

Research Progress 2010-2011

A. Program area: Varietal Development Program

A1. Program performing unit: Plant Breeding Division

	Research Progress	Expected Output
1	Development of Upland rice Back cross breeding has been made to introgress drought tolerance, short duration (85-90 days) into modern genetic background and three advance breeding lines have been selected from regional yield trial	Drought tolerant DSR for upland ecosystem.
2	Development of T Aus rice Four most promising lines out of 8 genotypes selected to test their regional adaptability	Short duration T. aus varieties.
3	Development of shallow flood tolerant rice Some crosses made for introgression of Sub1 gene into breeding lines suitable for shallow flooded deep water ecosystem	Development of rice varieties for shallow flooded deep water (1 m) environment
4	Development of rainfed lowland rice (RLR) Five advanced breeding lines were selected from Regional Yield Trials based on short to medium growth duration.	Short duration variety with good grain quality
5	Development of tidal submergence tolerant rice Two lines were selected from Regional Yield Trial for tidal non-saline conditions.	Development of non-saline tidal submergence tolerant variety.
6	Development of submergence and water stagnation tolerant rice a. Twelve single crosses and 13 multiple/back crosses were done. b. 690 progenies were selected under submerged condition and 614 progenies were selected under medium stagnant water condition. c. In MAS, 5 best plants were selected from each of the BC ₁ F ₁ populations and 1052 BC ₂ F ₁ seeds were produced for introgressing <i>SUB1</i> into BRRi dhan33, BRRi dhan44 and BRRi dhan49. d. Under 21-days submergence of Gazipur, IR64-Sub1 produced around 2.0 t/ha more yield and 2-3 weeks earlier growth duration than BRRi dhan51 and BRRi dhan52. e. The performance of Lakhi and Saita were highly satisfactory like tolerant check FR13A.	These submergence and water stagnation tolerant rice lines will increase the productivity in the submergence and water stagnation prone low lying areas of the country.
7	Development of salt tolerant rice a. Three promising lines were identified as promising salt tolerant for Aus season. b. Two promising salt tolerant lines were identified for T Aman and two were evaluated by NSB team for Boro season.	Salt tolerant varieties
8	Development of premium quality rice Two promising genotypes selected from Secondary Yield trial for T. Aman and 9 promising genotypes in Boro season.	Premium quality rice varieties
9	Development of standard Boro rice Two genotypes were identified as high yielding in Proposed Variety Trial.	These genotypes will be submitted to NSB for releasing as varieties
9	Development of low amylose rice Generation of breeding populations are in developmental stage	HYV rice genotypes with low amylose (<20%) contents for ethnic people
11	Development of micronutrient enriched rice a. Four genotypes with high iron and zinc content were selected from SYT b. 500 Genotypes from Genebank and 500 Genotypes from NPT were screened for high Zn content c. Bio-efficacy trial with collaboration with ICDDRDB and WAS,	Development of high yielding rice variety along with high Fe (14 ppm), Zn (26 ppm) and Vitamin A contents

	Australlia	
12	Development of disease resistant rice One advanced line for BB and Two lines for RTV were finally selected in T Aman season	Development of BB and RTV resistant genotypes
13	Development of insect resistant rice Thirty five and five genetically fixed lines have been selected in T Aman and Boro season, respectively	Gall Midge and BPH tolerant rice varieties will be developed
14	Development of aerobic rice Under dry direct seeded aerobic condition, IR84984-83-15-6-B-B showed the highest yield (0.56 kg/plot) while the checks BRRI dhan28 and BRRI dhan45 gave 0.18 and 0.26 kg/plot respectively with more or less similar growth duration in Boro 2010-11.	Development of aerobic rice variety

A2. Program performing unit: Biotechnology Division

15	<p>Development of rice variety through anther culture Development of salt tolerant rice lines through anther culture (2010-2011) Only the anther from cross of BRRI dhan29 X BRRI dhan40 gave single callus but other 17 crosses did not produce any calli. Although more than 1000 anthers were plated from each cross.</p> <p>Hybridization In total 735 F1 seeds were obtained from nine crosses.</p>	Elevated salt and drought tolerant entries
16	<p>Development of drought tolerance rice lines through <i>in vitro</i> Screening Highest callus was produced by BRRI dhan49 followed by BRRI dhan46. Highest number of calli were found in control media (PEG=0) followed by P5 (PEG=5gm/l) media.</p> <p>Progeny selection: In T. Aman/2010 a total of 226 plants were selected and 146 plants were planted for the selection of superior plants in Boro/2011.</p> <p>Observational trial: In T. aman/2010 seven superior genotypes were selected and in Boro/2011 a total of 19 genotypes were planted for further evaluation.</p>	

17	<p>Application of DNA markers</p> <p>Pyramiding gene for resistance to Bacterial blight (BB) Two backcrosses were made and 415 BC₂F₁ and 171 BC₃F₁ seeds were obtained.</p>	Breeding lines possessing two (<i>Xa13</i> and <i>Xa21</i>) BB resistance genes.
18	<p>Introgression of submergence tolerance gene <i>SUB1</i> in BRRI dhan44 172 BC₁F₁ heterozygous plants bearing <i>SUB1</i> gene was identified using molecular marker. Among them 4 best plants were selected and were harvested 481 BC₂F₁ seeds</p> <p>Eighty eight molecular marker were screened and 8 identified as polymorphic</p>	Submergence tolerant variety
19	<p>Identification of yield enhancement QTLs Four backcrosses were made for identification of yield QTLs and 618 BC₂F₁ seeds were obtained from these crosses. Two thousand primers were surveyed and 50 were found polymorphic.</p>	Identification of yield enhancing QTLs.
20	<p>Identification of QTLs for salinity at both seedling and reproductive stage Screening at reproductive stage is completed morphological and yield contributing characteristics were collected. Sixty nine primers were surveyed and 11 were found polymorphic.</p>	QTLs for salinity tolerance
21	<p>Genetic diversity analysis in Aus genotypes using SSR markers Genotyping of 94 Aus genotypes including both local and inbred have been completed at molecular level using 91 SSR markers.</p>	Information from DNA fingerprinting of 94 Aus genotypes can be used for further breeding program.

