Research Progress 2011-2012

Sl. No.	Research Progress	Expected Output
	Program Area: Varietal Development Program (VDP) **Program Performing Unit: Plant Breeding Division**	
	I. Rice Breeding	
1	**1.1. Development of Upland rice** Based on 101 days growth duration and reasonable yield, OM1490 was selected for PVT for Upland Rice (Broadcast Aus)	Short duration variety suitable as DSR in upland condition
	1.2. Development of Transplant Aus Rice Five short duration entries were selected for evaluation in RYT	Short duration varieties suitable for T. Aus season
2	**1.2. Development and dissemination of high yielding rice salt tolerant varieties** Five promising lines having tolerance to salinity and submergence were selected under actual salinity and submergence conditions at Bagerhat	Intermediate tall variety having tolerance to salinity and submergence
3	**1.3. Development of shallow flooded deep water rice** Four crosses were made 28 crosses were bulked from pedigree nursery. Five advanced line were selected from yield trial	Rice varieties suitable for 1-m deep water conditions
4	**1.4. Development of rainfed low land rice (RLR)** Nine advanced breeding lines were selected from Secondary Yield Trials based on medium slender grain type with medium growth duration.	Rice varieties for early to medium growth duration, quality grain & fit for rice-wheat cropping pattern
5	**1.5. Development of tidal submergence tolerant rice (Non-Saline)** Five breeding lines were selected from Preliminary Yield Trial for tidal non-saline conditions. 19 advanced lines were selected for testing in the farmers field.	Improved varieties for tidal wetlands during T. Aman seasons
6	**1.6. Development of Submergence Tolerant Rice** A total of 11 crosses were made, 14 crosses were confirmed, 497 plants along with 55 fixed lines were selected from pedigree nursery. Introgression of *SUB 1* QTL into BRRI dhan33, BRRI dhan44 and BRRI dhan49 are in progress. Two Bangladeshi cultivars, Kalojoma and DG1-349 were identified as new sources of submergence tolerances.	Submergence tolerant rice lines
7	**1.7. Development of Salt Tolerant Rice** **Aman:** Forty three promising salt tolerant lines have been selected from yield trial. Twelve *Saltol* introgression lines were evaluated in SYT. **Boro:** Two lines viz. BR7100-R-6-6 and IR78794-B-Sat 29-1 were selected for ALART. Two lines (**BR7105-4R-2** and **IR72573-B-3-2-3-3**) were evaluated by NSB Team and waiting for final approval for release as variety.	Salt tolerant varieties
8	**1.8. Development of premium quality rice** Three promising lines were selected from SYT for promoting in RYT in T. Aman season. Five advanced breeding lines from RYT were found promising in Boro season. Two advanced breeding lines ALART were found promising in Boro season	Minikit type rice variety
9	**1.9. Development of Standard Boro Rice** Eight lines have been selected from preliminary yield trial	These lines will be advanced to SYT
10	**1.10 Development of Super High Yielding Rice** Seven advance lines have been selected from observational trial	These lines will be advanced to PYT
11	**1.11. Development of Cold Tolerant Rice**	These lines will be

	Nine advanced breeding lines from observational yield trial have been selected	advanced to PYT
12	**1.12. Development of Low Amylose Rice** Three advanced line have been selected from observational trial	These lines will be advanced to PYT
13	**1.13. Development of Micronutrient Enriched Rice** BR7517-2R-27-3 were evaluated by evaluation committee of NSB for releasing as variety	Micronutrient dense rice variety
14	**1.14. Development of Disease Resistant Rice** Two advanced lines have been for BB from preliminary yield trial	These lines will be advanced to SYT
15	**1.15. Development of Insect Resistant Rice** Seven genotypes were selected for RYT for gall midge resistant	Gall midge tolerant rice genotypes
16	**1.17. Development of Arsenic Tolerant Rice** BRRI dhan47 was the tolerance to different level of Arsenic(As)	Development of Arsenic tolerant varieties
17	**1.18. INGER** 46 advanced lines were selected for yield trial	These materials will be used for developing variety
18	**1.19. Stress Tolerant rice (Drought) for the Poor Farmers in Africa and South Asia (STRASA) under Rainfed Lowland Rice environment (BMGF funded)** Fifteen drought tolerant genotypes with 100-120 days growth duration, 3 IR64 NILs genotypes 5 promising donors were selected. Six genotypes were promoted to ALART from Participatory Variety Selection (PVS) experiment.	Drought tolerant rice varieties
19	**1.20. Evaluation of Exotic NERICA Genotypes** Thirteen lowland NERICA genotypes were selected	Suitability of NERICA varieties in Bangladesh
	Program Performing Unit: GRS Division	
	I. Rice germplasm and seed	
20	**1.1 Genetic Resources conservation and management** 132 germplasm have been collected. 1607 germplasm rejuvenated and 429 were characterized with 45 morpho-agronomic characters. 100 germplasm accessions were documented in computer database with available information from the descriptors.	Long term conservation of the rice germplasm and utilized them in further research. Resistance sources of biotic and aboitic stresses
21	**1.2 Project: Seed production and variety maintenance** In total 101.5 ton Breeder seeds of 40 BRRI varieties were distributed in T aman , Boro and Aus seasons from previous year production. All BRRI developed varieties are maintained as nucleus stock. In T. Aman 37.19 tons and in Boro 78.71 tons BS were produced.	Maintenance of pure seed stock and supply of breeder seeds to GO, NGO and private seed producing organizations under rice seed network of BRRI
22	**1.3 Exploratory and genetic studies** Genetic divergence studies with 80 entries were done.	Understanding genetic make up of germplasm

Program Performing Unit: Biotechnology Division

23	**I. Development of rice variety through tissue culture** **1.1 Development of salt tolerant rice lines through anther culture** Twelve plantlets regenerated from the calli of the cross combination BRRI dhan29 × FL378.	Stress tolerant rice variety
24	**II Field performance of tissue culture derived lines** **Progeny selection** In T Aman/2011, a total of 204 plants were selected and 94 plants were selected in Boro/2011-12. **Observational trails** In T. Aman/11, two materials were selected and during Boro/11-12,	New rice variety New rice variety

	ten materials were selected depending on the duration and comparable yield with checks.	
	III. Application of DNA markers	
25	**Gene pyramiding for resistance to Bacterial blight (BB)** For pyramiding of bacterial blight resistance genes, molecular screening was done on 20 BC_5F_1 progenies of BRRI dhan28*6/IRBB60 and three plants were selected with both genes (x*a13* and *xa21*). One plant showed resistance compared to resistant check. Three plants were also selected from BRRI dhan29*6/IRBB60 cross having only *xa21* genes. One plant showed resistance compared to resistance and susceptible checks.	BB resistance rice variety
26	**Identification of yield enhancement QTLs** 238 individuals derived from BRRI dhan28/ *Oryza rufipogon (Ac.no.105890)* and 210 individuals generated from BRRI dhan28/ *Oryza rufipogon (Ac.no.103404)*. One hundred and eight polymorphic markers were identified.	Yield enhancing QTLs
27	**Identification of QTLs for salinity tolerance at both seedling and reproductive stage** Out of 108 molecular markers 28 were run in BRRI dhan28/ *Oryza rufipogon (Ac.no.105890)* to observe the inheritance pattern of yield enhancing QTLs. Out of sixty molecular markers, 35 were run in BRRI dhan29/ IR4630 to see genetics of QTLs conferring tolerance to salinity.	QTLs for salt tolerance
28	**Marker assisted breeding to improve lodging resistance in Biroi** Seven hundred F1 seeds were generated to introgress lodging resistance gene (*sd*) in Biroi and RM297, RM302, RM212 were identified as polymorphic markers between parents	Improved plant type
29	**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	Submergence tolerance variety
	Aus genotypes of Bangladesh have been screened against. One hundred and twenty seven (12 BRRI released and 115 landraces) Aus genotypes were grouped into six clusters using 76 SSR markers. All BRRI released modern variety grouped in same cluster.	Genetically diverged parents will be used for breeding program
30	**IV. Development of transgenic rice** Transgenic plants were confirmed by GUS test. These plants need to be confirmed by PCR with specific gene.	Salt tolerant rice lines

