) planted on 6 August and matured within 128 days in Aman season. None of the promising line performed well than the recommended rice varieties of BRRI dhan29 and BRRI dhan28 in respect of grain yield and growth duration in Boro season.	selection of genotypes having high yield potential.
4.	Escaping salinity by adjusting planting time in Aman season **Progress:** BRRI dhan53 and BRRI dhan54 are better for 30 July planting as they are early maturing variety farmer may take advantage to planting robi crops. BRRI dhan40 and BRRI dhan41 performed better in 10-20 August planting.	Optimum planting time for higher productivity in Aman rice
5.	Performance of modern rice varieties under standard agronomic management at farmer's condition in Aman season at Amtoli, Barguna **Progress:** The modern variety BRRI dhan49 showed the highest grain yield, while, the lowest grain yield was found in local variety Moulata in Aman season, in Barisal reigon	Suitable variety for growing rice in southern reigon
6.	Validation of planting density on the growth & yield of rice in Aman season at Amtoli, Barguna **Progress:** Planting rice in closer spacing (15×20 cm) produced higher grain yield over farmers practice in Aman season, at Amtoli in Barguna, Barisal region	Optimum planting density for growing rice in southern reigon
7.	Performance of modern rice varieties under standard agronomic management at farmer's condition in Aus season in southern Reigon **Progress:** The modern rice BRRI dhan27 performed well in Aus season in Barisal reigon.	Suitable variety for growing rice in southern reigon
8.	Performance of modern rice varieties under standard agronomic management at farmer's condition in Boro season at Betagi, Barguna **Progress:** The modern variety BRRI dhan28 showed the highest grain yield while the lowest grain yield was found in BRRI dhan 47 in boro season at Barguna in Barisal region	Suitable variety for growing rice in southern reigon
9.	Performance of short duration aman rice varieties under different establishment methods **Progress:** The rice crops established by direct seeding of dry seed and direct seeding of sprouted	Appropriate growth parameters and yield

	seed method matured 7 days earlier than that of transplanting method.	
10.	**Urea Spraying as an Alternate Method of N Fertilizer Application** Progress: **22% urea in Aman season and 27% urea in Boro season could be saved without scarifying grain yield if 2/3 rd of urea was applied as top dress along with 2-3 times urea spraying maintaining 3.5% urea solution instead of last top dress. The study needs further evaluation.**	**Appropriate urea application techniques and increase NUE in rice**
11.	Performance evaluation of NPK briquette on HYV rice yield and nutrient status during T. Aus and T. Aman season at different locations **Progress:** In T Aus season, BRRI recommended fertilizer rate (NPKSZn) produced higher yield than without fertilizer and N alone treatment irrespective of locations and seasons. Overall the highest grain yields were obtained with the deep placement of single 3.4 g NPK briquette at all locations. The yield increasements by 3.4 g NPK briquette over recommended fertilizer rate were 22%, 26% and 36% irrespective of Gazipur, Sagordi, Barisal and Babuganj, Barisal sites. In T Aman season, the highest grain yield was also observed when 3.4 g NPK briquette was deep placed between the four hills. Grain yield advantages over recommended rate of fertilizer were 16% 20 % and 18 % irrespective of Gazipur, Sagordi, Barisal and Babuganj, Barisal sites.	Proper effectiveness of NPK briquette deep placement for e rice production in tidal flooded soil and heavy texture soil
12.	Effect of spacing on the performance of USG on HYV rice yield and nutrient status during T. Aus and T. Aman season **Progress:** 1.8 g. USG deep placement During T. Aus and T. Aman season in BRRI dhan48 and BRRI dhan49 respectively at BRRI farm Gazipur performed highest grain yield when the planting spacing was followed 25 cm × 15cm.	Appropriate spacing and effectiveness of USG for sustainable rice production in heavy soil
13.	Effect of Time of USG placement on the performance of USG on HYV rice yield and nutrient status during T Aus season **Progress:** Grain yield of BRRI dhan48 was maximized when USG was deep placed at date of transplanting during T Aus season at BRRI farm, Gazipur after that it decreased.	Appropriate time of USG application and effectiveness of USG for sustainable T Aus rice production in heavy soil
14	Potentiality of urea super granule for increasing rice yield in tidal submergence ecosystem of	Increase rice production through USG in tidal submergence-

	Bangladesh during *aman* season **Progress:** Local varieties produced around 2.0 t ha^{-1} grain yield by farmers practice or without fertilization. But more than 3.0 t ha^{-1} yield could be obtained through UDP by cultivating of Lalpyka, Kutiagoni, Mutha, Razasail, Sada pajam, Lal chikon, Sada chikon, Sada muta, Moulata and Lal Muta.	prone area during aman season
15	Farmer's Participatory Site Specific Nutrient Management in Barisal Region for HYV Rice in Boro season **Progress:** Nutrient manger based fertilizer save fertilizer and gave satisfactory grain yield but it requires further evaluation.	Appropriate field-specific nutrient management package for rice.
16	Demonstration of new saline tolerant varieties under different N management practices in the farmers field. **Progress:** All the saltol varieties of T.Aman performed better with the application of USG except BRRI dhan53.Among the variety BRRI dhan54 is the best followed by BRRI dhan40 and BRRI dhan41.	Suitable varietal performance under different nitrogen management practices in the farmerôs field of saline prone area
17.	Validation of the nutrient management for increasing yield of rice under standard agronomic management at farmer's condition in Aus season **Progress:** Fertilizers to be applied based on BRRI recommended dose to obtain higher grain yield of rice in Aus season, Barisal region.	Optimum level of fertilizer for growing rice
18	Validation of integrated weed control option for yield maximization in Boro Season in Barisal area Progress: **Grain yield of rice increased significantly when weeding was done by hand at different date after transplanting than herbicide treated plot or herbicide with one hand weeding plot.**	Recommend appropriate weed management option
19	Potential allelopathic effect of some rice cultivars on *Echinochloa crusgalli* **Progress:** Among the tested varieties/lines acc no. 833 and 841 may have allelopathic potentialities and more inhibitory character to suppress weeds in laboratory condition but further research need to be carried out for its conformity under field condition.	Asses the weed suppressing potential of rice cultivars on *Echinochloa crus- gali*
20	Growth analysis of transplanted rice under different competition durations with *Echinochloa crusgalli* **Progress:** In case of short duration Aman variety like BRRI dhan56 weed competition can be allowed not more than 20 days after	Proper growth behavior of transplanted rice under different competition durations with *Echinochloa crusgalli*

