Research Progress 2014-15
Plant Breeding
Research Progress (Aus, Aman, Boro) 2014-15

SL No	Research Progress	Expected Output
Program Area/Project: **Varietal Development Program (VDP)**		
1	**Development of Upland Aus Rice** In total, 18 crosses were made using 18 parents; 12 crosses were confirmed as true hybrid; 280 progenies were selected from 10 F_2 populations; 215 progenies and 43 fixed lines were selected from pedigree nurseries. Eight entries were selected from OT. Five advanced lines were selected from PYT. Three genotypes viz. BR7698-2B-1-9-2, BR7383-2B-23 and BR7587-2B-3 were selected from RYT for further evaluation. One genotype, BR6848-3B-12 was selected from ALART and recommended for Proposed Variety Trial. One genotype (OM1490) was evaluated by Technical Committee of National Seed Board (NSB) and released as direct seeded Aus variety-BRRI dhan65 for drought prone environments. **Project duration:** on going	Development of short duration rice variety (100 days) suitable for dry direct seeded upland condition.
2	**Development of Transplant Aus Rice** In total, 16 crosses were made; 7 crosses were confirmed as true hybrid; 262 progenies and 88 fixed lines were selected from pedigree nurseries. Eleven entries were selected from OT. Two advanced lines were selected from PYT. Two advanced lines were selected from SYT, 4 promising genotypes were selected from RYT and 1 promising genotype were selected from AYT. **Project duration:** on going	Development of high yield potential varieties with short growth duration, good grain qualities and tolerance to major diseases and insect pests.
3	**Development of shallow flooded deep water rice** In total, 14 crosses were made; 9 crosses were confirmed as true hybrid; 6 populations from F_3 and F_5 were separately bulked. 2 crosses were separately bulked from BC_1F_6 generation. 9 crosses from F_6 and 6 crosses from F_7 were separately bulked. Three entries were selected from OT. 6 genotypes from selected from PYT **Project duration:** on going	Development of rice varieties suitable for shallow flooded deep water environment up to 1m depth.
4	**Development of rainfed low land rice (RLR)** In total, 22 crosses were made using 16 parents; 16 crosses were confirmed as true hybrid; 259 progenies were selected from 10 F_2 populations; 776 progenies and 108 fixed lines were selected from pedigree nurseries. Eighty four entries were selected from OT. Thirty advanced lines were selected from PYT. Seven advanced lines were selected from SYT. Six advanced lines were	Development of genotypes superior to standard varieties and adaptable to rainfed lowland environment in T. Aman season.

	selected from RYT **Project duration:** on going	
5	**Development of Tidal submergence Tolerance Rice** In total, 12 crosses were made; 5 crosses were confirmed as true hybrid. Totally 208 progenies were selected from F_2, F_3 and F_7 generations as well as 2 crosses were separately bulked from BC_1F_6 generation. Fifteen entries were selected from OT, 86 genotypes from PYT and 7 entries were selected from SYT. Two promising lines were selected out of 04 AYT-1. BR7941-116-1-2-1 gave 5.06 t/ha grain yield with 10 days shorter growth duration than Sadamota and 58 cm seedling height with 55 days old seedling. In AYT-2 Barshadhan gave 4.0 t/ha grain yield, 152 cm plant height, 67 cm seedling height with 55 days old seedling and 151 days growth duration **Project duration:** on going	Development of high yielding varieties adaptable to tidal non-saline condition in the southern districts.
6	**Development of Salt Tolerant Rice** **T aman and Boro:** In T. Aman, Rice genotypes were evaluated in a set of field experiments under salt stress. The water salinity level was moderate to high in Noapara, Asasuni, Satkhira and modearte in other three locations. The salinity ranged from 4.1-6.0 dS/m at Farmar's field, Katibarhall, Shaymnagor Satkhira, 3.4-5.1 dS/m at Sorapdipur, Kaliganj, Satkhira, 3.2-3.9 dS/m at Kulia, Debhata, Satkhira and 4.5-10.5 dS/m at Noapara, Asasuni, Satkhira in T. Aman season. IN T. Aman, twenty six crosses were made and 18 crosses were confirmed. A total of 358 progenies were selected from F_2 populations and 934 progenies were selected from F_3-F_5 populations and 29 bulks were isolated from pedigree nursery. In observational and yield trials, out of 43 genotypes, 11 were selected from OT based on phenotypic acceptability (PAcp) at maturity, growth duration and yield, 6 (IRRI147, IR85925-11-2-2-AJY1-B, IR83412-6-B-5-1-1-1-AJY1-B, IR10T116, BR8715-10-7-23 and BR8727-9-11-7) entries were selected from PYT. Seven genotypes (IR78761-B-SATB2-4-25-3, IR87868-2-AJY1-B, IR83441-6-B-5-2-1-1-AJY1-B, IR85926-11-3-1-AJY1-B, IR83439-4-B-4-1-1-1-AJY1-B, IR84089-7-3-AJY1-B and IR84095-AJY-301-SDO4-B) were selected from SYTs. Two most promising genotypes i) IR78761-B-SATB1-28-3-24 and ii) IR78761-B-SATB1-28-3-26 were evaluated by Technical Committee of National Seed Board (NSB) and IR78761-B-SATB1-28-3-24 was finally recommended by National Technical Committee (NTC) for releasing as BRRI dhan73 for salt tolerant T. Aman variety. In PVS trials, two genotypes (IR78761-B-SATB1-52-1 and	Salt affected areas will come under modern rice variety cultivation; yield will increase due to salt tolerance ability.