	Program area: Crop-Soil-Water Management	
	Program performing unit: Agronomy Division	
32	**I. Seeds and seedling** **1.1 Effect of tiller separation on yield of *boro* rice** It was possible to obtain sufficient tillers from the main plot which was re-transplanted four times more area than main plot in 15 December and 30 January planted crop	Tiller separation might be an alternate source of seedling during crisis period
32	**1.2 Validation of the seedling age on the growth and yield of rice in Boro season** Insignificant grain yield difference of BRRI dhan29 was observed because of 40, 45 and 50-day old seedlings.	Optimum seedling age for Barisal region would be confirmed

33	**II. Planting practice** **2.1 Effect of time of planting on growth and yield of advanced lines in T. Aman and Boro season** In Aman season, BR7474-60-5-3 gave higher grain yield than check variety. In Boro season, none of the tested entries gave higher grain yield than the check varieties.	Suitable time of planting for future variety.
34	**III. Fertilizer Management** **3.1 Urea Spraying as an Alternate Method of N Fertilizer Application** About 22% urea in Aman and 27% urea in Boro season could be saved without scarifying grain yield if 2/3rd of urea is applied as top dress along with 2 times urea spraying at 3.5% solution instead of last top dress. The study needs further evaluation.	Saving of urea
35	**3.2 Fertilizer and weed management options for wet direct seeded rice by drum seeder** Weed free treated plot and herbicide + 1HW treated plot gave higher grain yield irrespective of fertilizer doses. Though weed free treated plot showed higher grain yield but herbicide + 1HW treated plot was economically viable.	Appropriate management package for DSR
36	**3.3 Effect of spacing on the performance of USG during Boro season** The highest grain yield (6.63 t ha^{-1}) was obtained at 25 x 15 cm spacing when USG was deep placed followed by 20 x 20 cm spacing.	Proper spacing for USG placement
37	**3.4 Effect of time of USG placement on grain yield of Boro rice** Grain yield of BRRI dhan29 increased with delayed USG deep placement time from 5 DAT to 15 DAT and highest yield (6.77 t/ha) was obtained when USG was deep placed at 15 DAT.	Suitable application time for USG
38	**3.5 Evaluation of NPK briquette during Boro season** Grain yield of BRRI dhan29 increased when 2.4 g NPK briquette was deep placed.	Balanced fertilization
39	**3.6 Validation of standard agronomic management at farmer's condition in Boro season at Barguna** BRRI hybrid dhan2 performed well and produced the highest grain yield followed by hybrid Suborno. BRRI hybrid dhan2 gave 16% higher grain yield over BINA dhan8 with same growth duration.	Location specific suitable variety identification
40	**3.7 Verification of Nutrient Manager for rice production in Faridpur region** Data collection is continuing validation of nutrient manager	Saving of fertilizers
41	**3.8 Farmers' Participatory Site Specific Nutrient Management in Faridpur Region during Boro season** Grain yield and fertilizer dose across the farmers' fields showed spatial variability.	Field-specific nutrient management package
42	**IV. Low Input Management** **4.1 Influence of fertilizer package on green super rice in Aman season** Soil test based fertilizer application gave the highest grain yield for both HUA565 and BRRI dhan33 varieties. Growth duration of HUA565 ranges from 104-110 days and BRRI dhan33 matured within 113-120 days.	Relative yield performance of green super rice

43	**V. Weed Management** **5.1 Potential allelopathic effect of some rice cultivars on *Echinochloa crusgalli*** Joli, Rangpuri (sada) and Mi-chocho have allelopathic potentiality and more inhibitory character to suppress weeds in laboratory condition.	Weed suppressing rice varieties
44	**5.2 Evaluation of candidate herbicides** The evaluated herbicides could be used to control weed effectively in transplanted rice field.	Effective new herbicide
45	**VI. Natural Resource Management** **6.1 Effect of waste water on plant growth and development** Water hyacinth allowed to grown in waste water for 20-30 days and then its use for irrigation purposes.	Refinement technique of waste water
46	**6.2 Climate Change Impacts, Vulnerability and Adaptation: Sustaining Rice Production in Bangladesh** Report on the basis of Farmers Group Discussion (FGD) was prepared	Impact of climate change on crops and economics
	Program performing unit: Plant Physiology Division	
47	**I. Salinity** **1.1 Salinity Screening at the seedling stage of rice in the T. Aman season supplied by Breeding division** Out of 54 genotype, 16 genotype was tolerant to moderately tolerant	Salt tolerant entry for T. Aman
48	**1.2 Salinity Screening at seedling stage of rice in the Boro season supplied by Breeding division** Out of 28 genotype 6 genotype was tolerant to moderately tolerant	Salt tolerant entry
49	**II. Submergence** **2.1 Identification of new sources of submergence tolerance germplasm** Out of 100 genotype 16 genotype was tolerant to moderately tolerant	
50	**2.2 Screening of rice germplasm for identifying new sources of submergence tolerance** Out of 100 genotype 32 genotype was tolerant to moderately tolerant	
51	**III. Drought** **3.1 Screening of rice genotypes for their deep rooting ability** Data processing	
52	**3.2 Effect of drought at reproductive stage on growth and yield of rice** Data processing	
53	**3.3 Effect of drought at reproductive stage on the assimilate partitioning, growth and yield in rice under green house conditions** Chemical analysis is ongoing	
54	**IV. Cold** **4.1 Selection of segregating short and medium duration population from F3 generation** Data processing	
55	**4.2 Nature of low temperature on some rice varieties (Rangpur)** Data processing	
56	**V. Seed physiology** **5.1 Dormancy and viability of some recommended rice varieties** Data is processing	
57	**VI. Climate and rice** **6.1 Estimation of genetic coefficient of some rice varieties** Data is processing	

58	**6.2 Effect of increased temperature on the growth and development of rice** Data is processing.	
59	**6.3 Identification of new sources of heat tolerant germplasm (Gazipur / Rajshahi)** Data is processing	
60	**6.4 Screening of promising rice genotype against heat** Data is processing	
61	**VII. Plant nutrition** **7.1 Effect of nutrient subsides on biomass, N, P, K, carbohydrate and free amino acid content of rice** Data is processing	
62	**7.2 Effect of nutrient subsidies on water content and sap flow of rice plants** Data is processing	

	Program performing unit: Irrigation and Water Management	
	I: Water Use Efficiency Improvement in Irrigated Agriculture	
63	**1.1. Development of Soil moisture declination model for alternate wetting and drying irrigation for Rice cultivation** Comparison of evapo-transpiration, seepage & percolation, effective rainfall, irrigation requirement and irrigation applied data indicated existence of a continuous horizontal inflow of water in the plots from adjacent field.	Soil moisture declination model will be develop to conduct next year experiment
64	**1.2 Assessment of cost effectiveness of low cost water distribution pipes for minor irrigation** Conveyance loss for 60 m (200 ft) section of earthen canal was around 30 percent. For the same length of other distribution systems (polyethylene pipe, plastic pipe and cotton pipe) the conveyance loss was less than 5 percent.	Cost-effective distribution system may be determined for minor irrigation
65	**1.3 Validation of crop model ORYZA2000 under AWD water management and effect of USG in rice production** Irrigation applied by AWD method up to 15-cm 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.	Water saving
66	**1.4 Refinement of alternate wetting and drying (AWD) irrigation for rice cultivation** The AWD saved 20-25% irrigation water without hampering the rice yield, even increased yield 0.2-0.5 ton/ha. The additional benefit of AWD method was Tk.4931/ha over continuous standing water practices.	AWD (water is 15 cm below the soil surface) is the best water management practice for irrigated Boro production.
	II: Utilization of Water Resources in Rainfed Environment	
67	**2.1 Terminal drought mitigation through integrated approaches in T. Aman cultivation** The early transplanting in T. Aman season through supplemental irrigation effectively mitigated terminal drought that occurred at reproductive stage and at vegetative stage during T. Aman season 2011.	Drought effect may be reduced by shifting transplanting date of T aman rice and using short duration varities
68	**2.2 Determination of suitable time for application of supplemental irrigation in T. Aman rice** Better grain yield was recorded when supplemental irrigation was applied at water level of 15-cm below the soil surface.	Timely application of supplemental irrigation
69	**2.3 Effect of drought on different T. Aman varieties**	Some T. Aman varieties