	transplanting.	
21	Evaluation of candidate herbicides **Progress:** All evaluated herbicides effectively control weeds in transplanted rice field	Efficacy of new herbicides
22	Validation of weed control option for yield maximization on BRRI dhan56 and BRRI dhan57 in drought condition at Rangpur region in T. Aman season (new) **Progress:** To control weed efficiently at Rangpur drought prone area either Pre emergence herbicide + one hand weeding or Post emergence herbicide + one hand weeding or three hand weeding may perform higher grain yield when BRRI dhan56 and BRRI dhan57 were used. These two varieties are drought prone varieties.	Recommend appropriate weed management option for drought condition
	Agril Economics	
	Sub-sub Program: Production Economics & Technology Adoption	
	Farm Level Evaluation of Modern Rice Cultivation in Bangladesh Report completed	Variety wise adoption rate of different MVs be estimated. Yield of different rice varieties be known.
	Estimation of Cost and Return of MV Rice Cultivation at Farm Level Report completed	Costs and return of MV rice cultivation in Bangladesh be estimated. Factors and income shares of MV Aus, T. Aman and Boro rice cultivation be known.
	Sub-Sub-Program: Rice Marketing and Price Issues	
	Supply and Demand Model for Rice in Bangladesh under Climate Change Situation Report completed	Projected supply and requirement (demand) of rice be anticipated.
	Impact Assessment of Climate Change on Rice Production and Marketing in Southern Coastal Region of Bangladesh Required data have been generated and analysis is going on.	The impact of climate changes on rice production and marketing in the South-west region of Bangladesh is evaluated.
	Sub-Sub-Program: Agricultural Policy and Development	
	Dynamics of Agriculture Labour Market in Bangladesh: Evidences from Farm Level Survey Report completed	Demand and supply of agricultural Labour be estimated.
	Returns to Investment on Rice Varietal Research in Bangladesh Data collection is going on.	Returns to investment in rice research will be determined.
	Tracking in Adoption of Improved Rice Varieties in Different Production Environments / Ecosystems of Bangladesh Report completed	Variety specific adoption rate be estimated.

	Agril. StatisticsDivision	
	Project: Yield Assessment through crop-cuts **1.1 Activity/Study:** Estimation of Area and Production of Rice in Bangladesh **Research Progress:** • Routine program with DAE • T. Aman data collected • Boro data collection is on going • Final report will be present in internal review workshop.	1. Forecast the rice yield using crop- cut methods 2. Formulate a protocol that provides reliable and unique estimates on area and production of rice in Bangladesh.
	Project: Stability Analysis of BRRI varieties (In collaboration with Pl. Breeding Div., ARD and Regional Stations) **2.1 Activity/Study:** Study on G x E interaction of BRRI varieties (In collaboration with Pl. Breeding Div., ARD Regional Stations) **Research Progress:** • Yield of BRRI varieties (T. Amna and Boro) at different regional stations have been collected for ten years. • Validation of stability model, developed by agricultural statistics division is going on.	1. List of varieties with stability measure by season 2. List of varieties that are loosing stability over time and location 3. Bio-physical factors affecting stability of varieties identified 4. Season, year and location-wise database on yield of BRRI varieties
	Project: Development of Computer Programme **3.1 Activity/Study:** Development/modification of software for Payroll accounting system for BRRI employees **Research Progress:** • Time to time modification of BRRI payroll system is being done on request from accounts section. We are updating the Payroll system accounting software by Win-base with the help of IT Park Ltd. Company.	1. Development of computer program for management and analysis of data 2. Development of software for administrative/accounting system of BRRI
	Project: Genetic Coefficient of BRRI Varieties **4.1. Activity/Study:** Study on genetic coefficient of BRRI released varieties (In collaboration with Pl. Physiology Div.) **Research Progress:** • Data has been generated for five years	1. Genetic coefficients of BRRI varieties to be used for modeling yield of BRRI varieties under different growing environment

	• DSSAT4.0 software has been collected and trying to match data with the software	
	Project: Spatial database for BRRI varieties **5.1 Activity/Study:** Suitability mapping of BRRI dhan44, 46 and 47, 50 and hybrid dhan4. (Collaboration with Pl. Breeding, RFS and ARD) **Research Progress:** • Work in progress. It will present in internal review workshop.	1. A geo-referenced database of BRRI varieties 2. Suitability maps for BRRI varieties
	Project: Geographical Information System (GIS) **6.1 Activity/Study:** Identification of submergence areas for growing newly developed BRRI varieties (In collaboration with Ag. Econ. and RFS Div.) **Research Progress**: • Spatial data has been collected for identification of submergence areas for growing newly developed BRRI varieties. It will be present in internal review.	1. Improve knowledge of the geographical distribution of contamination of soil and irrigation water with arsenic, in order to target arsenic management strategies to the most contaminated areas
	6.2 Activity/Study: Distribution of Arsenic (soil and water) in the Arsenic Prone Areas of Bangladesh. (In collaboration with soil science Div. and Cornell University under FFP) **Research Progress**: • In total 4242 soil samples and 1414 water samples from 1414 location of 19 districts has been collected and about 2210 soil samples has been digested, 1124 water samples analyzed for As and 839 samples analyzed for Fe, Mn and P. • Data entries have been completed by this time. • Water As map/surface created for arsenic prone areas.	1. Maps delineating submerged areas suitable for growing newly developed submergence tolerant BRRI varieties
	6.3 Activity/Study: Determination of arsenic content in BRRI varieties at diverged /different environment (In collaboration with soil science Div., GQN and Cornell university under FFP) **Research Progress**: • In total 30 soil samples and 10 water samples from 10 locations of BRRI R/S and HQ has been collected for As analysis. • In T. Aman 271 and in Boro 221 straw and grain sample from 10 locations of BRRI R/S	