	BR8371-18-20-52-124) as well as BRRI dhan53 and BRRI dhan54 were preferred by farmers and selected through PVS which showed consistency with yield performance. In screening, 100 rice germplasm were evaluated for salinity tolerance and 11 landraces were found moderately tolerant (SES value 4-5) and survivability was 45-90%. Twelve entries were selected from INGER nursery (IRSSTN) and will be used for yield trial as PYT. In Boro 2014-15 season, the experiments were conducted in on-station and on-farm condition with different salinity level. Water salinity ranged from 3.0-7.5 dS/m at Farmer's field, Binerpota, Sadar, Satkhira, 5.9-10.2 dS/m at Chiledangha, Asasuni, Satkhira, 3.0-5.3 dS/m at Kulia, Debhata, Satkhira and 4.7-8.9 dS/m at Noapara, Asasuni, Satkhira. Fifty eight crosses were made for Boro season. A total of 25 F_1's were confirmed and selected. Bulk progenies were selected from 25 F_2 populations, 798 progenies and 63 fixed lines were selected from pedigree nurseries (F_3-F_6). In observational and yield trial, nineteen advanced lines were selected from OT and 7 entries were selected from PYTs. Four (IR77674-3B-8-2-2-14-2-AJY2, IR77674-3B-8-2-2-12-5-5-1, IR83484-3-B-7-1-1-1 and BR8131-24-1) genotypes were selected from SYTs. In three Participatory Variety Selection (PVS) trials, three genotypes (IR98066-102-B, BRRI dhan28-Saltol and IR86385-117-1-1-B) as well as BRRI dhan58 and BRRI dhan61 were selected by the farmers through PVS which showed consistency with the yield performances. Five and eight entries were selected from INGER (IRSSTN) and Salt Tolerant Breeding Nursery (STBN), respectively and will be used for yield trial as PYT. Two genotypes viz. BR7100-R-6-6 and IR78794-B-Sat29-1 were evaluated by Technical Committee of National Seed Board (NSB) and BR7100-R-6-6 released as BRRI dhan67 for salt tolerant variety for Boro season. Participatory Varietal Selection (PVS) and validation trials were conducted under IAPP (breeding-salinity) at two upazilas like Amtoli, Borguna and Kalapara, Patuakhali during Aus, T. Aman and Boro seasons. Based on the farmers' preference, Mala (Local), BRRI dhan65 and BINA dhan8 at two locations, BRRI dhan28, BRRI dhan48 and BINA dhan10 at one location in Aus; BRRI dhan52 at three locations, BRRI dhan54 and BR11-Saltol at two locations, BRRI dhan41, BR8371-18-20-52-124 and BR8371-18-20-52-145 at one location in T. Aman; and BRRI dhan58 and BRRI dhan47 at four locations, BRRI dhan59 and BINA dhan8 at three locations, BRRI dhan67 and BRRI dhan55 at one	

	location in Boro were selected by farmers through PVS. Information was generated about varietal performance and acceptability through farmer participatory varietal selection (PVS) is also helpful for rapid varietal diffusion and popularization.	
7	**Development of premium quality rice** In T. Aman season, 22 crosses were made; 14 crosses were confirmed as true hybrid; 407 progenies were selected from 7 F_2 populations; 633 progenies and 67 fixed lines were selected from pedigree nurseries. Sixty five genotypes were selected from OT. Twenty genotypes from PYT, 15 from SYT, 1 from RYT, 1 promising lines from ALART were selected. Finally 1 genotype from PVT was found suitable for proceeding in variety release protocol. In Boro season, 41 crosses were made, 18 crosses were confirmed as true hybrid; 2098 progenies were selected from 19 F_2 populations; 2347 progenies and 39 fixed lines were selected from pedigree nurseries. Thirty six genotypes were selected from OT. Three genotypes from PYT, 3 from SYT, 5 from RYT and the genotype BR7357-11-2-4-1-1 performed better from ALART were selected for release as a variety. **Project duration:** on going	Development of aromatic and non-aromatic fine quality rice with national (Kalizira/Chinigura type) and international (Basmati/Banglamati type) standards for domestic use and export.
8	**Development of Rice varieties for favourable Boro Environment** A total of 16 crosses were made and 14 crosses were confirmed. 1736 individual plants were selected from 30 crosses of 13 F_2 population and 1445 progenies and 90 fixed lines were selected from pedigree generations. Five uniform advanced lines were selected from OT. Five advanced breeding lines showing higher yield than the check varieties coupled were selected for further evaluation. From SYT, 6 genotypes were selected for regional yield trial. One genotype was selected from RYT based on their yield and growth duration. **Project duration:** on going	The variety will help in sustainable increased rice production in Boro season
9	**Development of Cold Tolerant Rice** Sixty three crosses were made. Thirty three crosses were confirmed as true F_1. In total 890 individual progenies were selected from F_2 populations. In total, 1089 individual progenies were selected from F_3- F_7 populations. Nine genotypes were selected from OT. Under IAPP cold program, in PVS trial, BR7812-19-1-6-	Development of high yielding rice varieties tolerant to cold injury by introducing cold tolerant gene(s)