A3. Program performing unit: Rice germplasm and seed

22	<p>Genetic Resources conservation and management 327 germplasm have been collected. 1957 germplasm rejuvenated and 350 were characterized with 45 morpho-agronomic characters. 100 germplasm accessions were documented in computer database with available information from the descriptors.</p>	<p>Long term conservation of the rice germplasm and utilize them in further research. Resistance sources of biotic and abiotic stresses identified for future use.</p>
23	<p>Seed production and variety maintenance In total 105.78 ton Breeder seeds of 33 BRRI varieties were distributed in T aman, Boro and Aus seasons from previous year's production. All BRRI developed varieties are maintained as nucleus stock. In Aus 0.95 tons, in T. Aman 34.53 tons, in Boro 88.89 tons BS were produced.</p>	<p>Maintenance of pure seed stock and supply of breeder seeds to GO, NGO and private seed producing organizations under rice seed network of BRRI</p>
24	<p>Exploratory and genetic studies Genetic divergence studies with 40 entries were done.</p>	<p>Estimation of genetic variability</p>

A4. Program performing unit: Grain Quality and Nutrition

25	Grain Quality characteristics for variety development Determination of physicochemical and cooking properties of rice grain Numbers of promising lines have been identified.	High yielding breeding lines with desired grain quality (Physicochemical)
26	Nutritional quality assessment of rice Study on protein digestibility of rice and rice by products Protein digestibility for by-product of BRRRI dhan28 is going on.	Food habit selection.
27	G x E effect on Zn and Fe content of BRRRI varieties G x E effect of BRRRI dhan28 and BRRRI dhan29 of 9 regional stations is going on.	Suggestion for supplementary Zn and Fe

A5 Research and Development of Hybrid Rice in Bangladesh

28	Material development Identification of prospective maintainers & restorers. 120 test crosses were made	Hybrid variety
29	Identification of new heterotic hybrids 7 promising heterotic hybrids were identified.	Hybrid variety
30	Improvement of parental lines (BxB and RxR crosses) Pedigree generations (F2-F6) with 505 lines were advanced.	Hybrid variety
31	Evaluation of Parental lines & Hybrids Observational Trial (OT) 10 promising hybrids were selected for their higher yield and acceptable grain quality.	Promising hybrid varieties
32	Multilocational Trial (MLT) One hybrid gave 4.0 t/ha yield advantages over BRRRI dhan28.	Future hybrid
33	Small scale F1 seed production of promising hybrids Four new combinations were used to F1 seed production.	Future hybrid
34	Large scale CMS seed production of released hybrids 400kg, 600kg and 1450kg CMS seeds were produced of BRRRI hybrid dhan2, BRRRI hybrid dhan3 and BRRRI hybrid dhan4 respectively.	Seed increase
35	F1 seed production of released hybrids 18kg, 400kg, 500 kg and 40kg F1 seeds were produced of BRRRI hybrid dhan1, BRRRI hybrid dhan2, BRRRI hybrid dhan3 and BRRRI hybrid dhan4 respectively.	Seed increase
36	Dissemination of hybrid rice technologies Distribution of parental line seeds to the seed companies along with BADC for F₁ seed production 1125 kg parental lines seeds of three hybrids were distributed among the 26 seed companies for producing F ₁ hybrid seeds of BRRRI hybrid dhan2, BRRRI hybrid dhan3 and BRRRI hybrid dhan4 respectively.	Seed increase
37	Demonstration trial of BRRRI hybrids during Boro 2010-11 A total of 400 kg F ₁ seeds of BRRRI hybrid dhan2 and BRRRI hybrid dhan3 distributed to the 200 selected farmers of 25 districts by DAE for observing demonstration.	Popularize hybrid rice varieties among the farmers.

B. Program Area: Crop-Soil-Water Management**B1. Program performing unit: Agronomy Division**

39	Seeds and Seedling Effect of splitting tillers on yield of Boro rice Maximum no. of tiller/m ² could be obtained from 15 Dec and 30 Jan planting which resulted maximum new area coverage (3 times higher)	Potentiality of splitted tillers as planting material for new area coverage
40	Effect of grain filling period on seed quality of modern rice after flowering The samples were collected. Germination test will be done in T. aman season.	Optimum period for grain filling of rice
41	Planting Practice Effect of time of planting on growth and yield of advanced lines both in Aman and Boro seasons In Aman season BR7517-2R-2-1 gave higher yield (3.86t/ha) upto 10 Aug with minimum growth duration (99days)	Suitable planting time for future variety
42	Time of planting for salinity tolerant advance lines in T.Aman season Both advance lines (BRRI dhan53 and BRRI dhan54) gave higher grain yield in mid August and early September planting in BRRI R/S Sonagazi.	Optimum planting time for higher grain yield in saline region
43	Production package of BRRI dhan46 in late direct wet seeded situation BRRI dhan46 gave satisfactory yield in 15 September planting with 60kg seed/ha seed rate and NPK @ 60-10-30 kg/ha fertilizer.	Appropriate production package for higher yield in late situation
44	Fertilizer Management Influence of fertilizer package of green super rice GSR (HUA565) gave higher yield with STB fertilizer (NPK)	High yield with minimum fertilizers.
45	Increasing nitrogen use efficiency by different application methods and source of N fertilizer on rice yield Instead of last top dress of urea just before PI stage, urea solution (3.5%) could be sprayed without yield reduction and therefore a portion of urea could be saved	Improvement of N use efficiency
46	Screening for low input (N) rice genotypes No genotype selected	N use efficient variety
47	Effect of different rates of nitrogen application on growth, yield and N use efficiency of DWSR under AWD system Crop harvested but analysis not yet done.	Optimum doses of N for DWSR under AWD condition
48	Effect of N sources and methods of application on DWSR under AWD condition Crop harvested but analysis not yet done.	The effectiveness of LCC and USG on yield and NUE
49	Production package for salinity tolerant advance lines in T. Aman season BRRI dhan53 and BRRI dhan54 gave higher grain yield with STB-25% and STB fertilizer, respectively.	Optimum fertilizer packages for higher grain yield in saline region
50	Weed Management Study of economic threshold level of <i>Scirpus maritimus</i> in rice field Twenty <i>Scirpus maritimus</i> /m ² can be allowed for in significant loss of grain yield of rice.	Economic threshold level of <i>Scirpus maritimus</i>
51	Economic threshold level of weed (mixed population) Nine weed /m ² can be allowed without insignificant grain yield reduction.	Minimum weed density that does not reduce grain yield
52	Effect of continuous application of herbicides on weed species shifting Most dominant weed species was <i>E. crusgalli</i> followed by <i>C. difformis</i> and <i>S. maritimus</i>	Impact of long-term application of herbicides on weed flora