	and HQ has been collected for As analysis.	
	Project: Characterization of rice environment in Bangladesh **7.1 Activity/Study:** Ground truthing of the characterization maps **Research Progress**: • Fine tuning of rice growing environment of Bangladesh (Boro and T. Aman) adjusting with new soil database.	1. Thematic and integrated maps of climatic variables and soil Properties. 2. Physical (soil and climatic) constraints to higher productivity of BRRI varieties identified. 3. Suitability maps for growing BRRI varieties
	Project: Probability Mapping of Weather Variables **8.1. Activity/Study:** Probability Mapping of Maximum Temperature and rainfall at different growth stages of T. Aman rice **Research Progress**: • Data are available now • Data process and analysis is on going • Some maps has been created **8.2. Activity/Study:** Variation of rice productivity and quality due to climate change **Research Progress**: • Due to lack of manpower the work could not progress	1. Station wise probability curves of weather variables would be obtained 2. Station wise return periods of the weather variable would be obtained 3. Surface maps for the estimates of weather variables in Bangladesh would be obtained 4. Effect of climate change i.e. temperature, rainfall and solar radiation on rice yield would be obtained 5. The physiological changes of rice plant and nutritional quality of rice grain would be obtained
	8.1. Activity/Study: An Application of Box-Jenkins Method for Forecasting of Aus Rice Production in Bangladesh **Research Progress:** Work in progress. It will present in internal review workshop.	1. Forecast the Aus rice production in Bangladesh
	Irrigation & Water Management Division	
	Sub-Sub-Program I: Water Use Efficiency Improvement in Irrigated Agriculture	
	Water Requirements	

	Experiments:	
	Development of Soil moisture declination model for alternate wetting and drying irrigation for Rice cultivation **Progress:** Crop is harvested. Analysis of water level, soil moisture content and irrigation data will be done soon.	Soil moisture declination model will be develop to conduct next year experiment
	Assessment of cost effectiveness of low cost water distribution pipes for minor irrigation **Progress:** All distribution systems consume more fuel compared to earthen canal at a specific engine speed range. Conveyance loss in all systems is much lower compared to the earthen canal. For 60 m (200 ft) section of earthen canal the distribution loss was found around 30 percent. For the same length of other distribution systems (polyethylene pipe, plastic pipe and cotton pipe) the conveyance loss is less than 5 percent.	Cost-effective distribution system may be determined for minor irrigation
	Validation of Aqua crop model under AWD water management and effect of USG in rice production **Progress:** Irrigation applied by AWD method up to 15cm below soil surface produced at per yield with that of continuous standing water application. AWD method up to 20 cm water depletion below soil surface reduced rice yield significantly. USG produced slightly higher yield (but not significant) than that of prilled urea when applied in short duration BRRI dhan28. But only USG cannot increase or maintain yield of longer duration Boro rice BRRI dhan29 compare to prilled urea. Validation of model with the experimental data is ongoing.	A valid model (Aqua Crop model) will be developed Crop yield and water requirement under AWD method in association with USG application will be determined.
	Climate change impacts on water requirement for irrigating paddy rice in Bangladesh (On-going) **Progress:** Daily climatic parameters like maximum and minimum temperatures, maximum and minimum relative humidity, wind speed and sunshine duration has been collected for a period of 30 years spanning from 1980 to 2010 from the Bangladesh Meteorological Department. Data collection is still going on and some spread sheet analysis are also done to see the long-term changes and trends of climatic parameters.	Climate change impacts on yield and water requirement at different stages will be predictable with the help of MAKESENS model.
	Improving low-cost check valve for STW and test its performance in field level (On-	An improved low-cost check valve for STW.

	going) **Progress:** Contacted with PVC and cast iron manufacturer but not yet completed to develop a prototype.	
	Sub- Sub Program II: Utilization of Water Resources in Rainfed Environment	
	Water Management for rice cultivation in climate change environment **Experiments:**	
	Terminal drought mitigation through integrated approaches in T. Aman cultivation **Progress:** Treatment W_1 (Supplemental irrigation) received 3 nos.Supplemental irrigation in vegetative stage, 2 nos. in reproductive stage and 1 in ripening stage. Production for the treatment W_1 was 6.4 ton/ha where W_2(Rainfed condition) produced 5.24 ton/ha. Percent yield loss 22.2. In case of BRRI dhan33 treatment T4(Transplanting date 31 July) faced less drought in reproductive stage and produced highest yield 5.29 ton/ha. T_1(Transplanting date 10 July), T_2(Transplanting date 17 July) and T_3(Transplanting date 24 July) produced 4.05, 4.39 and 4.76 ton/ha respectively. In case of variety BR11 highest yield was obtained for the treatment T_3 and it was 5.26 ton/ha as it face faced less drought in reproductive stage than others. Yield for the treatment T_1, T_2 and T_4 was 4.78, 5.24 and 4.79 ton/ha respectively.	Drought effect may be reduced by shifting transplanting date of T aman rice and using short duration varities
	Determination of suitable time for application of supplemental irrigation in T. Aman rice **Progress:** The number of supplemental irrigation application was 4, 3 and 2 nos. for the treatment T_1(Supplemental irrigation applied when water level reaches at 5 cm below ground surface) , T_2(Supplemental irrigation applied when water level reaches at 10 cm below ground surface) and T_3(Supplemental irrigation applied when water level reaches at 15 cm below ground surface) respectively. Production for the treatment T_1 , T_2 and T_3 was 5.4, 5.3 and 5.6 ton/ha respectively. No significant yield difference was found.	Timely application of supplemental irrigation may increase yield but the water depth when to irrigate need to be confirmed.
	Effect of drought on different T. Aman varieties **Progress:** Results showed that mean yield reduction due to drought stress in varieties ranges from 1.7 to 18.6 percent. Highest yield reduction was found for BRRI dhan44 (18.6%) followed by	Some T. Aman varieties were found less sensitive to drought stress and drought effect can be minimized using short duration variety.