	1-P2 and BR7812-19-1-6-1-P4 had almost similar yield and growth duration with BRRI dhan28 and BRRI dhan36. In experiment of evaluation of CS1 pedigree nurseries for cold tolerance at seedling stage, 283 progenies were selected from 68 progenies. In Rapid generation advance of F_2 population, 2500 progenies were selected. **Project duration:** on going	
10	**Development of Low Amylose Rice** In Pedigree nursery, 950 individual progeny from F_6-F_7 and 30 bulk lines were selected. From OT, 7 genotypes were selected based on growth duration, yield and homogeneity in morpho-agronomic traits for PYT. From PYT 9 genotypes were selected on the based on yield and growth duration compared with check. **Project duration:** on going	Development of high yielding indica rice variety with low amylose content for domestic use particularly for ethnic people and export
11	**Development of Micronutrient Enriched Rice** In T. Aman, A total of 77 crosses were made and 69 crosses were confirmed. Seventy nine uniform advanced lines were selected from OT. Five advanced breeding lines showing higher yield than the check variety were selected for further evaluation. From SYT, 10 genotypes were selected. Two genotypes were selected from RYT based on their yield and growth duration for further evaluation in adaptive trial under farmers' field condition. In Boro, 124 crosses were made and 36 crosses were confirmed. In total, 352 individual plants were selected from F_2 population and 2040 progenies and 33 fixed lines were selected from pedigree nurseries. One hundred two uniform advanced lines were selected from OT. Fifty advanced breeding lines showing higher yield than the check variety were selected for further evaluation. From SYT, 10 genotypes were selected for regional yield trial. **Project duration:** 2015-2018	Development of high yielding rice varieties with improved nutritional quality in term of high iron and zinc content in polished grain.
12	**Development of Disease Resistant Rice** In T. Aman season, 24 for BB and 17 crosses for blast were made. Twenty five crosses for BB and 1 for blast were confirmed as true F_1. Four hundred ninety seven resistant progenies for BB were selected. Two hundred ninety three superior progenies for BB, 258 for blast and 11 for RTV were selected. Fifteen fixed lines for BB, 12 for blast and 6 fixed lines for RTV were isolated. From OT, 11 homogeneous lines for BB and 4 lines for Blast showed better yield potential and agronomic performance over the check varieties. From PYT, five genotypes were selected. Two breeding lines for BB and 1 for blast and 4 lines for RTV were selected from SYT. Two genotypes for both BB and blast were selected from AYT during T. Aman season.	Development of disease resistant rice variety

	In Boro season, 13 crosses for BB and 13 crosses for blast were made. Twenty eight crosses for BB were confirmed as true F_1. One hundred eleven superior progenies were selected for BB during Boro season. Forty seven fixed lines were isolated for BB during Boro season. From OT, 5 entries for BB showed better yield potential and agronomic performance over the check varieties. From PYT, 2 genotypes were selected. Two genotypes for BB resistant were selected from each of trial (PYT, SYT and AYT) during Boro season. **Project duration:** on going	
13	**Development of Insect Resistant Rice** In T. Aman season, eighteen crosses were made. Fifteen crosses were confirmed, 78 progenies from F_2 populations, 1471 progenies (907 for BPH & GM) and 30 fixed lines for BPH & GM were selected from pedigree nursery. Ten lines from OT, 11 lines from PYT and 3 lines from SYT were selected showing resistance to BPH and GM in T. Aman season. In Boro season, 45 crosses were made and 28 crosses were confirmed. From F_2 populations 353 progenies as well as 564 progenies for BPH were selected from pedigree nursery. Ten genotypes from PYTs and 7 genotypes from SYT were selected showing resistance to BPH in Boro season. **Project duration:** On going	Development of insect resistant rice variety
14	**Development of Submergence and water Stagnation Tolerant Rice** A total of 20 crosses were made and 6 crosses were confirmed. From F_2-F_8 and BC_1F_3 generations 338 progenies were selected along with 14 fixed lines for observational trial. Two BRRI dhan49-Sub1 lines were promoted to ALART having submergence tolerance one week more than BRRI dhan52 and grain yield potential like BRRI dhan49. In case of introgressing *SUB1* QTL into BR22, 15 BC_2F_1 plants were selected through 'Foreground+ Phenotypic selection' approach to produce 815 BC_3F_1 seeds. In case of introgressing *SUB1* QTL into BRRI dhan39, 13 BC_3F_1 plants were selected to produce 406 BC_4F_1 seeds. 93% recipient genome was recovered in the best plant of BC_3F_1 generation. Nine lines were selected from PYT and 6 from SYT. Five advanced breeding lines showing higher yield than the check varieties were selected for further evaluation. From SYT 10 genotypes were selected for regional yield trial. Two genotypes were selected from RYT based on their yield and growth duration. Under both flooded and non-flooded condition three genotypes were selected from PVS# Early. Two genotypes were selected under non-flooded condition. Under controlled submergence,	Development of submergence tolerant rice lines with increased productivity for submergence prone low-lying areas of the country.