53	Weed seed bank dynamics in different cropping pattern at BIRRI Highest weed species was observed in the month of July to September.	Determine weed seed population in different depth of soil.
54	Potential allelopathic effect of some rice cultivars on <i>Echinochloa crusgalli</i> No allelopathic potential rice cultivars were found.	Weed suppressing potential of rice cultivars on <i>Echinochloa crusgalli</i> .
55	Effect of weed management strategies of DWSR on weed infestation, growth and yield of rice under alternate wetting and drying (AWD) irrigation system Crop harvested but analysis not yet done.	Investigation of different weed dynamics under AWD system.
56	Weed control options in wet-seeded rice Crop harvested but analysis not yet done.	Effective herbicide for weed control
57	Effect of water level on the efficacy of herbicide in transplanted rice Treatment effect was not found owing to delay establishment of crop (done at BIRRI R/S Bhanga).	Optimum water level for efficient use of applied herbicide
58	Performance evaluation of weed tolerant rice 1 (GSR) In case of two hand weeding weed tolerant rice 1 gave higher yield (3.97 t/ha)	Evaluate performance of weed tolerant Rice 1 (GSR)
59	Evaluation of candidate herbicides 27 herbicides were evaluated.	Weed control efficiency of new herbicides
60	Yield Maximization Influence of gibberellic and boric acid on rice yield Crop harvested but analysis not yet done.	Improvement of spikelet fertility and yield
61	Natural Resource Management Effect of waste water on plant growth and development Crop harvested but analysis not yet done.	Toxic substance uptake by the rice plant and its effect on grain quality of rice

B2. Program performing unit: Soil Science Division

62	Soil Fertility and Plant nutrition Site specific nutrient management for promising advanced lines. None of the advanced lines out yielded the check varieties. Laboratory analysis of plant N, P and K are going on.	Optimum and economic levels of NPK fertilizers
63	Identification and management of nutritional deficiency problem Long-term study on the effect of missing nutrient element on rice yield. Omission of N and K reduced grain yield of BIRRI dhan49 by 0.27 t/ha and 0.4 t/ha respectively from complete fertilizers at 52 nd crop during T. Aman season. Poultry manure treated plot (previously -SZn) produced 4.5 t/ha followed by mixed manure. SOM increased, P fertilization built up available P in soil, but when P was not applied the available P level decreased. Sulfur status of the soil increased due to industrial urbanization even in S omitted plot. Nitrogen was the yield limiting factor for all other sites, while in Hobiganj and Rangpur sites K response was observed.	Balanced fertilization increases yield and maintains soil health.
64	Effect of intensive rice cropping on rice yield under continuous wetland condition Annual rice production decreased overtime in unfertilized plot and came down to about 1.0 t/ha after 29 years of continuous cropping (Boro, Aus and T.Aman). NPKS fertilization showed little bit increasing trend or maintained static position in rice yield as of 1981.	Balanced fertilization produces optimum yield and maintains a good soil health.
65	Zinc and N interactions in MV rice in calcareous soil An application of N and Zn @ 120 and 7.5 kg/ha in Boro was found optimum but in T. Aman the rates of N and Zn were 90 and 2.5 kg/ha respectively.	Determination of appropriate dose of Zn and N in calcareous soils.

66	<p>Nutrient Use Efficiency in Rice Maximize rice yield in double/triple cropping pattern through balanced fertilization with organic amendment Triple rice pattern gave higher yield than double rice. The highest yield (11.5 t/ha) was observed in T3 (i.e. 50% NPK fertilizers + MM) of triple rice compared to 8.9 t/ha in double rice</p>	Maximize rice yield through organic amendment.
67	<p>Integrated Nutrient Management through Waste Concern Organic fertilizer Soil test based NPKS and waste concern organic fertilizer @ 3 t/ha + IPNS based chemical fertilizer produced statistically similar yield of 6.17 t/ha and 6.01 t/ha at BRRRI Rangpur; while at BRRRI Gazipur RS + IPNS and STB produced almost similar yield of 4.54 and 4.51 t/ha, respectively</p>	Reduced dose of chemical fertilizer and maintain soil fertility
68	<p>Studies of Soil and Environmental Problems Heavy metal contamination in water-soil-plant system A green house experiment was conducted with 0, 1 and 2 ppm Arsenic against water hyacinth. The changes of As conc. water decreased with time. After 2 hrs, As conc. decreased to 0.744 and 1.47 ppm from 1 and 2 ppm. The conc. reduced to 0.101 ppm and 0.72 ppm after 7 days. The percent removal of As was 25% after 2 hrs and 32% after 4 hrs from 1 ppm As. It was 22 and 29% from 2 ppm. The highest 90% As was removed from 1 ppm and 61% from 2 ppm. The ranking of As in water hyacinth plant parts was root>leafstalk>leaf.</p>	Water hyacinth acts as bioaccumulator to remove As from contaminated water.