	BR 23 (17.9%), BRRI dhan41 (16.9%), BRRI dhan46 (15.9%), BR 25 (14.6%), BRRI dhan39 (12.7%) and BR 11 (12.5%).Yield reduction was lowest for BRRI dhan31 (1.7%) followed by BRRI dhan30 (3.2%), BRRI dhan49 (4.9%), BRRI dhan33 (7.2%) and BRRI dhan40 (7.6%), respectively. BRRI dhan31, BRRI dhan30, BRRI dhan49 and BRRI dhan40 were found more drought stress tolerant than the other varieties.	
	Sub–Sub Program III: Land Productivity Improvement in the Coastal Environment	
	Land and Water Resources Use for Sustainable Crop Production **Experiments:**	
	Fresh ground surface water investigation for crop production in coastal saline areas of Bangladesh **Progress:** Experiment conducted and data analysis is going-on	The mono-crop area will be converted into double crop area using fresh ground and surface water.
	Effect of long term groundwater extraction on the performance of STW and on crop production in coastal region of Bangladesh (On-going) **Progress:** Data collected and analysis is going on.	Prediction of long-term effect of groundwater extraction in the coastal saline areas
	Assessment of farm reservoir utilization for irrigation in the coastal area at Sonagazi **Progress:** Salinity of water collected from STW at Sonagazi area was measured. Salinity ranged from 0.32-0.50 dS/m. Salinity of canal water ranged from 10.50-12.72 dS/m in Aus season and 3.15-4.33 dS/m in Aman season. Salinity of pond water varied from 0.91-2.77 dS/m in Aus season and 1.33-1.46 dS/m in Aman season.	Land productivity will be improved by cultivating rabi crops using water from farm reservoir
	Survey on surface water utilization and its scope for crop production in different Agro-Ecological Zones of Bangladesh **Progress:** Survey on surface water was conducted in 3 districts (Sylhet, Sunamganj and Moulivibazas) of Sylhet region..Surface water is available for crop production in both dry and wet seasons. But under utilization of surface water for crop production is a common issues in both the locations. Recently, DAE, LGED , BADC and BWDB have taken some initiatives to utilize surface water for crop production. Minor projects related to surface water development and utilization is implemented by DAE, LGED and	Irrigated area can be increased by using surface water in hill tracts like Khagrachari.

	BADC. On the other hand, major projects are implemented by BWDB. Farmersô participation in surface water development and utilization is essential. Local and regional planning should be developed for better utilization of surface water of that region.	
	Sub-Sub Program IV: Sustainable Management of Groundwater	
	Surface and Ground Water Assessment Experiments:	
	Monitoring of groundwater fluctuation and safe utilization in different geo-hydrological regions **Progress:** Weekly groundwater table monitoring data were taken in BRRI Gazipur and from different regional stations of BRRI	Groundwater declines both in BRRI Gazipur and BRRI regional stations.
	Sub-Sub Program V: Renewable Energy **Experiments:**	
	Renewable energy for irrigation	
	Feasibility study of solar pump for irrigated rice **Progress:** The solar panel is not purchased due to lack of fund.	Multiple use and economic performance of solar pump
	Sub- Sub Program VI: Technology Validation in the Farmers' Field	
	Project Title: Adoption of new cropping system under climate change and validation of cropping system model APSIM **Progress:** Experiment was conducted at Dacope, Khulna Division by RFS with the following cropping patterns: Fallow- Fallow- T. Aman (LV), Fallow- Fallow- T. Aman (HYV), Cowpea- Fallow- T. Aman (HYV), Boro- Fallow- T. Aman (HYV).	Suitable Cropping Pattern for changing climate.
	Project Title: Productive, profitable and resilient agricultural and aquaculture systems **Progress:** Polder 30 (Khulna): Aman-Boro and Aman Rabi experiment conducted. BRRI dhan54 gave highest yield in Aman season. 1st December is suitable for transplanting of Boro season to escape high water salinity. BRRI dhan47 and BRRI dhan28 gave the highest yield. Sesame and Mungnean was sown in Rabi season and crop is in the field. Polder 3 (Satkhira): Rice-Fish pattern was conducted. BRRI dhan54 and Jatai (Local) gave the highest yield in Aman season. Polder 43/2F (Barguan, Amtali): Aus-Aman-Boro and	Increased cropping intensity and productivity in the coastal region of Bangladesh by improve water management

	Aus-Aman-Rabi experiment was conducted. BRRI dhan48 gave the highest yield in Aus season, BRRI dhan54 gave the highest yield in Aman season and BRRI dhan28 gave the highest yield in Boro season in both pattern. Six rabi crop i.e. Chili, Mungbean, Sesame, Water melon, Maize and Sunflower were grown and Rabi crop is in the field.	
	Project Title: Testing, Validation and Upscaling of Water Saving Technology in Rice Production (TWST) **Progress:** Farm reservoir (FR) technology was tested in T. Aman 2012 at Dhamurhat of Noagoan district. Maximum two supplemental irrigation were applied from FR at research management plots. The yield was increased by 13.46% due to applying supplemental irrigation. The benefit of supplemental irrigation was analyzed by using partial budget method. Result shows that average 3475 Tk/ha was total return in 2012 in which BCR is 1.43.	Water saving technologies to Increase irrigated area coverage
	Project Title: Adaptation and Demonstration of Water Management Technologies at farmer's fields under Integrated Agricultural Productivity Project **Progress:** Rangpur region:10 demonstrations during Aus-2012 with BRRI dhan48 as test variety were conducted. Results show that supplemental irrigation at early stage can increase 20 % more yield compare to farmerôs practice at Pirgonj upazilla, Rangpur. In Aman season supplemental irrigation and rainwater harvesting by levee management technologies were adopted. Sixteen (16) demonstrations were conducted in farmerôs fields. Among them, 8 trials were used for supplemental irrigation and rests of trials were conducted for rainwater harvesting. Results show that 2 to 4 supplemental irrigation were needed in Rangpur region according to distribution of rainfall amount during rainy season. Barisal region: 9 demonstrations during Aus 2012 were conducted. Among them 4 were demonstrated at Sadar Upazilla Patuakhali and other 5 fields were demonstrated at Sadar Upazilla Jhalkati. The test varieties were BR 14 and BR 2 at Patuakhali and Jhalkati, respectively. 6 trials for supplemental irrigation were conducted and same numbers of trials were used for rainwater harvesting in T. Aman season 2012. Only one irrigation at flowering stage increased yield by 30-50 percent.	Adoption of water saving technologies to increase water productivity and consequently to increase command area.