	BR9158-19-9-6-9-9 was selected based on grain yield (4.1 t/ha) and survival % (94.4%). Under natural flooding in two installments, BR9159-49-1-2 (BRRI dhan49-Sub1 line) produced 4.7 t/ha grain yield at Chilmari, Kurigram. Four genotypes were selected from newly developed Pyramided (Xa21 & Sub1) Lines developed through marker assisted backcross breeding and 11 genotypes from 11 lines from adaptive trial of BRRI dhan33-Sub1, BRRI dhan44-Sub1 and BRRI dhan49-Sub1 lines. BR9159-8-5-40-13-57 from the of BRRI dhan49-Sub1 lines produced highest average grain yield 4.9 t/ha at three locations of northern region under non-flooded condition **Project Duration:** 2015-2018	
15	**Development of Drought Tolerant Rice** In total, 15 crosses were made; 23 crosses were confirmed as true hybrid; 491 progenies were selected from 16 F_2 populations; 1566 progenies were selected from pedigree nurseries. Twenty five and 11 drought tolerant genotypes from OYT and AYT, respectively were selected. Three genotypes out of 14 genotypes were identified as promising in Rajshahi and 3 out of 10 genotypes were identified as promising in Rangpur by farmers and researchers in PVS. IR82589-B-B-84-3 was selected for proceeding in variety release protocol from PVT. **Project duration:** on going	These genotypes can be adaptable under drought prone environment and can escape terminal drought under rainfed condition
16	**Improvement of Rice Varieties/Breeding Lines for Low Water Availability** In total, 13 crosses were made and 180 progenies were selected from F_3 generations. Two genotypes from OYT#1, 3 genotypes from OYT#2 and in OYT#3 10 genotypes, where IR93856-10-2-3-3 yielded 5.84 t/ha with 1.0 ton higher yield performance than BRRI dhan28 with 2 days shorter growth duration. In OYT#4, 11 entries performed better producing more than 5.0 t/ha grain yield and acceptable phenotypic performance. The grain yield of BRRI dhan58 was the highest having 4.49 t/ha grain yield with 121 days growth duration among 09 BRRI and BINA varieties while BRRI dhan48 produced the second highest grain yield 4.33 t/ha with 119 days growth duration under the 'validation trial of Boro varieties under late Boro condition' experiment. **Project duration:** on going	Development and identification of efficient rice genotypes/varieties which will utilize minimum water with maximum output
17	**Development of Green Super Rice (GSR)** In T Aman season, Seventeen genotypes were selected on basis of yield, plant type, grain quality, homogeneity and other agronomic traits from OT. From PYT#1 & PYT# 2, 9 genotypes were selected and one genotype (HHZ5-SAL10-DT1-DT1) was selected from RYT. In	Development high yield potential rice variety.

	Boro Season, seventeen fixed lines were selected as compared with the check variety. From PYT, 8 genotypes were selected and from SYT, 9 genotypes were selected. In RYT, 3 genotypes gave highest yield than checks. **Project duration:** 2014-15	
18	**International Network for Genetic Evaluation of Rice (INGER)** In T Aman season, 62 genotypes were selected and in Boro season 28 genotypes were selected.	Selected materials will be used for hybridization program, trials for developing variety
19	**Development of High Beta-Carotene Rice (Golden Rice)** **Project duration: On going**	Development, introgression and evaluation of beta-carotene enriched transgenic golden rice.

Hybrid Rice Division
Research Progress 2014-15

SN	Research Progress	Expected output
	Program area: Varietal development **Season T Aman (July to November)**	
Title of the Project 01: Development of Parental Lines and Hybrids (T. Aman)		
1	Source Nursery	Eighty six **(**86) test crosses and 123 (A x R) crosses were made
2	Testcross Nursery	Out of 242 testcrosses nine entries were found heterotic over check variety and 19 F_1's showed complete sterility and their corresponding male parents were regarded as suspected maintainer and immediately backcrossed for conversion
3	Backcross Nursery	Two backcross generations were evaluated and found stable in terms of pollen sterility and other desirable agronomic traits and advanced for next generation
4	CMS Maintenance and Evaluation Nursery	121 CMS lines were maintained by hand crossing for their genetic purity
Title of the Project 02: Development of Disease Resistant Hybrid Rice Parental Lines (T. Aman)		
1	Testcross Nursery	Out of 35 testcrosses five entries were found as heterotic over check variety
2	Pedigree Nursery	34 progenies were selected as F_7 population
3	Confirmation of F_1 against BB	Eight crosses were confirmed against BB
4	Development of BC_3F_1 population against BB	Three population were advanced as BC_4F_1
Title of the Project 03: Evaluation of Parental lines and Hybrids (T. Aman)		
1	Observational Trial (OT) of	Out of 142 entries, three (3) hybrid combinations