B3. Program performing unit: Plant Physiology Division

	Research Progress	Expected output
69	<p>Salinity Mapping QTLs for salinity tolerance at reproductive stage of Boilam Data collection completed</p>	Development of salinity tolerance variety
70	<p>Salinity tolerance at seedling stage in T. Aman Out 40 materials 5 genotypes were selected (score: 3-5)</p>	Future variety
71	<p>Salinity tolerance at the seedling stage in Boro Data collection completed</p>	Future variety
72	<p>Submergence Characterization of floodwater around submergence time of Sub1 cultivars at different location of Bangladesh Sub1 introgressed varieties were sensitive to temperature, light and oxygen concentration of water.</p>	Better Sub1 introgressed variety
73	<p>Phenotypic and molecular diversity of submergence tolerant genotypes There exists an alternate source of Submergence QTL.</p>	Salinity tolerant variety development
74	<p>Drought Screening for drought tolerance ability of 111 breeding lines</p>	Drought tolerant variety
75	Screening for drought tolerance ability of 148 land race genotypes	
76	<p>Cold Screening for cold tolerance at the reproductive stage Some lines with short and medium growth duration are selected.</p>	Cold tolerant variety
77	<p>Mechanism of cold toleranc Data analysis and report writing in progress</p>	Nature of cold tolerant variety
78	<p>Water management for quality seedling raising Data analysis in progress</p>	Reduction of seedling mortality

B4. Program performing unit: Irrigation Water Management

79	Water Use Efficiency Improvement in Irrigated Agriculture Effect of irrigation interval based on AWD for water saving and N fertilization methods in transplanted rice cultivation The program has been executed. Analysis is going on.	Reduction of cost for water and fertilizer
80	Study on water productivity for rice based cropping system in different locations The experiment has been conducted with different cropping patterns.	Better cropping pattern.
81	Impact of fertigation on nitrogen efficiency and yield for rice cultivation The plots with fertigation were found better than the prilled urea plots.	Reduction of fertilizer cost
82	Utilization of Water Resources in Rainfed Environment Assessment of water source availability for irrigation to increase rice production in tidal areas of Barisal region Secondary information has been collected through the prescribed questionnaire. Data analysis is on-going.	Irrigated area expansion
83	Comparison of drought effect for direct seeded Vs transplanted rice in T. Aman season BRRI dhan 39 performed better under direct seeded condition.	Drought effect mitigation
84	Effect of supplemental irrigation on aromatic rice varieties in T Aman season No irrigation was required due to sufficient rainfall. BRRI dhan 34 and Kalizira performed better	Right transplanting time for utilizing maximum rainfall
85	Land Productivity Improvement in the Coastal Environment Fresh ground and surface water investigation for crop production in coastal saline areas of Bangladesh Salinity level of water from different sources was analyzed. This year the pond water salinity was higher than the previous years due to the cyclone "Aila".	Increased production in saline zone during boro season.
86	Assessment of farm reservoir for crop production in the coastal area at Sonagazi Winter vegetable was produced using stored water in farm reservoir.	Improved land productivity by cultivating rabi crops
87	Sustainable Management of Groundwater Assessment of groundwater resources and safe utilization in different geo-hydrological regions Monitoring of groundwater level is going on. Water level is declining day by day during dry season.	Installation of optimum number of tubewells.
88	Design, installation and test the performance of modified STW in coastal region of Sonagazi Test tubewell has been installed and performance test is going on.	Growing rice in every season
89	Effect of different water treatment with arsenic contaminated irrigation water on rice yield Low arsenic content was found in soil and rice plant under AWD condition.	Reduction of arsenic content in rice
90	Technology Validation in the Farmers' Field Demonstration of Alternative Wetting and Drying (AWD) Implemented in different districts. Farmers were willing to accept the technology as it was found better than the traditional method.	Reduction of water, fuel and electricity costs

C. Program Area: Rice Farming Systems Division

91	<p>Sub program I. Survey on Cropping Patterns of Bangladesh Cropping pattern survey in all Upazila of Bangladesh Results of 7 greater districts were reported in Annual Research Review Workshop. Results of rest of the 12 greater districts will be reported soon.</p>	Information on land type and cropping patterns, area coverage, rice yields and fallow period under different cropping patterns will be available.
92	<p>Study of existing farming systems in the eastern hill tracts of Bangladesh (AEZ 29). Questionnaire was developed.</p>	
93	<p>Intervention of Farming Systems Technologies for Improving the Livelihood of Resource Poor Farm Households</p> <p>Intervention and monitoring the whole farm activities of small farmers Interventions on N-management through use of LCC, water saving, high value summer and winter vegetables, production of turmeric and zinger in the homestead, etc are going on.</p>	Improvement of farmers' income and livelihood
94	<p>Intervention and monitoring the whole farm activities of landless farmers. Interventions on production of improved papaya in the homestead, rearing of layer and pigeon, spraying on mango and litchi bearing trees, rearing of goat and honey bee, etc are going on.</p>	Improvement of farmers' income and livelihood
95	<p>Development of Resource Conservation Technologies</p> <p>Evaluation of crop management options for narrowing the yield gap in Boro and T. Aman rice In T. Aman, BRRI recommended management, recommended management + LCC and recommended management + USG produced significantly higher grain yield, which was about 26.05, 25.78 and 18.42% higher than the farmers' practice (3.80 t/ha).</p>	Resource conserving and profitable cropping patterns along with component technologies for increasing system productivity.
96	<p>Crop residue and weed management of permanent raised beds in Rice-Wheat-Mungbean systems The higher grain yield of DS Aman (3.9 t/ha) was produced by permanent beds with 100% crop residue retention than other management practices viz., 50% crop residue retention, without crop residue retention and conventional practice in DS Rice-Wheat-Mungbean cropping pattern. Yield of wheat was better in bed (2.9 t/ha) than conventional system (2.3 t/ha).Mugbean is in the field.</p>	
97	<p>Evaluation of different cropping patterns in irrigated medium highland ecosystem In Boro-F-T.Aman, Potato-DT.Boro-T.Aman, Potato-T.Aus-T.Aman, Mustard-T.Aus-T.Aman and Boro-T.Aus-T.Aman cropping patterns, in Aman season, the yield of BRRI dhan49 was higher (5.27-5.5 t/ha) than BRRI dhan46 (4.67 t/ha).</p>	Resource conserving and profitable cropping patterns along with component technologies for increasing system productivity.
98	<p>Evaluation of <i>Sesbania</i> incorporation and weed management practices in T. Aman under Boro-Fallow-T. Aman cropping pattern During T. Aman season, irrespective of weeding method, 30 days old sesbania incorporation through herbicide application gave about 21% higher grain yield than that of without sesbania incorporation. Irrespective of Sesbania incorporation, hand weeding at 15, 30 and 45 days after transplanting gave about 97 % higher yield than without weeding. Boro has been harvested.</p>	