<table>
<tr><td></td><td>Project Title: Climate change impacts, vulnerability and adaptation: Sustaining rice production in Bangladesh

Progress: Piloting low water demanding wheat, mustard and chola in three Upazilas of Rajshahi region during Rabi season due to cope with water shortage, Piloting salt tolerant wheat and mustard in Barisal saline prone region in three upazilas for crop intensification during Rabi season, Piloting Boro rice in three upazilas of Barisal region by using non-saline river water before February and tapped canal water from February for improving land and water productivity of that region. Rabi data processing is on-going and some Boro rice are harvested and some are in the field.</td><td>Assessment of impacts of climate change on water resources and rice yields</td></tr>
<tr><td></td><td>Soil Science Division</td><td></td></tr>
<tr><td>1</td><td>
<table>
<tr><th rowspan="2">Ecosystems</th><th colspan="2">Season</th></tr>
<tr><th>Boro</th><th>T. Amn</th></tr>
<tr><td>1. Saline char area (AEZ-18)</td><td>25% less of STB dose ($N_{180}P_{24}K_{14}$ S_{15} Zn_4)</td><td>25% more NPK with STB dose (N_{97} P_{12} K_7 S_{10} Zn_3)</td></tr>
<tr><td>2. Haor area (AEZ-21)</td><td>25% more PK with STB dose (N_{144} P_{36} K_5 S_3 Zn_0)</td><td>-</td></tr>
<tr><td>3. Submergence and Cold area (AEZ-3)</td><td>25% more NP with STB dose (N_{187} P_{13} K_{75} S_{15} $Zn_{1.1}$)</td><td>25% more NPK with STB dose (N_{100} P_7 K_{39} S_{10} Zn_1) (BRRI dhan52)</td></tr>
<tr><td>4. Tidal Flood Ecosystem (AEZ-13)</td><td>STB dose (MV) (N_{162} P_{11} K_{58} S_{11} Zn_0)</td><td>a. STB dose (MV) (N_{64} P_3 K_{39} S_8 $Zn_{1.3}$)
b. 25% more N with STB dose (N_{22} P_3 K_{19} S_5 Zn_0) (LIV)</td></tr>
<tr><td>5. Drought prone and Cold area (AEZ-26)</td><td>25% more NK with STB dose (N_{174} P_{27} K_{84} S_{19} Zn_0)</td><td>STB dose (N_{62} P_{11} K_{28} S_9 Zn_0) (BRRI dhan56)</td></tr>
</table>
</td><td>Updated optimum dose of NPKSZn fertilizers for newly released varieties.</td></tr>
<tr><td>2</td><td>Effect of N rates on the yield of some promising lines

In T. Aman season twelve promising lines with two check varieties BRRI dhan56 (GD-117 days) and BRRI dhan44 (GD-136 days) were tested to determine the optimum rates of N for higher yield. Among the tested lines and varieties, IR83377-B-B-93-3 (GD-117 days) produced significantly highest yield of 5.05 t/ha at 81 kg N/ha. It was higher than check varieties (BRRI dhan44 (4.56 t/ha) and BRRI dhan56 (3.09 t/ha) respectively). The experiment needs further confirmation.</td><td>Determination of appropriate N rates for some newly released BRRI varieties/ lines for optimum yield.</td></tr>
<tr><td></td><td>Effect of K rates on the yield of BRRI dhan49
Potassium level on grain yield was observed during T. Aman season. BRRI dhan49 produced significantly higher yield (4.54 t/ha) @ 50 kg</td><td>Determination of appropriate K rates for optimum yield of newly released BRRI varieties.</td></tr>
</table>

	K/ha application.	
2.	**Project: Identification and management of nutritional disorder**	
2.1	**Long-term effect of some macro and micro nutrients on yield and nutrition of low land rice (Open)** **Major findings:** Cow dung + IPNS based chemical fertilizers produced a little bit higher grain yield (4.44 t/ha) than complete fertilizer treatment (4.23 t/ha). Missing element trial of BRRI regional station, Barisal indicates that omission of any element (NPKSZn) significantly decreased the grain yield (0.50- 0.70 t/ha) of BRRI dhan41 from that of complete fertilizers (4.69 t/ha) at 8th crop during T. Aman season.	Increased yield and soil health maintenance through IPNS based fertilizer.
	Expt. 2.2. Effect of intensive rice cropping on rice yield under continuous wetland condition (Open). **Objectives:** To evaluate the consequence of intensive rice cropping under wetland condition and to monitor soil fertility changes over time. During 2011-12, annual grain yield of unfertilized plot was 6.29 t/ha while in fertilized plot (NPKS) was 12.52 t/ha and reversed control plot was 12.89 t/ha.	Increased annual rice production in wet land condition and soil health maintenance through balanced fertilization.
	Expt. 2.3. Integrated nutrient management (INM) for double/triple rice cropping pattern for maximizing yield and sustaining soil fertility (Open). Triple rice pattern gave higher yield than double rice cropping irrespective of fertilizer management treatments. Highest annual grain yield (11.43/ha) was obtained in 50% NPKS fertilizers + mixed manure (MM) treatment.	To obtain yield of 15 t/ha/yr through integrated nutrient management approach.
	2.4. Validation of BRRI Fertilizer Management Technology (Boro, T. Aus and T. Aman rice) Rice straw @ 4.5 t/ha (sun dry basis) with IPNS fertilizers completely supplemented potassium fertilizer.	Dissemination of BRRI developed fertilizer mgt. packages among the farmers.
	2.5. Physico-chemical properties of coastal saline soils (Collaboration with RFSD) • Intensive crop cultivation decreased the soil salinity levels than that of mono crop	Determination of soil salinity status and moisture content of soil under different cropping pattern in coastal area.

	cultivation system. • Soil salinity was recorded in Khulna. The highest salinity level was found at 0-15 cm soil layer. It was 10.35 dS/m in December 2011, 10.80 dS/m in February 2012 and 10.69 dS/m in May 2012 at Lakshmikhola and 6.99 dS/m in March 2012 and 8.72 dS/m in May 2012 at Perchalna.	
	3. Project: Arsenic in Soil-Water-Plant System (NATP) (2010-2013) • High soil-water As content was observed in five union of Koloroa upazila under Satkhira district and three union of Faridpur sadar upazila and it considered as As hot spot. • BRRI dhan47 and BRRI dhan50 showed less As uptake among nine Boro varieties. • Continuous standing water (CSW) condition with As containing ground water apparently showed little bit higher As content in straw and paddy than that of surface water irrigation irrespective of alternate wetting and drying (AWD) and CSW. • Addition of organic sources significantly increased grain yield but did not influence soil arsenic content. • Soil treated with sugarcane leaf or ash @ 2 t/ha with recommended fertilizer showed little bit lower As uptake by rice plant than recommended fertilizer.	• Development of GIS based map of As in ground water, soil and rice. • Determination of grain As of BRRI released varieties. • Determination of mitigation method of soil As.
	4. Project: Carbon sequestration in soils of Bangladesh (NATP) (2010-2013) • Continuous standing water (CSW) was more efficient to accumulate soil organic carbon (SOC) in soils. • The amount of CO_2 released was significantly higher (41.15 kg CO_2/ha/day) in rice straw incorporated soil over the rice straw surface mulch (36.96 kg CO_2/ha/day), while in control plot it was lower (27.53 kg CO_2/ha/day). • The release of CO_2 was higher in T. Aman season than Boro season. • Minimum tillage produced significantly identical grain yield to traditional tilllage in Gazipur site. • In Boro 2011-12, the rate of CO_2 emission increased gradually up to 9th weeks after	a) Determination of present soil carbon status. b) To determine the effects of different cropping systems and management practices on soil carbon.