	experimental hybrids	were selected based on yield, duration and grain type
2	Preliminary Yield Trials (PYT)	Out of 9 hybrids two hybrids found around 1 ton yield advantage over local inbred standard check BRRI dhan49 and BR11 and 0.5 ton yield advantage over standard hybrid check BRRI hybrid dhan4
3	National Hybrid Rice Yield Trials (NHRYT)	15 hybrids along with one check variety were evaluated. Data were compiled by SCA
SN	**Research Progress**	**Expected output**
4	Demonstration trials of promising and BRRI released hybrids	Performance of the newly selected hybrids were satisfactory
5	Validation trials of BRRI hybrid dhan4 at Barisal regions through IAPP	Performance of BRRI hybriddhan4 at Barisal sadar, Jhalokhathi, Barguna and Patuakhali was satisfactory and average yield was 5.72 t/ha with average growth duration 117 days
6	Validation trials of BRRI hybrid dhan4 at Rangpur regions through IAPP	Performance of BRRI hybriddhan4 at Nilphamari sadar, Lalmonirhat, Kurigram and Rangpur was satisfactory and average yield was 5.70 t/ha with average growth duration 115 days
Title of the Project 04: Seed Production of Parental Lines and Hybrids (T. Aman)		
1	CMS line multiplication of BRRI hybrid dhan1, 2, 3 & 4	Eighteen (18), 70, 75 and 18 kg of CMS line seeds were produced respectively
2	F_1 seed production of BRRI hybrid dhan2	Fifty (50) kg F_1 seeds were produced
3	F_1 seed production of BRRI hybrid dhan3	One hundred fifteen (115) kg F_1 seeds were produced
4	F_1 seed production of BRRI hybrid dhan4	Twenty two (22) kg F_1 seeds were produced
5	F_1 seed production of BRRI hybrid dhan3 at farmer's field through IAPP	One hundred ninety (190) kg F_1 seed was produced that was equivalent to 1.8 t/ha.
6	Small scale multiplication of promising CMS lines	Seven promising CMS lines were multiplied and got seed yield ranged from 2.3 -17 kg.
7	Restorer lines multiplication of released hybrids	Seed yield 96 kg/plot (3.1 t/ha), 100 kg/plot (3.15 t/ha) and 107 kg/plot (3.2 t/ha) were obtained from restorer lines of BRRI hybrid dhan1, BRRI hybrid dhan2 & 4 and BRRI hybrid dhan3
Research Progress 2014-15 (Boro)		
	Program area: Varietal development **Season Boro (November to June)**	
Title of the Project 01: Development of Parental Lines and Hybrids (Boro)		
1	Source Nursery	One hundred eight **(**108) test crosses and 130 (A x R) crosses were made
2	Testcross Nursery	Out of 86 testcrosses seven entries were found

		completely sterile and three entries exhibited more than one ton yield advantage over BRRI dhan28 & BRRI dhan29
3	Backcross Nursery	One new CMS line was developed in the background of elite advance line
4	CMS Maintenance and Evaluation Nursery	66 CMS lines were maintained by hand crossing for their genetic purity
SN	**Research Progress**	**Expected output**
Title of the Project 02: Development of Disease Resistant Hybrid Rice Parental Lines (Boro)		
1	Hybridization	Four new crosses were made with resistant sources
2	Testcross Nursery	Out of 33 testcrosses three entries were found as heterotic over check variety
3	Pedigree Nursery	Out of 120 progenies, 105 were selected as F_5 population
4	Confirmation of F_1 against BB	Four crosses were confirmed against BB
5	Development of BC_3F_1 population against BB	Three population were advanced as BC_4F_1
Title of the Project 03: Evaluation of Parental lines and Hybrids (Boro)		
1	Observational Trial (OT) of experimental hybrids	Out of 123 entries, 10 hybrid combinations were selected based on yield, duration and grain type
2	Preliminary Yield Trials (PYT)	Three entries out of 12 showed more than one ton yield advantage over standard check variety BRRI dhan28 and BRRI dhan29
3	Demonstration trials of promising and BRRI released hybrids	Performance of the newly selected hybrids were satisfactory
4	National Hybrid Rice Yield Trials (NHRYT)	54 hybrids along with two checks were evaluated. Data were compiled by SCA
5	Validation trials of BRRI hybrid dhan3 at Barisal regions through IAPP	Performance of BRRI hybriddhan3 at Barisal sadar, Jhalokhathi, Barguna and Patuakhali was very encouraging and average yield was 9.38 t/ha with average growth duration 146 days.
6	Validation trials of BRRI hybrid dhan3 at Rangpur regions through IAPP	Performance of BRRI hybriddhan3 at Rangpur (Pirganj), Kurigram (Ulipur), Lamonirhat sadar and Nilphamari (Jaldhaka) was very encouraging and average yield was 9.06 t/ha with average growth duration 146 days.
Title of the Project 04: Seed Production of Parental Lines and Hybrids (Boro)		
1	CMS line multiplication of BRRI hybrid dhan1, 2, 3 & 4	Ninety (90), 110, 130 and 90 kg of CMS line seeds were produced respectively
2	F_1 seed production of BRRI hybrid dhan2	One hundred (100) kg F_1 seeds were produced
3	F_1 seed production of BRRI hybrid dhan3	One hundred twenty (120) kg F_1 seeds were produced