	Twelve T. Aman BRRI varieties were used for the study. Based on growth duration the varieties were divided into 3 categories as short duration, medium duration and long duration. Among the medium duration varieties, BRRI dhan31 and BRRI dhan49 were found less sensitive to drought. Among the long duration varieties (141-146 d) BR11 and BRRI dhan40 were found less sensitive to drought. Among the long duration varieties (153-155d), BR23 and BRRI dhan41 were found less sensitive to drought.	were found less sensitive to drought stress and drought effect can be minimized using short duration variety.
	III. Land Productivity Improvement in the Coastal Environment	
70	**3.1 Fresh ground surface water investigation for crop production in coastal saline areas of Bangladesh** Experiment conducted and data analysis is going-on	Conversion of mono-cropped area to double cropped area
71	**3.2 Design, installation and test the performance of a STW to explore the fresh groundwater resources for increasing crop production in coastal region of Sonagazi area** Good water bearing aquifer exists at a depth from 155 m to 180 m (510 ft - 590 ft). the salinity level ranged from 0.30 to 0.57 dS/m which was below the permissible maximum limit (<4 dS/m). BRRI dhan28, BRRI dhan47 and BRRI dhan55 were grown during Boro 2012 using GW. The yield of BRRI dhan28, BRRI dhan47 and BRRI dhan55 were 5.52 t/ha, 5.27 t/ha and 5.70 t/ha respectively	The mono-crop area will be converted into double crop area using fresh ground and surface water.
72	**3.3 Assessment of farm reservoir utilization for irrigation in the coastal area at Sonagazi** Rainwater harvesting in a reservoir with 25 cm high embankment conserved more water than without embankment, which could increase irrigated area of Rabi crops in the coastal area.	Land productivity will be improved by cultivating rabi crops using water from farm reservoir
73	**3.4 Survey on surface water utilization and its scope for crop production in different Agro-Ecological Zones of Bangladesh** Survey was conducted to evaluate the present surface water utilization status and future scope of utilization in Khagrachari district only. It was observed that rain water harvesting, ring well renovation, rubber dam or river cross dam in Chegi river and Myani river, hill water conservation from small hill stream by making creek dam could be the good source of surface water in these region.	Irrigated area can be increased by using surface water in hill tracts like Khagrachari.
	IV: Sustainable Management of Groundwater	
74	**4.1 Monitoring of groundwater fluctuation and safe utilization in different geo-hydrological regions** Weekly groundwater table monitoring data has been taken in BRRI Gazipur and from different regional stations of BRRI	Groundwater declines both in BRRI Gazipur and BRRI regional stations.
75	**4.2 Water quality assessment and its suitability for irrigation in different location in Bangladesh** Sample collection is going-on.	Assessment of suitability of water for irrigation in crop production.

	Program Performing Unit: Soil Science Division	
	1. Fertility assessment of rice soils	
76	**1.1 Site specific nutrient management (SSNM) for promising advanced lines (Open)** In SSNM approach the estimation of N and P was found to be much lower than the applied doses. Such lower requirement may not be realistic practically. For the estimation of actual requirement of the major nutrients the SSNM approach should be re-formulated.	Optimum dose of NPK fertilizers for tested genotypes/ promising lines
77	**1.2 Updating fertilizer doses for five different unfavorable ecosystems of Bangladesh (NATP) (2011-13)** In T. Aman season at Sonagazi site need 25% more N with STB dose (N_{90} P_{11} K_{30} S_4 $Zn_{1.5}$) to produce the maximum yield (4.60	Optimum dose of NPKSZn fertilizers for newly released varieties

	t/ha), while in Boro season required 25% less of STB dose (N_{180} P_{24} K_{14} S_{15} Zn_4) to obtain (5.81 t/ha) yield. In Rangpur site, the addition of 25% more NP will be required with STB dose (N_{187} P_{13} K_{75} S_{15} $Zn_{1.1}$) to produce yield target of (8.68 t/ha) during Boro season, while in Rajshahi site 25% higher NK dose need to be increased with STB dose (N_{174} P_{27} K_{84} S_{19} Zn_0) for obtaining yield target of (6.87 t/ha) as a cold and drought prone area during Boro season.	
78	**1.3 Effect of N rates on the yield of some newly released BRRI varieties** In T. Aman season, BRRI dhan51, BRRI dhan52, BRRI dhan53 and BRRI dhan54 did not response beyond 30 kg N/ha. In Boro season, BR7372-18-3-3, BR7358-30-3-1 and BR7358-5-3-2-1 with a check variety BRRI dhan50 were tested with variable N rates. BR7358-5-3-2-1 yielded 0.22 t/ha and BR7358-30-3-1 yielded 0.08 t/ha higher than check variety BRRI dhan50 (4.34 t/ha) at 150 N kg/ha under the BRRI farm soil condition.	Determination of appropriate N rates for some newly released BRRI varieties/lines for optimum yield.
79	**1.4 Effect of K rates on the yield of some newly released BRRI varieties** In T. Aman season, BRRI dhan51 produced grain yield of 5.3 t/ha at 75 kg K/ha while BRRI dhan52 and 53 responded at 50 kg K/ha giving yield around 3.25 t/ha. In Boro season, BRRI dhan55 and BRRI dhan58 produced significantly higher yield (>5.0 t/ha) at 150 kg K/ha rates where as BRRI dhan57 produced yield 4.5 t/ha and BRRI dhan28 produced yield of 5.18 t/ha at 50 kg K/ha.	Determination of appropriate K rates for some newly released BRRI varieties for optimum yield.
	II. Identification and management of nutritional disorder	
80	**2.1 Long-term effect of some macro and micro nutrients on yield and nutrition of low land rice (Open)** Long-term omission of N and K fertilizer decreased grain yield of 0.29 and 0.93 t/ha of BBRI dhan49 respectively from that of complete fertilizers at 54th crop during T. Aman season while in Boro season the decrease was 3.02 and 2.75 t/ha respectively at 55th crop. In other missing element trial at BRRI R/S indicate that N was a yield limiting factor for all station sites. Potassium response was observed in Habiganj and Rangpur sites indicating K fertilization need to be required for obtaining higher yield.	Increased yield and soil health maintenance through balanced fertilization.
81	**2.2 Effect of intensive rice cropping on rice yield under continuous wetland condition (Open)** NPKS fertilization showed little bit increasing trend or maintained static position in rice yield as of 1981. In unfertilized plot, annual three rice crop production (Boro, T. Aus and T. Aman) decreased rice yield about 4.0 t/ha after 31 years.	Increased annual rice production
82	**2.3 Effect of double/triple rice cropping pattern for maximizing yield and sustaining soil fertility (Open)** Native nutrients, 100% NPKS, 50% NPKS + mixed manure (CD @ 2 t/ha + Ash @ 1 t/ha and 1 layer Azolla) and Farmers' practices were tested on double (Boro-T. Aman) and triple rice crop (Boro-T. Aus-T. Aman). BRRI dhan29 and BRRI dhan49 were used in Boro-T. Aman cropping and BRRI dhan29, BRRI dhan43 and BR 22 were used in Boro-T. Aus-T. Aman rice cropping system. Triple rice pattern gave higher yield than double rice cropping irrespective of fertilizer management treatments. The highest annual grain yield (11.28 t/ha) was obtained in T_3 (50% NPK fertilizers + MM) of triple rice compared to 9.32 t/ha in double rice.	Grain yield of 15 t/ha/yr through integrated nutrient management approach
	III. Arsenic in Soil-Water-Plant System (NATP) (2010-2013)	