	transplanting then decreased gradually. Among the tested organic materials the rate of CO2 emission was higher in cow dung and poultry manure treated plots.	
	5. Project: Green House Gas (GHG) Emission Trial at BRRI • Deep placement of NPK briquette during the Boro season increased yield by 200 kg/ha with less amount of fertilizer (NPK 23-4.5-11 kg/ha) than conventional urea broadcast method. • Deep placement method leads to a significant decrease in flood water NH_4-N content	Determination of the GHG emission from rice field under different water management
	6. Project: Evaluation of new fertilizers	
	6.1. Performance of liquid fertilizer (Magic growth) on the yield of MV rice • Spray of magic growth as liquid fertilizer did not increase yield over equivalent amount of conventional N dose.	
	6.2. Performance of NEB on the yield of MV rice • NEB treated urea did not show yield superiority than that of prilled urea application.	
I.	**Program Area : Technology Transfer** **Program Performing Unit : Training Division**	
	1. Technology Transfer through training	Knowledge and skill of the trained personnel of the subject matter will be increased.
	1.1. Integrated Rice Production Training (Mujibnagar) Participant : SAAO (DAE), Extension Overseer (BWDB) No. of participants:313 Duration: 1 week Batch: 16	Trained SAAO and extension overseer will be able to identify and solve field problems of rice cultivation
	1.2. Training on Modern Rice Production Technologies for SAAO (Regular) Participant : SAAO (DAE), SA and SSA of BRRI No. of participants: 294 Duration: 1 week Batch: 15	Trained SAAO will be able to identify and solve field problems of rice cultivation and help the farmers to increase productivity. SA and SSA will be able to collect data properly.
	1.3. Training on Modern Rice Production Technologies (IAPP) Participant : SA and CF of the Project No. of participants:79 Duration: 1 week	Trained SA and CF understood objectives and out come of the project. Also they can able to identify and solve field problems of rice cultivation and

	Batch: 4	help the farmers to increase productivity.
	1.4. Quality rice seed production training course (IAPP) Participant: SAAO (DAE), SA & CF of the Project. No. of participants:138 Duration: 3 days Batch: 7	The trained persons could play an important role to produce more quality rice seeds in the project area
	1.5. Quality rice seed production training course (EQSSP) Participant : SAAO (DAE) No. of participants:118 Duration: 3 days Batch: 6	Knowledge and skill of the participants on quality seed production will be increased.
	1.6. Utilization of Bangladesh Rice Knowledge Bank Participant: SAAO, AEO and Service providers of UISC No. of participants:138 Duration: 3 days Batch: 7	Utilization and extension of BRKB will be increased and accelerated
	1.7. Minimization of rice yield gap Participant: DAE Officers No. of participants:82 Duration: 3 days Batch: 04	Trained Extension personnel will be able to ð Recognize the importance, concepts and reasons for rice yield gap ð Train the field level extension agents and farmers about RYG.
	1.8. Training on aqua crop modeling Participant: BRRI Scientist and DAE Officers No. of participants:25 Duration: 5 days Batch: 01	Trained person will be able to use aqua crop modeling software for data analysis
	1.9. Training on rice plant hoppers in light trap: collection, identification and preservation Participants: SA and LA of BRRI No. of participants:25 Duration: 5 days Batch: 01	Trained persons will be acquainted with rice plant hoppers and also improved the know-how about collection, identification and preservation of rice plant hoppers.
	1.10. Training on breeder seed production Participants: SSA and SA of BRRI No. of participants: 25 Duration: 3 days Batch: 01	Trained SSA and SA will be able to produce breeder seed properly. Also increase the knowledge about breeder seed preservation.
	1.11. Farmers training Participants: Farmers from different location No. of participants: 84 Duration: 01 days	Trained farmers could play an important role to improve the rice production.

	Batch: 04	
II	Evaluation of imparted training program.	Training program will be improved.
	2.1. Performance of long and short term training programs. Participant :1-week trainees (10 batch)	This will help improvement of training course and method of training.
III	BRKB and its improvement.	BRKB will be enriched.
	3.1. Bangladesh Rice Knowledge Bank improvement Updated: Internet and CD January 2010	Information about rice technologies will be available in internet and CD.
	Adaptive Research Division	
	Validation of Technologies	
	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 2012-2013. • **ALART (GSR), T. Aman, 2012.** Five advanced lines along with BRRI dhan44 were evaluated in 9 locations of Bangladesh during T. Aman, 2012. • **ALART (Drought), T. Aman, 2012.** Five advanced lines along with BRRI dhan56 were evaluated in 8 locations of Bangladesh during T. Aman, 2012. • **ALART (RLR), T. Aman, 2012.** Three • advanced lines along with BRRI dhan44 and BR11 were evaluated in 9 locations of Bangladesh during T. Aman, 2012. • **ALART (Standard), Boro 2013.** Five advanced lines along with BRRI dhan28 were evaluated in 10 locations of Bangladesh during Boro 2013. • **ALART (Micronutrient), Boro 2013.** Three micronutrient dense advanced lines along with BRRI dhan28 were evaluated in 10 locations of Bangladesh during Boro 2013. • **ALART (Salinity), Boro 2013.** Four salt tolerant advanced lines along with BRRI dhan28 and BRRI dhan47 were evaluated in 8 locations of Bangladesh during Boro 2013.	Some advanced lines were found promising to be a variety. Based on the overall performance, some advanced lines will be recommended for Proposed Variety Trial (PVT). So new varieties from those advanced lines may be released in future for different agro ecological zones of Bangladesh with some special characters through PVT.
	Dissemination of Technologies	
	Seed Production and Dissemination Program (SPDP) of BRRI varieties. Popular BRRI varieties were demonstrated for motivating farmers and accelerating their dissemination throughout the country in three rice	• BRRI varieties will be disseminated among the farmers through quality seed production. • Quality seed production will be increased.