4	F_1 seed production of BRRI hybrid dhan4	Four hundred fifty (450) kg F_1 seeds were produced
5	Seed multiplication of selected promising CMS lines	Thirty (30), 12, 5, 6, 12, 0.2, 80 and 4 kg CMS seeds were produced respectively from BRRI7A/B, BRRI13A/B, BRRI28A/B, BRRI30A/B, BRRI33A/B, BRRI79A/B, IR79156A/B and UKA/B
6	F_1 seed production of selected promising hybrid combinations	One hundred (100), 100, 35, 1.5 and 20 kg F_1 seeds were produced respectively from IR79156A/BasmatiR, IR79156A/BRRI20R, IR79156A/PL-1R, BRRI7A/BRRI31R and BRRI33A/BRRI31R
7	F_1 seed production of BRRI hybrid dhan3 at Barisal through IAPP	We got 1 ton F_1 seeds from 1 acre of land that was equivalent to 2.6 t/ha.
8	F_1 seed production of BRRI hybrid dhan2 & BRRI hybrid dhan3 through PGB project	We got 260 kg F_1 seeds of BRRI hybrid dhan2 & 250 kg F_1 seeds of BRRI hybrid dhan3 from equal 1000 m^2 of land from BRRI HQ
9	Maintainer and restorer lines multiplication of selected lines	Considerable amount of maintainer and restorer lines were multiplied for further use
10	Parental line purification of BRRI hybrid dhan2	Twenty (20) A/B/R paired crosses were made from A, B and R lines of BRRI hybrid dhan2. Block wise (A/B & A/R) paired cross will be evaluated this on-going Aman season for multiplication after pollen fertility status observation
11	Parental line purification of BRRI hybrid dhan3	Twenty three (23) A/B/R paired crosses were made from A, B and R lines of BRRI hybrid dhan3. Block wise (A/B & A/R) paired cross will be evaluated this on-going Aman season for multiplication after pollen fertility status observation

Biotechnology Division
Research Progress 2014-2015

Sl. No.	Research Progress	Expected Output
1	**Project I: Development of rice variety through anther culture**	
	Expt.1.1 Development of low glycemic index (GI) rice variety through anther culture A of total 42877 hybrid anthers of 11 crosses were plated in KE media. In total 348 calli were obtained. The highest numbers of calli (105) were obtained from hybrid anthers of BR16 × Kanaklata cross. No green plants were regenerated yet. However many albino plants were	Low glycemic index (GI) rice variety will be developed from this experiment.

	regenerated.	
	Expt. 1.2 Development of salt tolerant rice variety through anther culture A total of 4707 hybrid anthers of 6 crosses were plated in KE media and from them 168 calli were obtained. The highest numbers of calli (115) were obtained from hybrid anthers of BRRI dhan29 × FL478 cross A total of 17 green plants were regenerated.	Salt tolerant rice lines will be developed.
	Expt.1.3 Development of aromatic and fine grain rice variety through anther culture A total of 709 F_1 seeds were harvested from 7 crosses.	Aromatic and fine grain rice lines will be developed.
	Expt. 1.4 Development of upland Aus variety through anther culture A total of 613 hybrid anthers from 4 crosses were plated in KE media. In total 17 calli were obtained. However, no green plants were regenerated yet.	Short duration, high yielding upland Aus rice variety will be developed.
2	**Project II: Field performance of tissue culture derived lines**	
	Expt. 2.1 Hybridization In total 709 F_1 seeds were harvested from 7 different crosses. **Expt. 2 .2 Progeny selection** During T.Aman/2014, 16 lines were bulked from 246 pedigree lines. During Boro/14-15, 87 lines were bulked from 169 pedigree lines. **Expt. 2.3 Observational trails** During T. Aman/14, 29 anther culture derived materials were evaluated and among them 16 materials were selected depending on the duration and comparable yield with checks. During Boro/14-15, 45 materials were evaluated and among them 15 materials were selected depending on the duration and comparable yield with checks **Expt. 2.4 Primary Yield Trial** During T Aman/14, 29 advanced lines were evaluated with standard checks and among them 22 materials were selected for further evaluation. During Boro/14-15, 41 materials were evaluated with standard checks and among them 31 lines were selected depending on the duration and comparable yield with checks.	New rice variety will be developed from these crosses New rice variety will be developed from these lines New rice variety will be developed from these lines New rice variety will be developed from this study.

	Expt. 2.5 Secondary Yield Trial During Boro 2014-15, six advanced breeding materials were evaluated.	New rice variety will be developed from these study.
	Expt. 2.6 Regional Yield Trial During Boro 2014-15, six and two advanced breeding materials were evaluated at 10 regional levels as RYT1 and RYT2. All the materials gave parallel yield and growth duration in comparison with the standard check BRRI dhan28 in RYT1. However, in RYT one line BR6158RWBC2-2-1-1 showed better performance than check.	New rice variety will be developed from these study.
3	**Project III: Rice transformation studies**	
	Expt.3.1 Development of salt tolerant transgenic rice BRRI dhan29 and BRRI dhan28 was used for transformation with gene construct *AeMDHAR*. A total of 40 and 20 putative transgenic plants were regenerated from BRRI dhan29 and BRRI dhan28, respectively. However, none of the putative transformants amplified by PCR with *AeMDHAR* gene specific primers.	Salt tolerant rice lines will be developed through transformation
	Expt.3.2 Development of salt tolerant transgenic rice T_4 seeds of salt tolerant putative transgenic BRRI dhan29 having *GlyI and GlyII* genes were harvested.	Salt tolerant rice lines will be developed through transformation