<table>
<tr><td>83</td><td>3.1 Assessment of As concentration in soil, water and crop (NATP)
Ground water As of upazila Kolaroa (163ppb) under Satkhira and Faridpur sadar (106 ppb) was found higher than Natore Sadar (7 ppb), and Shibaloy upazila(44 ppb) under Manikganj district. Arsenic content in rice grain ranges from 0.07 to 0.29 mg/kg in Faridpur Sadar area while in Kolaroa upazila area of Satkhira district it ranges from 0.06 to 0.82 mg/kg. However, arsenic content in soil of Faridpur Sadar area ranges from 6.7 to 43.4 mg/kg.</td><td>Development of GIS based map of As in ground water, soil and rice.</td></tr>
<tr><td>84</td><td>3.2 Response of rice varieties to As contaminated irrigation water in BRRI R/S Satkhira and Bhanga
Arsenic content in irrigation water of Bhanga upazila (410 µg/l) was higher than that of Satkhira site (125 µg/l). Obviously higher rice grain As content was obtained at Bhanga upazila site (range from 0.31 to 0.63 mg/kg) than Satkhira site (range from 0.29 to 0.38 mg/kg). Only significant variation of grain As content was observed within varieties at Bhanga Upazila site but grain As content did not exceed the As permissible limit (1 mg/kg) in both locations.</td><td>Determination of grain As of BRRI released varieties.</td></tr>
<tr><td>85</td><td>IV. Carbon sequestration in soils of Bangladesh (NATP) (2010-2013)</td><td></td></tr>
<tr><td></td><td>A total of 1728 soil samples were collected from 10 AEZs of Bangladesh viz. AEZ 1 to 10. Four AEZ soil samples (0-20 cm depth) were analyzed for organic carbon.
Carbon stock (t/ha) of soil of four AEZ in different land types
<table>
<tr><td>AEZ</td><td>HL</td><td>MHL</td><td>LL</td></tr>
<tr><td>AEZ -1</td><td>6.46</td><td>8.25</td><td>14.19</td></tr>
<tr><td>AEZ -3</td><td>3.39</td><td>6.09</td><td>6.45</td></tr>
<tr><td>AEZ -4</td><td>4.58</td><td>4.58</td><td>4.67</td></tr>
<tr><td>AEZ -9</td><td>5.98</td><td>7.26</td><td>11.24</td></tr>
</table>
Carbon stock is higher in low land soil type than medium high land and high land soil type irrespective of AEZ. Among the four AEZs highest C stock was found in AEZ-1 irrespective of land types.</td><td>Determination of present soil carbon status</td></tr>
<tr><td></td><td>Program Area: Pest Management

Program performing unit: Plant Pathology Division</td><td></td></tr>
<tr><td></td><td>I. Survey and Monitoring of rice diseases</td><td></td></tr>
<tr><td>86</td><td>1.1 Survey & monitoring of Rice Diseases in different AEZ of Bangladesh
Neck blast and Bacterial blight disease were identified as major disease in Boro season while Sheath blight and BB were major in T. Aman season. All aromatic rices were highly susceptible to neck blast disease. Neck blast disease was found higher incidence in Hybrid rice along with BRRIdhan29 and aromatic rices.</td><td>Understanding epidemiology and disease sample collection</td></tr>
<tr><td></td><td>II. Disease Resistance and Molecular Studies</td><td></td></tr>
<tr><td>87</td><td>2.1 Virulence analysis of P. grisea on International differential set (monogenic lines of IRRI)
2.2 Characterization of blast isolates based on DNA finger printing
2.3 Identification of blast races from Bangladesh by using MLS
670 samples collected from different AEZs of Bangladesh, purified around 500 isolates and tested pathogenecity of 330 against MLS.</td><td>Major races of the blast pathogen and their corresponding resistant genes</td></tr>
</table>

	pi9, pita-2, pish, pib and piz genes were found highest resistant frequency against the Bangladesh blast isolates. Mycelial harvesting of 100 isolates have already completed for DNA finger printing. So far 80 different races have been identified and more isolates yet to be tested to find total available races of Blast disease.	
88	**2.4 Identification of major blast resistant genes in land races of Bangladesh** 300 land races have already collected from GRS division. Molecular studies using gene based marker yet to be done.	
89	**2.5 Identification of major blast resistant gene in BRRI developed rice varieties** Leaf collection of 53 rice varieties has already done. MAS and pathogenicity test will be done will be started soon	
90	**2.6 Identification of Xanthomonas oryzae pv. oryzae (BB pathogen) races in Bangladesh** 132 BB isolates have already tested using NILs and pyramid lines. Xa21 gene (IRBB21) found resistant against 85% tested isolates and gene combination Xa4, Xa7, xa13 and Xa21 (IRBB65) found best.	BB resistant rice varieties
91	**2.7 Performance of polygenic BB resistant genotypes in different agro-ecosystem** 10 pyramid lines with IRBB21 and susceptible check were tested in Barisal, Rajshahi, Sonagazi and Gazipur. IRBB21, IRBB60 and IRBB65 performed best against BB.	
92	**2.8 Identification of BB resistant novel QTL in landraces** 370 land races tested against the major race of BB pathogen. Among them 11 were found resistant both in seedling and maximum tillering stages. SUNGWALA, PAJRE, MATHIA and HARMA SHAIL (1) are 4 of them. However, MAS using specific gene based markers are necessary for more confirmation.	
93	**2.9 Pyramiding bacterial blight resistant genes into the genetic background of BR11 derived submergence tolerant rice lines** BC4F1 seed already developed in collaboration with Breeding Division.	
94	**2.10 Development of BB resistant variety for Boro and T. Aman season** BRRI Rajshahi has made cross between BRRI dhan28 & BRRI dhan29 and IRBB65 for developing BB resistant variety.	
95	**2.11 Screening exotic lines for physiological resistance against Sheath blight** Physiological resistance and screening germplasms against ShB have already done in BRRI Rajshahi. Unfortunately, there were no resistant materials among the tested 28 materials. However Sabtri, CO9 and Tetep showed tolerant reaction against ShB. This experiment is being continued in braAus for confirmation	ShB tolerant variety
96	**2.12 Screening advanced breeding lines against BB and Tungro** 38 advanced breeding lines were tested against BB. None of the materials found resistant.	Identify resistant genotypes
97	**2.13 Natural screening of drought resistant materials against major diseases**	promising drought tolerant lines
98	**2.14 Biological Characterization and Management of Rhizoctonia oryzae sativae causal agent of Aggregate Sheath spot disease of Rice** Cultural characterization and Pathogenecity test of the pathogen, and In vitro chemical tests have already done.	Management practices against aggregate sheath spot
99	**2.15 Development of mass screening method for False smut disease of rice**	Resistant germplasms against false smut