	growing seasons. **SPDP under Mujibnagar Integrated Agricultural Development Project (MIADP)** **SPDP, T. Aus 2012.** SPDPs were conducted in 16 upazilas of 4 districts (Kushtia, Meherpur, Chuadanga, Jhinaidah) by using BRRI dhan48. **SPDP with USG, T. Aman, 2012.** SPDPs were conducted in 16 upazilas of 4 districts (Kushtia, Meherpur, Chuadanga, Jhinaidah) by using BRRI dhan49 and BRRI dhan57. **SPDP with USG, Boro, 2013.** SPDPs were conducted in 16 upazilas of 4 districts (Kushtia, Meherpur, Chuadanga, Jhinaidah) by using BRRI dhan50 and BRRI dhan55.	• Farmersô rice production will be increased by replacing local varieties with BRRI varieties in different favorable and stress condition like salinity, drought, tidal submergence etc. • Farmersô income through rice production will be increased by using BRRI varieties. • Awareness and adoption about BRRI varieties by the farmers will be increased. • To popularize Urea Super Granule (USG) instead of prilled urea among the farmers. A significant amount of prilled urea can be saved by using USG. • Insect and disease infestation will be reduced and yield will be slightly increased due to USG application.
	SPDP under Integrated Agricultural Productivity Project (IAPP) **SPDP, Aus 2012.** SPDPs were conducted in 16 upazilas of Barisal and Rangpur regions. BRRI dhan27 and BRRI dhan48 were used as T. Aus varieties in Barisal region whereas BRRI dhan42 and BRRI dhan43 were used as B. Aus varieties in Rangpur region. **SPDP with USG, T. Aman 2012.** SPDPs with USG were conducted in 32 upazilas of 4 southern and 4 northern districts. BRRI dhan41 and BRRI dhan44 were selected as cultivars in southern districts whereas BRRI dhan49 and BRRI dhan57 were selected for northern districts of the country.	
	SPDP under BRRI core program. **SPDP with USG, T. Aman 2012.** SPDPs were conducted in 3 upazilas of 3 districts (Mymensingh, Sherpur and Khulna) by using BRRI dhan49 and BRRI dhan57 as cultivars. **SPDP with USG, Boro 2013.** SPDPs with USG were conducted at 14 uazilas of 8 districts (Sherpur, Gazipur, Gaibandha, Gopalgonj,	

	Khulna, Comilla, Chittagong and Sylhet) by using BR16, BRRI dhan28, BRRI dhan47, BRRI dhan50 and BRRI dhan55	
	SPDP with poultry manure, Boro 2013. SPDPs with poultry manure were conducted at 11 uazilas of 6 districts (Sherpur, Gazipur, Gaibandha, Comilla, Chittagong and Sylhet) by using BR16, BRRI dhan29, BRRI dhan50 and BRRI dhan58.	• Poultry manure can substitute the full dose of phosphate fertilizer and partial dose of N fertilizer in rice cultivation. • It will reduce environmental pollution because, if poultry litter is remained unutilized, it will create unhygienic condition surrounding the poultry farms and also for the human for their peaceful normal living.
	Asian Food and Agricultural Co-operation Initiative (AFACI) Food Security Project in Bangladesh. **Rice production by using USG applicator, T. Aman 2012.** Demonstration was conducted in Chandina, Comilla and sadar, Satkhirah. In Chandina, Comilla the farmers were provided with seeds of BRRI dhan38, 39, 49 and BRRI hybrid dhan4 whereas the farmers of Satkhirah were provided by BRRI dhan49, 51, 52 and BRRI hybrid dhan4. **Rice production by using USG applicator, Boro 2013.** Demonstration was conducted in Daudkandi, Comilla and sadar, Satkhirah. In Doudkandi, Comilla the farmers were provided with seeds of BRRI dhan50, 55, 58 and BRRI hybrid dhan3 whereas the farmers of Satkhirah were provided by BRRI dhan47, 55, 58, BRRI hybrid dhan3 and BINA dhan8.	• USG applicator will save time and labour and application cost will be reduced. • USG applicator is easy to handle.
	2.5 Yield gap minimization in rice using Integrated Crop and Resource Management (ICRM) Practice (KGF) **2.5.1 T. Aman 2012.** ARD, BRRI conducted **o**n-farm farmersô participatory adaptive research trials on ICRM practices in 5 upazilas of 3 districts (Gazipur, Kishorgonj, Norsingdi) by using BRRI dhan49 and BRRI dhan52. **2.5.2 Boro 2013.** ARD, BRRI conducted on-farm farmersô participatory adaptive research trials on ICRM practices in 5 upazilas of 3 districts	The yield gap between actual and obtainable yield will be reduced by about 0.5-1.0 t/ha.

	(Gazipur, Kishorgonj, Norsingdi) by using BRRI dhan28 and BRRI dhan29.	
	Promotional activities	
	Farmers training Farmersô training on modern rice production technologies were arranged during 2012-13. 60 farmersô trainings were arranged under GOB, AFACI and yield Gap Minimization project during 2012-13. **Field days.** Field days were also arranged to disseminate rice production technologies among the farmers during the above reporting period under different programs. A total of 64 field days were arranged under GOB, MIADP, SPDP and AFACI.	About 3,700 farmers and DAE field staffs were trained about modern rice production technologies. About 10,000 farmers, DAE staffs, elite persons, social workers gained knowledge about modern rice production technologies.
	Enrichment of own seed stock.	
	4.1 Seed production at BRRI farm. For conducting adaptive research trial in different locations of Bangladesh, ARD produced quality rice seeds at BRRI farm during Aus 2012, Aman 2012 and Boro 2013.	A total of 7900 kg quality seeds of different BRRI varieties were produced which were used for follow up adaptive research trials.
	Workshop Machinery and Maintenance	
	Design and development of power transmission system of a power unit	
	✓ Design, drawing and manufacturing of gearbox as well as assembling has already been completed.	A gearbox with mechanism of two forward and a backward speed will be developed for easy power transmission.
	Design, development, modification and introduction of self-propelled reaper and mini-power tiller to augment crop production	
	✓ Design, drawing, fabrication, assembling has been completed. ✓ It will be tested in the field.	A very simple, less weight, and easy to operate self-propelled reaper and mini-power tiller will be developed.
	Modification of a self propelled field mower	
	✓ Modification of the chassis of self propelled field mower was completed. ✓ Its attachment will be done soon.	For easy manufacturing, a simple chassis of a self propelled field mower will be developed.
	Design and development of a small windmill for electricity generation	
	✓ Different types of data related to wind speed were collected and analyzed. ✓ It is not feasible in Bangladesh.	A small and low cost windmill will be developed
	Design and development of circular type cutting	