4	**Project IV: Application of DNA markers** **Expt. 4.1 Identification of yield enhancing QTLs** Genotyping of Population 1(BRRI dhan28*3/ *O. rufipogon* (Ac. No. 105890) having population size 238 has been completed with 108 polymorphic marker Genotyping and QTLs analysis of population 2 (BR28*3/ *O. rufipogon* (Ac. No. 103404) having population size 210 have been completed. Some QTL were identified having one major gene after QTL analysis with 97 polymorphic markers. Genotyping of Population 3 (BR29*3/ *O. rufipogon* (Ac. No. 103404) having population size 209 were done with 31 polymorphic marker only. Rest of genotyping work is going on. **Expt. 4.2 Identification of QTLs for salinity tolerance at both seedling and reproductive stage** Genotyping of QTL mapping population (BRRI dhan29/ IR4630-22-2-5-1-3) having population size 121 was done with 17 polymorphic markers only. Rest of genotyping work is going on. Population Size 121 **Expt. 4.3 Field evaluation of Bacterial Blight (BB) gene pyramided rice lines** Eighteen BB pyramided BRRI dhan29 lines were evaluated during Boro 2014-15 with standard check as OT. Among them 8 lines were selected depending on the phenotypic acceptability and yield. These eight lines were confirmed by PCR with specific primers.	Yield enhancing QTLs will be identified QTLs for salt tolerance will be identified Bacterial Blight (BB) resistant rice variety will be developed from these lines.

Genetic Resources and Seed Division

Research Progress 2014-2015

Sl. No.	Research Progress	Expected Output
Program Area 01: Varietal Development Program (VDP)		
3	**Sub-program area: Rice Germplasm and Seed**	

3.1	**Project: Genetic Resources conservation and management** • Collection of 265 germplasm. • Rejuvenation of 1851 germplasm and characterization of 189 germplasm with 53 morpho-agronomic characters. • Supply of 1861 accessions of germplasm and 742 samples of BRRI varieties for research and demonstration.	Long term conservation of the rice germplasm and utilization for future research and breeding. Findings of the experiments according to objective could be utilized in further research.
3.2	**Project: Seed production and variety maintenance** • All BRRI developed varieties were maintained as nucleus stock. • During Boro season, 79.81 tons Breeder seed from 17 varieties and 37.17 tons from 34 varieties in T. Aman seasons were produced. • Again, 71.35 tons Breeder seed from 14 varieties in Boro, 4.40 tons from 10 varieties in Aus and 28.59 tons from 28 varieties in T. Aman seasons were distributed.	Maintenance of pure seed stock and supply of Breeder seed to GO, NGO and private seed producing organizations according to their demand under rice seed network of BRRI.
3.3	**Project: Exploratory and genetic studies** Genetic diversity of 54 entries in T Aman, 55 entries in Aus and 31 BRRI varieties in Boro season were studied.	Estimated genetic variability, character associations, genetic relationships and selection criteria for yield and yield components of rice germplasm would be used for clear understanding of genetic makeup of the tested germplasm.

Grain Quality and Nutrition Division

Research Progress 2014-2015

Sl. No.	**Research Progress**	**Expected output**
	Programme area / Project with duration	
1.	Grain Quality Characteristics for Variety Development	
	1.1. Determination of physicochemical and cooking properties of breeding lines (continue)	To find out the physicochemical and eating quality of breeding lines for identifying better grain quality.
	1.2. Evaluation of genetic diversity of *Waxy* gene in selected rice varieties by using microsatelilte marker and cleaved amplified polymorphic sequence marker(Complete)	To identify amylose content at seedling stage.
2.	Grain Quality Parameters for Consumers Preferences	

	Energy utilization and conservation in paddy parboiling and cooking of rice (complete).	To determine the energy requirement in cooking of BRRI released rice varieties at different presoaking condition owing to save fuel consumption. To determine the energy requirement in paddy parboiling for different BRRI released rice varieties.
3.	Nutritional Quality Assessment of Rice	
	The impact of adding zinc and iron fortificants during parboiling on the zinc and iron content of raw and cooked Bangladeshi rice (Complete).	To determine the magnitude of increase in Zn and Fe content in rice. To determine the dose response effect of increasing amounts of Z in the soaking water.

Agronomy Division

Research Progress 2014-15

Sl No.	Research Progress Programme area/Project with duration	Expected output
	1. Program Area : Crop-Soil-Water Management	
1	**1.1. Project: Seeds and Seedlings**	
	Expt. 1.1.1. Evaluation of rice transplanter and seedling raising on trays (on going) **Progress**: The mechanized transplanted plots yielded 4.41 t ha^{-1} whereas, manual transplanted plot yielded 4.35 t ha^{-1}. Although, there was no yield benefit but farmers could saved about 850 Tk $bigha^{-1}$ by mechanized transplanting over manual transplanting.	Cost of production will be reduced
	Expt. 1.1.2 Effect of different seed bed media on rice seedling growth during Boro season (on going) **Progress:** T_4 treatment (50% Compost + 50% Soil) produced good quality seedling in respect to seedling height, number and dry weight followed by T_2 (50% Chopped Rice Straw + 50% Soil) and T_5 (50% Ash + 50% Soil + 60 kg N/ha.	Good quality seedlings will be obtained
	Expt. 1.1.3 Effect of seed rate on yield of direct dry seeded rice in Aus season (on going) **Progress:** In direct dry seeded condition seed rate 45 kg/ha gave higher yield.	Optimum seed rate for advanced lines of direct dry seeded rice will be obtained
	Expt. 1.1.4 Evaluation of some advanced lines in direct wet seeded condition in Aman season **Progress:** Considering the grain yield and growth duration, IR91066-81-1-31, IR84788-40-3-3-1-1 and BR7181-2B-1-HR_4 gave similar yield with BRRI dhan57.	Suitable direct wet seeded rice lines will be selected