	Though inoculated seeds showed better performance than non inoculated seeds in false smut development. However need to repeat for more confirmation.	
	Epidemiological studies	
100	3.**1 Effect of different missing nutrient element on rice sheath blight and BB disease development and natural incidences of other rice diseases** Still no distinct effects were found from this experiment.	Suitable and effective disease management
101	3.**2 Epidemiological study of *P. grisea* from different ecosystem** During Boro 2010-11 over all disease incidence was very low however in T. Aman 2011, incidence of blast disease was quite severe.	Detail understanding the factors related to blast epidemics
102	3.**3 Epidemiology and management of Bakanae disease of rice** Incidence of Bakanae was high in Boro than Aus. BRRI dhan29 was most susceptible in natural field condition, while BR1 was in T. Aus. Seed borne inoculums is more important than soil borne inoculums. Seed and Seedling treatments are equally effective for to control Bakanae disease control. Benzimidazole fungicides and strobin fungicides are highly effective.	Detail understanding the factors related to bakanae epidemics
	Management of rice diseases	
103	**4.1 Collection, isolation and identification of *Trichoderma* spp. from different eco-system & their effect on ShB and other sclerotial fungi** Collected 24 isolates of *Trichoderma* spp. and characterized their morphology. In addition their effectivity test against *Rhizoctonia* also did *in vitro* condition.	*Trichoderma* strain identified
104	**Evaluation of new chemicals against BB disease** Eight chemicals were tested against BB, unfortunately none of the chemicals found effective under field condition. However, streptomycine based chemicals inhibited bacterial growth *in vitro* condition.	Effective rice disease management chemicals
105	**Evaluation of new chemicals against Sheath Blight disease** Twenty eight chemicals were tested against ShB, only 3 (Dizole, Emiscore & Powerblast) found effective under field condition in Gazipur, Rajshahi & Sonagazi.	
106	**Evaluation of new chemicals against leaf scald** Fifteen chemicals were tested against leaf scald among them 4 found moderately effective under field condition in Gazipur.	
107	**Evaluation of new chemicals against Blast disease** Nineteen chemicals were tested against blast among them five chemicals (Tricyclazole & Azox+cyproconazole group) found effective under field condition.	
108	**Evaluation of new chemicals against false smut disease in Rajshahi** Seven chemicals were tested against false smut, among them 2 (Difenoconazole+Propiconazole) were found effective as highest as 60% on BRRIdhan49 under field condition in Rajshahi.	
109	**Integrated Management of Sheath Blight Disease of Rice** BRRI recommended practices (transplant at 30 July) provided fewer diseases.	
	6-9 Others	
110	**6.1 Mycotoxin production by fungi isolated from stored rice grains** Mycotoxin production by fungi isolated from stored rice grains. Store grain fungi (*Rhizopus, Aspergillus, Penicillium* and *Fusarium*)	Mycotoxin in stored grain food

	identification has already done and chemical spray already done to analyze residual effect in grain. Apprehending new species of *Fusarium* associated with brown rice imported from Thailand.	
111	**7.1 Training on rice disease management and healthy seed production** 10 trainings have already done in Barisal and Rangpur region using IAPP fund	Enriched knowledge of farmers and SAAO
112	**8.1 Fact sheet and poster up gradation on rice diseases & management** With the collaboration of Training Division, it is going on	Information on rice disease management
113	**9.1 Advisory and clinical service** Around 200 persons got services from Plant Pathology Division on disease management	Farmers will be benefitted directly from the BRRI scientists

	Program Area: Entomology Division	
	I. Survey & Monitoring of Rice Arthropods	
114	**1.1 Pest monitoring at BRRI Farms** Data have been collected from 5 habitats of Aus, Aman and Boro.	Incidence patterns of insect pests and their natural enemies
115	**1.2 Incidence of insect pests and natural enemies in the light trap** Light trap data of different seasons have been collected from BRRI head-quarters and four regional stations.	Long term effect of climate change on rice insects and natural enemies
	II. Studies on rice insect pest ecology	
116	**2.1 Studies on the biology of rice gall midge** Adult male and female longevity, days required for completion of life cycle, average number of generations per year and month of high infestation (August) have been determined. BRRI dhan 33 produced little or no onion shoots.	Better management system for GM
	III. Biological Control of rice insect Pests	
117	**3.1 Development duration and fecundity of *T. zahiri* at different constant temperatures** Developmental duration decreased with increased temperature (18 to 34^0C) and the highest fecundity was found at 26^0C.	Determination of suitable temperature regime for *T. zahiri*
118	**3.2 Adult longevity of *T. zahiri* on different diets** The highest longevity of *T. zahiri* was found with host food + 25% honey solution.	Mass rearing of the parasitoid
	IV. Crop Loss Assessment	
119	**4. 1 Relationship between rice hispa damage and yield loss** Data collection and analysis on yield losses of 3 Aus varieties and 4 Aman varieties have been completed and 3 Boro varieties are going on.	Hispa tolerant BRRI varieties
120	**4.1 Test of different insecticides against major insect pests** A total of 120 insecticides were evaluated against BPH, RH and YSB. Among them 98 were found effective	Effective new pesticides
	V. Host Plant Resistance	
121	**5.1 Screening of IRBPHN materials** A total of 114 materials were screened against BPH of which 14 materials were MR to R. There are about 91 materials yet to be screened against BPH, WBPH and GLH.	Insect pests resistant/ tolerant lines

	Program Area: Socio-economics and Policy **Program Performing Unit: Agricultural Statistics Division**	
122	**I. Yield Assessment through crop-cuts** **1.1 Estimation of Area and Production of Rice in Bangladesh** One year field data are available, Boro data are being collected and analysis is going on.	Reliable and unique estimates on area and production of rice in Bangladesh
123	**II. Stability Analysis of BRRI varieties** (In collaboration with Pl. Breeding Div., ARD and Regional Stations) **2.1 Study on G x E interaction of BRRI varieties** Season, year and location-wise data on yield of BRRI varieties at different regional stations have been generated for eight years to perform stability analysis according to the model developed by agricultural statistics division	List of varieties with stability measure by season Bio-physical factors affecting stability of varieties identified
124	**III. Development of Computer Program** **3.1 Development/modification of software for Payroll/ administration/accounting system for BRRI employees** Time to time modification of BRRI payroll system is being done on request from accounts section. Now, we are trying to update the Payroll system administration/accounting software by Win-base.	Development of software for administrative/ accounting system of BRRI
125	**IV. Genetic Coefficient of BRRI Varieties** **4.1 Study on genetic coefficient of BRRI released varieties** (In collaboration with Pl. Physiology and Soil Science Div.) Data have been generated for three years. DSSAT4.0 software has been collected and trying to match data with the software	Genetic coefficients of BRRI varieties
126	**4.2 Growth and structural stability in area, production of rice, wheat, maize, jute and vegetables (potato and tomato) in Bangladesh**. Final report presented in Annual Research Review workshop 2011-12.	Change in area, production and yield of rice, wheat, maize jute, potato and tomato
127	**V. Spatial database for BRRI varieties** **5.1 Suitability mapping of BRRI dhan44, 46 and 47, 50 and hybrid dhan4** Preliminary work has been done for suitability map of BRRI dhan44, 46 and 47 47, 50 and hybrid dhan4.	Suitability maps for BRRI varieties
128	**VI. GIS application for estimation of areas suitable for submergence tolerant BRRI varieties** **6.1 Distribution of Arsenic (soil and water) in gangetic flood plain** (In collaboration with soil science Div. and Cornell University under FFP) In total 1524 soil samples and 508 water samples from 508 location has been collected and about 620 soil samples has been digested, 329 water samples analysed for As and 206 samples analysed for Fe and Mn and Data entry have been completed by this time.	Areas suitable for growing submergence tolerant BRRI varieties
129	**6.2 Identification of submergence areas for growing newly developed BRRI varieties** (In collaboration with Ag. Econ and RFS Div) Spatial data has been collected for identification of submergence areas for growing newly developed BRRI varieties	