	blade of rice-wheat reaper	
	✓ Its design and drawing was completed. ✓ No progress of manufacturing was done due to the limitation of workshop facilities/manpo- -wer.	A circular type cutting blade system will be developed for minimizing vibration
	Study on cone penetration resistance of agricultural soil	
	✓ The study was done for clay loam soil and a cone penetration model has been developed. ✓ The instrument is being procured for further study.	A model of cone penetration resistance of different types of soil will be developed. Maximum cone penetration resistance will be determined for machine design.
	Database development for repair and maintenance of BRRIôs farm machineries and auto-mobiles of a power unit.	
	✓ Database has been developed to record all maintenance cost BRRI automobiles and farm machinery.	A database will be developed.
	Regional Station Rangpur	
	VARIETAL DEVELOPMENT PROGRAM (VDP)	
	1.1 Mother Trial with Sub1 and stagnant genotypes under Participatory Variety Selection (PVS) in northern Bangladesh **Progress:** Among six submergence and medium stagnant water tolerant high yielding genotypes along with two standard check varieties farmers were chosen are BRRI dhan52 and is BRRI dhan51 and stagnant entries were least preferred for long mature and other traits by PVS activities.	Increased area coverage under modern variety in flood prone areas.
	1.2 Participatory Variety Selection (PVS) Baby trial **Progress:** Four submergence-tolerant genotypes were evaluated in farmersô field of submergence-prone areas	Farmers were storage these seeds and use it instead their existing varieties with increased area coverage under modern variety in flood prone areas.
	1.3 Preliminary Yield Trial of medium stagnant flood tolerant entries under controlled stagnant and rainfed conditions **Progress:** A total of 13 genotypes were selected among 21 genotypes based on yield and growth duration.	Selected entries were performed better in both submergence and stagnant water conditions.
	1.4 Growing and Screening of pedigree generations **Progress:** A total of 52 PS from F_3 generation, 77 PS from F_4 generation, 3 PS and 7 bulks from F_5 generation, 8 PS from F_6 generation, 8 PS and 2 bulks from F_7 generation, 4 bulks from F_8 generation, 24 bulks from BC_2F_7 generation, 17 PS and 6 bulks from	Selection for submergence and medium stagnant water tolerant progenies with improved plant type

	BC_1F_8 generation were selected and preserved	
	CROP SOIL WATER MANAGEMENT	
	2.1 Integrated fertilizer management practice for premium quality rice in Aman season, 2011 **Progress:** STB gave the highest yield (4.5 t/ha) and same result shown by fresh poultry liter.	Fresh poultry liter is an alternative instead of organic and inorganic fertilizer.
	2.2 Water management for quality rice seedling production in winter. **Progress:** Twelve hours of irrigation water in night time gave the quality seedling which is followed by twelve hours day time irrigation.	Farmers are using this technology to protect the seedlings from cold weather during Boro season.
	2.3 Optimizing number of seedlings/hill and spacing for transplanting to enhance the productivity of stress tolerant rice genotypes for submergence prone areas. **Progress:** The output of this experimental observation showed, 20 x 20 cm is the suitable spacing for BRRI dhan51 and BRRI dhan52. However, 4 seedlings per hill are gave good results for difference parameter in both varieties.	Number of hill and also number of seedlings per hill within per unit area is an important attribute to minimize yield loss and spacing for transplanting to enhance the productivity of stress tolerant rice genotypes. So the results will take role for stress tolerant rice genotypes in submergence prone areas.
	2.4 Nursery management for enhanced survival of SUB1 introgressed genotypes of rice for submergence- prone areas. **Progress:** About 80% crops were damaged by different kinds of aquatic. So the experiment was repeated in Boro 2013. And the experimental results showed that, 30-35 days old seedlings are better for higher yield and the suitable fertilizer rate in the nursery bed is N3 ($N:P_2O_5:K_2O$::100:50:50 [25 Kg N through 5t/ ha of FYM and remaining 75 kg N, and full P, and K through chemical fertilizer]) for enhance survival and yield in BRRI dhan51 rice variety.	Testing of different fertilizer/nutrient rate combinations in the seedbed, concentrating on the inorganic nutrients N, P, K and the use of FYM and different ages of seedlings will perform better under submergence conditions.
	2.5 Fertilizer management after submergence for quick recovery **Progress:** About 80% crops were damaged by different kinds of aquatic. So the experiment was repeated in Boro 2013. And the experimental results showed that, D4 (N: K_2O:: 20:20 Kg ha^{-1} at 5-6 days after termination of submergence water) is the suitable fertilizer rate and application time for faster recovery, survivality and yield in BRRI dhan51.	Small additional amount of N after recede of flood water is considered good for faster recovery. There is a need to standardize this schedule for SUB1 varieties as this duration may vary as per the severity of the stress and tolerance limit of genotypes. Similarly potassium application is considered beneficial especially in submergence prone-areas. So the results will take role for stress tolerant rice genotypes in submergence prone areas.
	2.6 Study on tillage/crop establishment and weed management options on maize in rice-maize-mungbean system **Progress:** Maize grown after DSR under conventional	There is no yield plenty in zero tillage practices and its cost of economic. So farmers are benefits

	tillage or zero tillage and after puddle transplanted rice under zero tillage gave significantly similar yields on maize under rice-maize-mungbean system.	on maize in zero tillage instead of conventional tillage.
	2.7 Effect of plant geometry and population on rabi maize **Progress:** Grain yield was significantly highest (8.7-9.2 t ha^{-1}) for 75000 plants ha^{-1} (60*22cm) and 82000 plants ha^{-1} (55*22cm)	Increased of yield under this plant geometry and population management practices on rabi maize.
	2.8 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-Mungbean cropping systems. **Progress:** Conventional tillage with Topster weed control options gave the highest grain yield (5.0 t/ha) followed by conventional with hand weeding and Serious (post emergence) for rice and in cropping systems wheat and mungbean gave higher yield in conventional tillage than strip tillage.	DSR under conventional tillage with pre-emergence herbicide Topstar is good control option for rice. Same tillage practices are best for wheat and mungbean.