99	<p>Development of Two and Three Crop Systems and Component Technology</p> <p>Evaluation of double transplanting and normal transplanting of T. Aman and Boro rice under T. Aman-Boro cropping system There was no significant yield difference in BRRRI dhan49, BR22 and BRRRI dhan46 due to transplanting from 25 July to 25 August. Double transplanting gave 20-30% more yield than normal transplanting on 25 September. Boro has been harvested.</p>	Profitable cropping patterns and component technologies for partially irrigated highland ecosystem.
100	<p>Effect of planting time and seedling age on yield of rice in T. Aman-Potato-Boro/DT Boro cropping pattern During T. Aman, BRRRI dhan49 gave 4.48 t/ha grain yield. In Rabi season, potato was planted in 24 Nov., 02 Dec. and 10 Dec, 2010. Among them, 24 Nov. planted potato gave higher yield (33.75 t/ha). Double transplanted Boro rice has been harvested.</p>	
101	<p>Long-term effect of three cropped cropping patterns on the agro-economic productivity and soil health In Aman, yield of BRRRI dhan49 were 4.8, 4.7, 4.6, 4.7 t/ha in Boro-Fallow-T.aman, Boro-T.Aus-T.Aman, Maize-Mungbean-T.Aman, Potato-Boro-T.Aman cropping pattern respectively. BRRRI dhan28, BRRRI dhan29 and Maize have harvested. In Potato-Boro-T. Aman cropping pattern, potato yield is 16.0 t/ha.</p>	Profitable cropping patterns and component technologies for partially irrigated highland ecosystem.
102	<p>Productivity evaluation of the Boro-T. Aus-T. Aman cropping pattern In Aman, yield of BRRRI dhan46 and BRRRI dhan49 were 4.78(t/ha) and (4.6t/ha), respectively than Horafdi (3.5 t/ha) in Boro –T. Aus – T. Aman Cropping pattern. Boro has been harvested.</p>	
103	<p>Evaluation of Boro-Fallow-T. Aman cropping pattern in the saline area In Aman, BR23 yielded 4.71 t ha⁻¹ followed by BRRRI dhan40 (4.09 t ha⁻¹) but yield variation of BRRRI dhan46 was very high (1.67-5.28 t ha⁻¹). On the contrary local variety yielded 2.72 t ha⁻¹. Boro has harvested.</p>	Profitable cropping patterns and component technologies for partially irrigated highland ecosystem.
104	<p>Evaluation of Vegetable-DS Aus- T. Aman cropping pattern in partially irrigated ecosystem Average yield of BRRRI dhan33 was 3.39 t ha⁻¹. Spinach yielded 17.18 t ha⁻¹. Average yield of potato was 17.40 t ha⁻¹. DS Aus is in the field.</p>	
105	<p>Validation and delivery of farming system technologies</p> <p>Promotion of improved cropping patterns The average yield of BRRRI dhan49 & BRRRI dhan46 under improved management was 4.88 t/ha, which was about 21% higher than farmers' management in Boro-T. Aman-Fallow pattern at Kapasia. The average yield of sugarcane, okra and mungbean were 31.41, 3.56 and 0.34 t/ha in sugarcane intercropped plot. Boro has been harvested.</p>	Profitable farming systems technologies and farmers' awareness towards adoption of improved farming systems technologies.
106	<p>Promotion of improved varieties of turmeric and zinger cultivation in homestead The average yield of turmeric and zinger were 13.62 and 8 t ha⁻¹</p>	Profitable farming systems technologies and farmers' awareness towards adoption of improved farming systems technologies.
107	<p>Vaccination of poultry birds Vaccination program of poultry birds and livestock of 03 households is on going. The mortality rate of the vaccinated birds and livestock is monitoring and recording.</p>	

108	Multilocation testing of improved cropping pattern at different locations of Bangladesh Yield of BRRI dhan46 ranged from 2.90-5.50 t/ha, which was 0.90-1.52 t/ha higher than BR22 in three locations	
109	Demonstration and evaluation of poultry manure as a source of organic manure in Boro-Fallow-T. Aman cropping pattern During T. Aman, BRRI dhan46 gave 4.81 t/ha grain yield. Boro has harvested.	Profitable farming systems technologies and farmers' awareness towards adoption of improved farming systems technologies.