130	**VII. Characterization of rice environment in Bangladesh** **7.1 Ground truthing of the characterization maps** Fine tuning of rice growing environment of Bangladesh (Boro and T. Aman) in relation to BRRI varieties with new soil database is under process.	Thematic and integrated maps of climatic variables and soil properties. Suitability maps for growing BRRI varieties
131 132	**VIII. Information and Communication Technology (ICT)** **8.1 BRRI Website Management** Network is on work. Fifty users have their own email address made through BRRI web mail. BRRI website is being updated according to some requirements of BRRI **8.2 ICT Network Management at BRRI** At present BRRI Internet is 1mbps to 4 mbps DDN bandwidth connectivity. So, internet speed is faster than previous one and we will able to give internet connection in 250 computers.	All divisions of BRRI will be connected with global as well as with each other through network
133	**IX. Maintenance of Agricultural Database** **9.1 Maintenance of rice and rice related variable database** It is a continuous process. Data has been updated with current information	A computerized database of rice and other minor cereal and non- cereal crops
	Program Performing Unit: Agricultural Economics Division	
	I Production Economics & Technology Adoption	
134	**1.1 Farm Level Evaluation of Modern Rice Varieties in Bangladesh** For Aus season 2010, data of 400 farmers have been collected. Data of 380 and 219 farmers have been collected for T. Aman and Boro seasons, respectively.	Variety wise adoption rate of MV Aus, T. Aman and Boro rice all over the country
135	**1.2 Estimation of Costs and Return of MV Rice Cultivation at Farm level** Data have been collected from 60, 60 and 33 sample farms for Aus, T .Aman and Boro seasons, respectively.	Costs and return of MV rice cultivation
136	**1.3 Hybrid Rice Technology and Its Sustainability: A study on Food Security in Bangladesh** Data collection was carried out from 500 farmers and reporting already finished	Adoption rate of hybrid rice
	II: Agricultural Policy and Development	
137	**2.1 Returns to Investment in Rice Varietal Research in Bangladesh** Data collection from secondary source is going on	The rate of return of post-1990 BRRI released modern rice varieties
138	**2.2 Tracking in Adoption of Improved Rice Varieties in Different Production Environments / Ecosystems of Bangladesh** Data collection was done from four expert panel discussion, 20 community survey and 500 farmers was completed	Quickest and cost effective data collection systems be identified
139	**2.3 Long term growth Analysis of Food grains in Bangladesh** Data analysis has been completed and report writing is going on	Growth of food grains in Bangladesh

	Program Performing Unit: Farm Management Division	
140	**I. Project:** Rice Production Management	
	1.1 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.

141	**1.2 Effect of quality seed and farmer's seed for seed production and yield gap between quality seed used plot and farmers' seed used plots** The crops were harvested and data collection process is running.	Yield gap minimization
142	**1.3 Effect of harvest time for producing quality seed of rice** Some yield components data were collected and the rest data collection is under process	Harvesting date after flowering for quality seed
	II. **Cost of production**	
143	**2.1 Cost and return of HYV rice cultivation at BRRI Gazipur Farm** The cost of production of per kg of aus rice was higher than aman rice	Cost of per kg rice production
	III. Survey and development of data base for labor management	
144	**3.1 Monitoring the laborers' wages rate for rice cultivation around BRRI Farms** The peak period was in May –June'2011 (Tk. 400-500 man day^{-1}) but in July-August'2010 it was Tk. 245-350 man day^{-1}. In December- January the rate was Tk. 300-390 man day^{-1}.	Average wage rate through out the year
145	**VI. Management and utilization of land and other resources** Ten activities were done on seed production, irrigation, drainage, beautification etc.	Efficient utilization of farm resources

Program Area: Technology Transfer

Program Performing Unit: Adaptive Research Division

	I. Validation of Technologies	
146	**1.1. Advanced Lines Adaptive Research Trial (ALART).** Evaluated general and specific adaptability of different advanced lines under on- farm condition during Aus 2011, Aman 2011 and Boro 2012. B. Aus-3 advanced lines T. Aus-1 advanced line T. Aman (PQR)-3 advanced lines T. Aman (RLR)-2 advanced lines Boro (PQR)-3 advanced lines Boro (Micronutrient)-4 advanced lines	New variety may be released for different agro ecological zones of Bangladesh with some special characters after Proposed Variety Trial (PVT).
	II. Dissemination of Technologies	
147	**2.1 Seed Production and Dissemination Program (SPDP) of BRRI varieties** Demonstrated popular BRRI varieties for motivating farmers and accelerating their dissemination throughout the country in three rice growing seasons.	Adoption of MV for increased yield
148	**2.2 Demonstration of Leaf Color Chart (LCC) for need based nitrogen management in rice cultivation** On-farm trials were conducted to create awareness of the farmers and disseminated LCC as a tool of judicious urea application during Aman, 2011 and Boro, 2012.	Saving of urea.
149	**2.3 Upscalling of Urea Super Granule (USG) application for continuous N supply in wet land rice cultivation.** On-farm trials of USG were conducted in 11 upazilas of 8 districts in T. Aman and 16 Upazilas of 10 districts in Boro season under core program. Trials on USG were also conducted in 35 upazilas of 9 southern coastal	Popularization of USG application

	districts under SRRPP during T. Aman and 41 upazilas of above 9 districts during Boro season.	
150	**2.4 Up-scaling of alternate wetting and drying (AWD) irrigation method as an effective water saving technology** Trials on AWD were conducted in 41 upazilas of 9 southern coastal districts under SRRPP during Boro, 2012.	Saving of irrigation water
	2.5 Demonstration of using poultry manure as organic manure in rice culture Demonstration trials on poultry manure application were conducted in 8 upazilas of 5 districts under core program during Boro, 2012.	Reduction of chemical fertilizer use
	III. Promotional activities	
151	**3.1 Farmers training and field days** Farmers' training on modern rice production technologies were arranged during Aus, 2011, Aman, 2011 and Boro, 2012. Seventy six, 18 and 14 farmers trainings arranged under SRRPP, AFACI and YGMR respectively. Field days were also arranged to disseminate rice production massage among the farmers during the above reporting period under different program. Seventeen, 25, 6 and 4 field days were arranged under core program, SRRPP, YGMR and AFACI respectively.	Capacity build up for MV rice cultivation
	IV. **Enrichment of own seed stock**	
152	**4.1 Seed production at BRRI farm** Produced quality rice seeds for next season adaptive research trials during Aus, 2011, Aman, 2011 and Boro 2012.	Quality rice production

	Program Performing Unit: Training Division	
	I. Capacity building and technology transfer through training	
153	1.1 Rice Production Course (Climate Change) Participant: Project Scientists of BRRI No. of Participants: 18 Duration : 1 week Batch : 01	Empowering researchers for planning, implementing and reporting research
154	1.2. Rice Production Techniques Participant : AEO of DAE No. of Participants: 90 Duration : 1 week Batch : 05	Solution of field problem on rice by SAAO
155	1.3. Modern Rice Production Technologies Participant : SAAO of DAE No. of Participants: 309 Duration : 1 week Batch : 10	Solution of field problem on rice by SAAO
156	1.4. Modern Rice and Seed Production (Climate change) Participant : SAAO of DAE No. of Participants: 356 Duration : 1 week Batch : 15	Solution of field problem on rice by SAAO
157	1.5. Training for Trainers on Modern Rice Production technologies Particiapant : Agriculturists in NGO (SUSFER) No. of Participants: 26 Duration : 1 week Batch : 01	Master trainer
158	1. 6. Utilization of Bangladesh Rice Knowledge Bank (BRKB)	Utilization and extension of BRKB

	Participant : SAAO, AEO and Service providers of USI centre No. of Participant : 78 Duration : 3 days Batch : 3	
159	1.7. Minimization of Rice Yield Gap Participant : DAE Officers No. of Participant : 62 Duration : 2 days Batch : 03	Increased rice production at farm level.
160	1.8. Modern Rice and Quality Seed Production (Climate change) Participant : Farmers No. of Participants: 700 Duration : 1 day Batch : 12	Quality seed production at farmers level
161	1.9. Modern Rice Production Participants : Farmers No. of Participants: 150 Duration : 1 day Batch : 05	Improvement of farmers knowledge on rice production
162	1.10. Workshop on Development of Bangladesh Rice Knowledge Bank Participant : BRRI scientists No. of participant : 40 No. of workshop : 02 Duration : 3 days	BRKB materials will be enriched.
	II. Evaluation of imparted training program	
163	2.1. Performance of long and short term training programs. Duration: Throughout the year	Improvement of training course
164	III. **Development and Utilization of Bangladesh Rice Knowledge Bank** Member of BRKB group : 15 Scientists Selection of Pilot Upazila: 15 Member of BRKB user group : 20 Developed new fact sheets: 20 Printed Poster-3000, Bookmark-2000 Sticker-1000 Updated BRKB CD distributed: 4000 Dev. Flip Chart: Content completed.	Enriched BRKB

	Program Area: Rice Farming Systems	
	Program Performing Unit: Rice Farming Systems Division	
	I. Survey	Improvement of existing farming systems in hilly areas
165	**1.1. Study of existing farming systems in the eastern hill tracts of Bangladesh (AEZ 29)** Questionnaires have been developed	
166	**II. Intervention of farming systems technologies for improving livelihood of resource poor farm households** Two experiments have been taken.	
	III. Development of Resource Conservation Technologies Seven experiments have been executed.	Resource saving farming systems technologies
167	**3.1 Evaluation of crop management options for narrowing yield gap in Boro and T. Aman rice** In Boro season, BRRI recommended management + LCC practices produced higher grain yield (6.71 t/ha), which was about 43% higher than	Resource saving

	the farmers management practices (4.58/ha). In T. Aman season, BRRI recommended management and recommended management + USG practices produced higher grain, yield which was about 55 and 48% higher than the farmers' practice (3.25 t/ha), respectively.	
168	**3.2. Crop residue and weed mgt. of permanent raised beds in rice-wheat-mungbean systems** In wheat-Mungbean-DS Aman pattern, the higher grain yield of Wheat was (3.00 t/ha) produced by permanent beds with 100% crop residue retention. Moreover, an average wheat grain yield was better in different bed practices than conventional practices. Mungbean was damaged due to excessive rainfall during crop establishment. In Aman season, average grain yield of DS Aman was (3.46 t/ha) in different bed practices and in conventional practice was (3.35t/ha).	
169	**3.3. Evaluation of different cropping patterns in irrigated medium highland ecosystem** Among five cropping patterns, the yield of potato and mustard were 12.5 (t/ha) and 0.64(t/ha) respectively. In addition, yield of Boro and DT Boro were 6.23(t/ha), 5(t/ha) and 5.5(t/ha) under Boro- F-T. Aman, Boro -T. Aus -T. Aman and Potato-DT Boro-T. Aman cropping patterns. Moreover, Yield of T. Aman was ranged from 4.41 to 6.4 (t/ha).	
170	**3.4 Evaluation of *Sesbania* incorporation and weed management** On going. During T. Aman season, irrespective of weeding method, 40 days old sesbania incorporation through herbicide application gave about 8% higher grain yield than without sesbania incorporation.	
171	**3.5 Evaluation of intercropping grass pea in maize and *Sesbania* in Aus in Maize-DS Aus-DS Aman cropping pattern** There was no significant difference in yield between sole maize and grasspea intercropped maize.	
172	**3.6 Evaluation of crop establishment method and weed management option in Aman rice under Boro–T. Aman cropping pattern** The study was not done due to excessive rainfall in Aman season. Boro is in the field.	
	IV. Development of Two and Three Crop Systems and Component Technology Fourteen experiments have been executed.	
173	**4.1 Evaluation of double transplanting and normal transplanting of T. Aman and Boro rice under T. Aman-Boro cropping system** Irrespective of variety and planting method BRRI dhan46 yielded (6.67 tha^{-1}) higher than other varieties transplanted on 25 July. Due to double transplanting (30+30 DOS) yield of BRRI dhan49 was 2.35 t ha^{-1} whilst, BRRI dhan49 was yielded only 0.98 t ha^{-1} at (30 D0S) normal transplanting on 25 September.	
174	**4.3 Long-term effect of three cropped cropping patterns on the agro-economic productivity and soil health** The highest REY (17.53 t/ha) was obtained from Potato-Boro-T. Aman cropping pattern (Rangpur site). The highest REY (17.8) was found from Potato-Boro-T. Aman cropping pattern followed by Boro-T. Aus-T. Aman (13.1), Boro-Fallow-T. Aman cropping pattern (13.2) and the lowest REY (11.1) was found from Maize-	

	Mungbean-T. Aman cropping pattern (Gazipur site).	
175	**4.4 Productivity evaluation of the Boro-T. Aus-T. Aman cropping pattern** In Boro-T.Aus-T.Aman cropping pattern, highest total grain yield of rice was obtained from the pattern BRRI dhan28- BRRI dhan48- BRRI dhan46 (12.18 t/ha) followed by BRRI dhan28- BR26- BRRI dhan33 (10.28 t/ha), BRRI dhan28- BRRI dhan48- BRRI dhan33 (10.48 t/ha), BRRI dhan28- BR26- BRRI dhan46(11.98 t/ha) and BRRI dhan28- BRRI dhan48- BRRI dhan49(11.78 t/ha), BRRI dhan28-Laughuri-Horafdi(10.40 t/ha) and BRRI dhan28-Mala- Horafdi(10.81 t/ha).	
176	**4.5 Evaluation of Boro-Fallow-T. Aman cropping pattern in the saline area** In Aman season-2011 BRRI dhan44 yielded higher (5.02 t ha^{-1}) followed by BR23 (4.54 t ha^{-1}). On the contrary local variety yielded 2.71 t/ha.	
177	**4.6 Evaluation of Vegetable-DS Aus- T. Aman cropping pattern in partially irrigated ecosystem** Spinach yielded 17.18 tha^{-1}. Average yield of potato, Tomato, Carrot and Red Amaranth were 17.40, 26.97 5.25 and 1.23 t ha^{-1}. In Aus season, average yield of BRRI dhan42 was 2.79 t ha^{-1} and average yield of BRRI dhan33 was 3.99 t ha^{-1} in T. Aman season.	
178	**4.7 Evaluation of time of seeding and variety on the productivity of dry seeded Aman rice under Rice-Wheat-Mungbean cropping pattern** BRRI dhan49 gave higher grain yield than other varieties at all seeding time. There was little relationship between time of seeding and varieties. Interestingly BRRI dhan33 gave higher grain yield at 30 July seeding than earlier seeding dates. On the other hand, BRRI dhan49 gave higher yield at earlier establishments. BRRI dhan53 gave highest grain yield at 10 July. All varieties didn't follow any specific trend at different seeding dates.	
179	**4.8 Performance of different types of seed bed for the quality of seedlings and yield in Aus, Aman and Boro seasons** This experiment was started in Aman, 2011. There were five types of seed bed. The yield of BRRI dhan49 under wet, dry, dapog, modified nursery-1 and modified nursery-2 seed bed were 5.9, 5.2, 5.0, 5.5 and 5.0t/ha respectively. Boro is in the field.	
180	**4.9 Evaluation of relay intercropping in Rabi in Rabi-Aus-T. Aman cropping pattern in medium highland** In Aman season, average yield of BRRI dhan49 was 4.33 t ha^{-1}.	
181	**4.10 Intesification single Boro cropping pattern by introducing T. Aus rice in medium lowland nonsaline ecosystem** In Mustard-BRRI dhan28-Fallow-Fallow and Mustard-DT BRRI dhan29-Fallow-Fallow cropping patterns, BARI Sarisha15 yielded 1.24 and 1.19 t/ha, respectively. On the other hand, yield of BARI Sarisha15 was 0.934 and 1.05 t/ha in Mustard-BRRI dhan28-Fallow-T. Aman and Mustard-DT BRRI dhan29-Fallow-T. Aman cropping patterns, respectively. Boro rice (BRRI dhan29 & 28) is in the field. **V. Validation and delivery of farming system technologies** Seven activities have been executed	
182	**5.1. Promotion of improved cropping patterns**	