D. Program area: Farm Mechanization and Post-harvest Technology

D1. Program performing unit: Farm Machinery and Post-harvest Technology Division

110	Development of Agricultural Machineries Performance evaluation of PTO seeder for minimum tillage systems Strip tillage (direct dry continuous seeding in rows) at 4 days after Round up spraying was done by PTOS during Aus 2011 for BRRI dhan43. No post emergence herbicide was applied after seeding. Supplementary irrigation was applied for proper seed germination. Crop establishment was found uniform. Field crack was not observed. Agronomic data were recorded.	Reduction of land preparation cost.
111	Evaluating and modifying of BRRI developed machines <ul style="list-style-type: none"> • Power source of BRRI power winnower has been changed by Diesel engine replacing electric motor • Power operated jute ribboner has been developed. • A straw chopper machine has been developed. 	Farmers can use this machine where electricity is not available. Jute ribboning Easier straw chopping
112	Test and evaluation of Bokto seeder A field trial of Bokto seeder was conducted with BRRI dhan28 in Boro season in BRRI farm, Gazipur and seed rate was 50 kg/ha. Seeding and fertilizer dispensing rate were also found uniform and placed at a proper depth. Crop yield was 4.20 t/ha.	Quick seeding in rows and placement of seed and fertilizer in proper depth and plac
113	Design and development of power operated hand reaper A power hand reaper was developed using existing power unit of hand mower. Reaper part was designed using AutoCAD tools. The reaper was fabricated in the FMPHT divisional research workshop as per design. The average field capacity and fuel consumption was found 28.90 decimal/h and 2.062 l/h respectively. However, the power unit (engine) has broken down and a new power unit is needed for detail experiment.	Low cost, user friendly and less laborious reaper will be available.
114	Performance evaluation of the BRRI USG applicator in different location of Bangladesh Performance evaluation of the applicator was conducted in 6 different locations of the country during Aman 2010. Average walking speed of the operator was 3.72 km/hr and field capacity was about 35 decimal/hr, whereas manual USG application capacity was 4.5 decimal/hr. Average depth of placement of the granule was around 6.32 cm. USG gave around 0.5 ton/ha yield advantage than prilled urea application.	Suitable USG applicator machine.
115	Evaluation of strip tillage and bed planting to establish rice and maize in drought area of Bangladesh Strip tillage saved 65% fuel and bed and strip tillage saved 25-26% water.	Reduction of production cost

116	Milling and Processing Technology Milling and processing of premium quality rice BRRI dhan50 was successfully processed after 3, 6, 9 and 12 months of aging in the BRRI auto rice-mill as un-parboiled condition.	Suitable milling and processing technique for BRRI dhan50
117	Renewable Energy Technology 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 and 0.5hp pump was installed.	Use of solar energy for irrigation purpose

D2. Program performing unit: Workshop Machinery and Maintenance

118	Development of Agricultural Machineries 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
119	Design and development of a power operated rice transplanter Picker has been developed. No other progress was done due to lack of workshop facilities.	Reduction of human drudgery and cost for transplanting.
120	Design, development, modification and introduction of self-propelled reaper and mini-power tiller to augment crop production Fabrication is going on.	Reduction of production costs.
121	Test and modification of existing tractor mounted scrapper Modification of the chassis of self propelled field mower was completed. Its attachment will be done after collection of power tiller.	Uniform land leveling
122	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.	Minimizing vibration
123	Assessment of Agricultural Machinery Workshop Database development for repair and maintenance of BRRI's farm machineries and automobiles Database software has been developed	Hand in data for any purpose

E. Program Area: Socio-Economics and Policy

E1. Program performing unit: Agricultural Economics Division

124	Production Economics & Technology Adoption Farm Level Evaluation of Modern Rice Cultivation in Bangladesh For Aus season 2010, data of 400 farmers have been collected. Data of 120 and 100 farmers have been collected for T. Aman and Boro seasons, respectively.	Variety adoption rate and yield
125	Estimation of Cost and Return of MV Rice Cultivation at Farm Level Data have been collected from 54 and 18 sample farms for Aus and T. Aman seasons, respectively.	Costs and return of MV rice cultivation

126	Economics of Rice-based Cropping System under Changing Climate of Coastal Districts of Khulna Questionnaire has been developed and data collection is going on.	Economically viable rice based cropping patterns
127	1.4. Hybrid Rice Technology and Its Sustainability: A study on Food grain Security in Bangladesh Data collection has been completed and entry is going on.	Changes in adoption rate of hybrid rice over the years

E2. Program performing unit: Farm Management Division

128	Rice Production Management 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
129	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
130	Effect of harvest time for producing quality seed of rice Some yield components data were collected and the rest data collection is under process.	Quality seed production
131	Cost of production 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.	Unit production cost
132	Survey and monitoring 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

E3. Program performing unit: Agricultural Statistics

133	Yield Assessment through crop-cuts 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.	Forecasting rice yield
134	Stability Analysis of BRRi varieties Study on GXE 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	Stable variety for different seasons and database on yield of BRRi varieties
135	Multivariate Analysis of BRRi Varieties Development and validation of producer and consumer preference model to rice varieties Analyses have been completed for Dinajpur, Bhola, Gazipur and Dhaka districts.	Factors of producers' and consumers preference
136	Development of Computer Programme Modification of software for Payroll 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 accounting software by Win-base.	Development of software for administrative/accounting system

137	Genetic Coefficient of BRR I Varieties Study on genetic coefficient of BRR I released varieties Data have been generated for three years. DSSAT4.0 software has been collected and trying to match data with the software	Coefficients of BRR I varieties
138	Development of yield forecasting model for rainfed rice Data is being compiled for development of yield forecasting model for rainfed rice.	Yield forecasting

F. Program area: Pest Management

F1. Program performing unit: Entomology Division

139	Studies on Rice Insect Pest Ecology Molecular identification of Biotype of Gallmidge in Bangladesh Rearing technique of Gallmidge has been developed in green house and molecular identification is going on.	GM resistant germplasm
140	Identification of BPH Biotype in Bangladesh BPH populations were collected from 8 locations and preserved in Biotechnology laboratory for biotype analysis.	Variations in BPH population
141	Effect of different fertilizers and their doses on the Biogenesis and tolerance of BPH Biogenesis and tolerance of BPH varied due to fertilizer variation and its doses.	Effective BPH control
142	Evaluation of chemicals and botanicals against rice insect pests Evaluation of chemicals One hundred twenty one commercial formulations of insecticides were evaluated against BPH, RH and YSB of which 102 were found effective.	Recommended to PTAC for registration
143	Host plant resistance Screening of IRBPHN materials A total of 156 IRBPHN materials were screened against BPH and 36 materials were MR to R.	Development of resistant variety
144	Screening of Germplasm materials for resistance sources against Gall midge A total of 24 germplasm were screened against Gall midge and only one was found promising.	Gall midge resistance source