	The The average grain yield of Boro varieties BRRI dhan29 and 28 were 6.07 & 5.51 t/ha, respectively. On the other hand, average grain yield of T. Aman varieties BRRI dhan49 and 46 were 4.75 & 4.19 t/ha, respectively in Boro-Fallow-T. Aman cropping pattern at Kapasia.	Agro-economically profitable farming systems technologies
183	**5.2 Promotion of improved varieties of turmeric and zinger cultivation in homestead** The yield of turmeric and zinger on an average were 9.46 t/ha and 8.11 t/ha from a homestead area of 38.6 m^2 and 5.5 m^2 respectively.	Farmers' awareness
184	**5.3 Vaccination of poultry birds** There were 347 chickens, 27 goats and 71 cows were vaccinated. There was no mortality in vaccinated goats and cows. However, the mortality of vaccinated chicken was 8%. This due to another factor that is unhygienic dwelling and extreme cold.	
185	**5.4 Multilocation testing of improved cropping pattern at different locations of Bangladesh** During Boro season, yield of BRRI dhan29 was 6.49 t/ha, which was 8.89% higher than Pajam in Trisal, Mymensingh. In T. Aman season, yield of BRRI dhan49 was 5.56 t/ha which was 26.94% higher than that of BR10 in Trisal, Mymensingh. During Boro season, yield of BRRI dhan29 under BRRI recommended practice was 7.65 t/ha which was 15.56% higher than that farmer's practice in Ulipur, Kurigram. In T. Aman season, yield of BRRI dhan46 was 4.26 t/ha which was 46.9% higher than that of Panisaiol in Ulipur, Kurigram. In Brammanbaria district the average yield of BRRI dhan46 was 5.16t ha^{-1}. Boro is in the field.	
186	**5.5 Demonstration and evaluation of poultry manure as a source of organic manure in Boro-Fallow-T. Aman cropping pattern** In Boro season, all fertilizers (–P) + poultry manure applied plot gave 15% higher grain yield than the all fertilizers (–P) applied plot which was 10% lower than the all fertilizers applied plot in Boro season. On the other hand, In T.Aman season, all fertilizers (–P) + poultry manure applied plot gave 13% higher grain yield than the all fertilizers (–P) applied plot which was 7% lower than the all fertilizer applied plot.	
187	**5.6** Farmers' training One farmers' training was conducted.	
	VI. Donor funded project Source of fund: BARC and IFAD	
188	**6.1. Maximizing the productivity of late T. Aman-based cropping patterns through newly released BRRI dhan46** Will be presented in the Internal Review.	Increased yield
189	**6.2. Support to Agricultural Research for Climate Change Adaptation in Bangladesh 12 activities have been done** Will be presented in the Internal Review.	Documentation of RFS technologies

Programme Area: Farm Mechanization and Postharvest Technology

Program Performing Unit: Farm Machinery and Postharvest Technology Division

190	**1.1 Performance evaluation of direct seeding machine (PTO seeder) for minimum tillage systems** Strip tillage (direct dry continuous seeding in rows) was done by PTOS during Boro 2012 for BRRI dhan29 and BRRI dhan46 at HQ farm. Crop establishment was found non-uniform. Field crack was not observed. Agronomic data were recorded.	Resource conserving technology for rice production will be developed
191	**1.2 Evaluating and modifying of BRRI developed machines** BRRI existing power winnower has modified and power unit has transferred from electric motor to diesel engine.	User friendly winnower
192	**1.3 Effect of soil settling period on performance of Rice Transplanter** Four settling periods 24hr, 32hr, 48hr, and 56hr were considered for this study. The performance of three rice transplanters on four specified settling period was observed.	Settling period of different soil type will be identified for successful operation of mechanical rice transplanter
193	**1.4 Performance evaluation of BRRI USG applicator in different location of Bangladesh** BRRI USG applicator was tested in 12 locations of the country during Boro/2012 season. Machine performance data was recorded. Agronomic data is under process. The drive wheel and skid of the applicator was also modified from metallic to plastic form taking fund support from FMTD project. The assembling is under process of the modified version.	Validation of BRRI developed USG applicator in different soil condition
194	**1.5 Evaluation of strip tillage and bed planting to establish rice and maize in drought area of Bangladesh** Under different tillage system (strip, bed, zero and conventional puddling) transplanting was done with three varieties (BR 10, BR11 and BRRI dhan49) at BRRI R/S Rajshahi. Yield and agronomic data were also recorded. Cost analysis was done. The result will be presented in research review workshop for 2012-13.	Human drudgery and cost of production will be minimized.
195	**1.6 Study the effect of spacing on yield transplanting by mechanical rice transplanter**	Appropriate spacing will be selected for mechanical rice transplanter
196	**Feasibility Study of Solar Photovoltaic (PV) Irrigation Pump** Photovoltaic irrigation system was designed. Three solar panels of each 50 watts with other accessories were set up in the FMPHT division. As per designed, 0.5hp pump was installed in the FMPHT division also. Data collection is under process.	Increased opportunity of Solar Photovoltaic (PV) in Irrigation system
197	**Physical and thermo-chemical characterization of rice husk** The experiment is completed and final report will present in next annual research review workshop.	Rice husk properties database will be developed which is very important for thermo chemical conversion system
198	**Design and Development of a Up-draft Gasifier** The experiment is completed	Rice husk based gasifire will be developed
	Study of biogas for farm machinery operations Biogas plant has been constructed. Initial charging has been completed.	Increased opportunity of biogas in operation of farm machineries

199	**Industrial and farm level extension of BRRI machinery and Postharvest technology** In the year of 2011-2012, a total 80 demonstration cum training programmes and 30 manufacturers training programmes were conducted at project side as Gazipur, Comilla, Kustia, Rangpur and Rajshasi resion.	Awareness will be created about BRRI developed machineries
200	**Maintenance practice scenarios of agricultural machinery in farmers field** Questioner was prepared and data collection will be started soon.	User manual will be developed for successful operation of agril machinery
	Program Performing Unit: Workshop Machinery and Maintenance Division	
201	**I. Design and development of power transmission system of a power unit** Design, drawing and manufacturing of gearbox as well as chassis has already been completed. Assembling is going on at BRRI Research Workshop	Easy power transmission
202	**II. Design, development, modification and introduction of self-propelled reaper and mini-power tiller to augment crop production** Fabrication is going on.	Simple, less weight and easy to operate self-propelled reaper and mini-power tiller
203	**III. 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.
204	**IV. Design and development of a small windmill for electricity generation** Different types of data related to wind speed were collected. It needs further study.	A small and low cost windmill will be developed
205	**V. 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/manpower/electricity	A circular type cutting blade system will be developed for minimizing vibration
206	**VI. Study on cone penetration resistance of agricultural soil** The study has been completed and presented in last annual research review. It needs further study.	A model of cone penetration resistance of different types of soil will be developed.
207	**VII. Database development for repair and maintenance of BRRI's farm machineries and auto-mobiles of a power unit.** Database software (1st version) has been developed and presented in last annual research review. Second version should be developed to make it more users friendly.	A database will be developed.