F2. Program performing unit: Plant Pathology Division

145	Resistance related and Molecular studies 1. Blast: Around 900 samples collected from different AEZs of Bangladesh, purified 223 isolates and tested pathogenicity of 60 using MLs both in Plant Pathology Division, BRR I and JIRCAS, Japan. 2. BLB: Forty-one isolates have already tested using NILs. Ten pyramid lines also tested in different AEZs against BLB. Around 300 landraces have already collected from GRS division to identify the novel BLB resistant gene. Pyramiding BLB resistant genes in BRR I dhan52 is also going on with the collaboration of Plant Breeding Division. 3. Fusarium sp. and Rhizoctonia sp.: Molecular characterization of <i>Fusarium</i> sp. and <i>Rhizoctonia</i> sp. are also	Major races of the pathogen of Blast, BLB, Bakanae and Sheath blight disease and their corresponding resistant genes will be identified that will help to develop durable disease resistant rice varieties in Bangladesh.
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	going on.	
146	<p>1. Recovering ability of tungro of BRRI released variety have done and found good recovering ability.</p> <p>2. Epidemiology and management of bakanae disease is going on as PhD work.</p> <p>2. No distinct effect of K on BLB development.</p> <p>3. Long term effect of missing nutrient on disease ShB and BLB is going on with the collaboration of Soil Science Division.</p>	Effective and also eco-friendly disease management techniques will be developed.
147	<p>Yield loss study Estimation of yield loss due to sheath blight (ShB) already executed.</p>	Economic threshold level of ShB disease
148	<p>Management of rice diseases No distinct effect was observed in controlling blast using ash. Effective chemicals were not found against BLB. Some new fungicides found effective against ShB and recommended it for registration. Curbuforan group found effective against ufra. Due to phytotoxicity of mehogani oil, it was not suitable for seed treatment.</p>	Economic and effective disease management practices will be developed.

G. Program area: Technology Transfer

G1. Program performing unit: Adaptive Research Division

149	<p>Validation of Technologies Advanced Line Adaptive Research Trial (ALART), T. Aman, 2010 ALARTs have been conducted in 8 different locations of Bangladesh at which three advanced lines along with BRRI dhan33 and BRRI dhan39 as check varieties were evaluated. Based on grain yield and growth duration, BR7323-4B-1 and BR7517-2R-27-3 may be considered for PVT.</p>	A variety may be released with shorter growth duration but similar yield to BRRI dhan33 and BRRI dhan39.
150	<p>Dissemination of Technologies Seed Production and Dissemination Program (SPDP) for Southern coastal region rice cultivation and production increase programme (SRRPP), Aus, 2010 BRRI dhan27 and BRRI dhan48 were demonstrated in 35 Upazilas of Pirojpur, Bhola, Patuakhali, Borguna, Bagerhat, Khulna, Barisal, Jhalokathi and Satkhira districts. A total of 105 farmers were involved. About 60 ton seeds were produced and 1 ton seeds were retained by the farmers for next year.</p>	Wide dissemination of these aus varieties may be expected in southern region
151	<p>Seed Production and Dissemination Program (SPDP) with LCC in southern region under SRRPP, Aman, 2010 BRRI dhan40, 41, 44, 46 and BRRI dhan49 were demonstrated with LCC in 58 Upazilas Pirojpur, Bhola, Patuakhali, Borguna, Bagerhat, Khulna, Barisal, Jhalokathi and Satkhira districts. About 227 ton seeds were produced and 65 ton seeds were retained by the farmers for next year.</p> <p>Seed Production and Dissemination Program (SPDP) with LCC under core program, Aman, 2010. BRRI dhan46 and BRRI dhan49 were demonstrated with LCC in 13 Upazilas of 13 districts (Gazipur, Norshindi, Jamalpur, Mymensingh, Sherpur, Tangail, Rajshahi, Dinajpur, Gaibandha, Borga, Cox'sbazar, B.Barria and Feni). About 39 ton seeds were produced and 12 ton seeds were retained by the farmers.</p>	<p>Wide dissemination of these aman. LCC based urea application will save urea fertilizer.</p> <p>Wide dissemination of these aman varieties. LCC based urea application will save urea fertilizer.</p>

152	Seed Production and Dissemination Program (SPDP) with USG in southern region under SRRPP, Aman, 2010 BRRI dhan40, 41, 44, 46 and BRRI dhan49 were demonstrated with USG in 58 Upazilas of Pirojpur, Bhola, Patuakhali, Borguna, Bagerhat, Khulna, Barisal, Jhalokathi and Satkhira districts. About 237 ton seeds were produced and 60 ton seeds were retained by the farmers for next year.	Wide dissemination of these aman varieties. Use of USG will help farmers in saving urea fertilizer.
153	Seed Production and Dissemination Program (SPDP) with USG under core program, Aman, 2010 BRRI dhan 46 and BRRI dhan49 were demonstrated with USG in 12 Upazilas of Gazipur, Norshindi, Jamalpur, Mymensingh, Sherpur, Tangail, Rajshahi, Dinajpur, Gaibandha, Borga, Cox'sbazar, B.Barua districts. About 43 ton seeds were produced and 12 ton seeds were retained by the farmers for next year cultivation.	Wide dissemination of these aman varieties. Use of USG will help farmers in saving urea fertilizer.
154	Seed Production and Dissemination Program (SPDP) with LCC in southern region under SRRPP, Boro, 2011 BRRI dhan28, 29, 45 and BRRI dhan47 were demonstrated with LCC in 54 Upazilas of Pirojpur, Bhola, Patuakhali, Borguna, Bagerhat, Khulna, Barisal, Jhalokathi and Satkhira districts. Crops were harvested and data are under process.	Wide dissemination of these Boro varieties. LCC based urea application will help farmers in saving urea fertilizer.
155	Seed Production and Dissemination Program (SPDP) with LCC under core program, Boro, 2011 BRRI dhan28 and BRRI dhan29 were demonstrated with LCC in 27 Upazilas. Crops were harvested and data are under process.	Wide dissemination of these Boro varieties. LCC based urea application will help farmers in saving urea fertilizer.
156	Seed Production and Dissemination Program (SPDP) with USG in southern region under SRRPP, Boro, 2011 BRRI dhan28, 29, 45 and BRRI dhan47 were demonstrated with USG in 54 Upazilas of Pirojpur, Bhola, Patuakhali, Borguna, Bagerhat, Khulna, Barisal, Jhalokathi and Satkhira district. Crops were harvested and data are under process.	Wide dissemination of these Boro varieties. Use of USG will help farmers in saving urea fertilizer.
157	Seed Production and Dissemination Program (SPDP) with USG under core program, Boro, 2011 BRRI dhan28, 29 and BRRI dhan50 were demonstrated with USG in 24 Upazilas. Crops were harvested and data are under process.	Wide dissemination of these Boro varieties. Use of USG will help farmers in saving urea fertilizer.
158	Seed Production and Dissemination Program (SPDP) with AWD in southern region under SRRPP, Boro, 2011 BRRI dhan28, 29, 45 and BRRI dhan47 were demonstrated with AWD in 54 Upazilas of Pirojpur, Bhola, Patuakhali, Borguna, Bagerhat, Khulna, Barisal, Jhalokathi and Satkhira districts. Crops were harvested and data are under process.	Wide dissemination of these Boro varieties. AWD was found very useful for saving money and irrigation water.
159	Seed Production and Dissemination Program (SPDP) with AWD under core program, Boro, 2011 BRRI dhan28 and BRRI dhan29 were demonstrated with AWD in 54 Upazilas of 9 southern districts (Pirojpur, Bhola, Patuakhali, Borguna, Bagerhat, Khulna, Barisal, Jhalokathi and Satkhira). Crops were harvested and data are under process.	Wide dissemination of these Boro varieties. AWD was found very useful for saving money and irrigation water.
160	Seed Production and Dissemination Program (SPDP) with LCC and AWD under AFACI program, Boro, 2011 BRRI dhan28, 29, 45 and BRRI dhan50 were demonstrated with LCC and AWD in two upazilas of Comilla and Satkhira districts. Crops were harvested and data are under process.	Wide dissemination of these Boro varieties. LCC and AWD were found very useful for saving urea fertilizer and irrigation water.

161	Seed Production and Dissemination Program (SPDP) with DWSR in southern region under SRRPP, Boro, 2011. BRRRI dhan28 and BRRRI dhan29 were demonstrated with DWSR in 25 Upazilas. Crops were harvested and data are under process.	Wide dissemination of these Boro varieties may be expected in southern region.
162	Use of poultry manure as a source of P during Boro, 2011 Two demonstrations by using poultry manure in rice cultivation were conducted in two locations of Gazipur district. Application of 30 days decomposed poultry manure @ 1.5 t/ha was used as a source of P. Data is under process.	Alternate source of P fertilizer and saving of foreign exchange.
163	Farmers' training and promotional activities Farmers training (Rice School) and Field Days during Aus 2010 to Boro 2011 During Aus, 2010 to Boro, 2011 a total of 30 farmers training were conducted under different program and 105 field days were conducted at different locations of the country.	Improvement of farmer's knowledge and skill on modern rice cultivation techniques

G2. Program performing unit: Training Division

164	Technology Transfer through training Modern Rice Production Technologies (Southern region) Duration: 6 days; Batch : 10; Participants: 390 (SAAO)	Knowledge and skill improvement.
165	Modern Rice Production Technologies (Northern region) Duration: 6 days; Batch : 10; Participants: 384 (SAAO)	Knowledge and skill improvement.
166	Training for Trainers on Modern Rice Production Technologies Duration: 6 days; Batch : 1; Participants: 29 (Agriculturists in NGO of PKSF)	Improvement of knowledge on rice production.
167	Modern Rice Production Technologies (Climate Change) Duration: 6 days; Batch : 19; Participants: 446 (SAAO)	Knowledge and skill improvement.
168	Modern Rice Quality Seed Production Technologies (Climate Change) Duration: 6 days; Batch : 1; Participants: 20 (Project personnel of Climate Change project)	Knowledge gain on quality seed production
169	Utilization of Bangladesh Rice Knowledge Bank (BRKB) Duration: 3 days; Batch : 3; Participants: 74 (AEO, SAAO, Computer operator, NGO officers)	Utilization and extension of BRKB
170	Minimization of Rice Yield Gap Duration: 3 days; Batch: 3; Participant : 76 (DAE Officers)	Yield gap minimization
171	GSR-Hybrid Rice Seed Production Duration: 2 days; Batch : 1; Participants: 18 (BRRRI scientists and NGO personnel)	Knowledge and skill improvement
172	Workshop on Utilization of Bangladesh Rice Knowledge Bank Duration: 3 days; Participants: 20 (BRRRI scientists and UAO of DAE)	BRKB materials will be enriched.
173	Evaluation of imparted training program Performance of long and short term training programs Duration: Throughout the year. Conducted one week Rice Production Training courses	Improvement of training program.

174	Bangladesh Rice Knowledge Bank (BRKB) Development and Utilization of Bangladesh Rice Knowledge Bank (BRKB) Duration: Throughout the year <ul style="list-style-type: none">• BRKB management committee• BRKB working group• BRKB users group – 15• Training – 3• Workshop –1	Information about rice technologies in internet and CD
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