2	**1.2 Planting Practices**	
	Expt. 1.2.1 Performance of hybrid and inbred rice at late planting situation under T. Aman-Potato- Braus cropping pattern in Rangpur **Progress:** BRRI dhan56 (4.17 t ha^{-1}) BRRI dhan57 (3.05 t ha^{-1}) and BRRI Hybrid dhan4 (4.24 t ha^{-1}) gave the highest yield in 30 July planting but BRRI dhan62 (3.95 t ha^{-1}) gave highest yield in 15 August planting. Among the varieties, BRRI dhan57 gave the lowest yield at all planting dates. Average of all planting dates, BRRI dhan62 gave higher (3.71 t ha^{-1}) grain yield due to produce higher number of panicles at all planting dates followed by BRRI dhan56 (3.66 t ha^{-1}). At 30 August planting, BRRI dhan62 gave higher (3.43 t ha^{-1}) yield followed by BRRI Hybrid dhan4 (3.24 t ha^{-1}) and BRRI dhan56 (3.14 t ha^{-1}).	Suitable variety for each planting of late Boro will be identified
	Expt. 1.2.2 Performance of Boro rice at varying time of planting in saline area of Patuakhali district **Progress:** Time of planting set-2 (transplanting at 30th January) had better performance than other set (set1-TP 15 Jan., set3-TP 15 Feb.).	Optimum time of planting and high yield potential genotypes for saline area will be identified
	Expt. 1.2.3 Comparative yield performance by applying BRRI recommendation practices in Aman season **Progress** : BRRI dhan49 and BRRI dhan52 gave higher grain yield over other varieties (BRRI dhan41, BRRI dhan44 and local variety).	Total production will be increased
	Expt. 1.2.4 Comparative yield performance by applying BRRI recommended practices in Aus season **Progress:** BRRI dhan48 gave higher grain yield over other varieties (BRRI dhan27, BRRI dhan55 and local variety).	Total production will be increased
	Expt. 1.2.5 Yield performance of rice in anaerobic condition **Progress:** Advanced lines IR92311-6-2-1 and IR95760-34 performed better in alternate wet and dry (AWD) condition than continuous standing water and yield was similar with BRRI dhan29.	Anaerobic rice lines for AWD will be selected
	Expt. 1.2.6 Performance of BRRI dhan62 under different spacing and levels of nitrogen **Progress:** Requirement of N for newly released BRRI dhan62 was determined with different spacing.	Optimum dose of N and planting density will be determined for higher yield

	Differentiating the quadratic equation of yield response with respect to applied N doses the maximum N rate appeared as 65, 61, and 66 kg ha^{-1} for 20 x15, 15 x 15 and 15 x 10 spacing respectively.	
3	**1.3 Fertilizer Management**	
	Expt.1.3.1 Validation of Nutrient and Crop management options for yield maximization of BRRI dhan51 at Rangpur region in T. Aman season **Progress:** Management 2 (45-day old seedling with 20 x 20 cm spacing and 4 seedlings per hill transplanted on 3rd week of July) + AEZ fertility based recommended nutrient management + 30 kg Nha^{-1} additional after 15 days de submerge performed better grain yield.	Suitable technology for yield maximization of submergence tolerance variety will be identified
	Expt.1.3.2 Validation of Nutrient and Crop management options for yield maximization of BRRI dhan52 at Rangpur region in T. Aman season **Progress:** Management 2 (45-day old seedling with 20 x 20 cm spacing and 4 seedlings per hill transplanted on 3rd week of July) + AEZ fertility based recommended nutrient management + 30 kg N ha^{-1} additional after 15 days de submerge performed better grain yield.	Suitable technology for yield maximization of submergence tolerance variety will be identified
	Expt.1.3.3 Validation of different nutrient management options for increasing yield of rice in Boro season **Progress:** USG (2.7 g) and NPK briquette (2×2.4 g) gave higher grain yield over farmer's practice.	New technology for yield maximization in Boro season will be identified
	Expt.1.3.4 Validation of the nutrient management for increasing yield of rice under standard agronomic management at farmer's condition in Aus season **Progress:** NPK briquette (3.4 g) treatment gave 22-34% higher grain yield over farmer's practice.	New technology for yield maximization in Aus season will be identified
	Expt.1.3.5 Nitrogen management in modern T.Aman varieties **Progress:** Requirement of N for newly released T Aman varieties appeared as 73, 58, 75 and 60 kg ha^{-1} for BRRI dhan49, BRRI dhan56, BRRI dhan57 and BRRI dhan62 respectively for achieved maximum grain yield	Nitrogen requirement for newly released T. Aman varieties will be determined
	Expt.1.3.6 Nitrogen management in modern Boro varieties **Progress:** Requirement of N rate of newly released Boro varieties were 148, 163, 144 and 159 kg ha^{-1} for BRRI dhan58, BRRI dhan59, BRRI dhan60 and BRRI dhan61 respectively	Nitrogen requirement for newly released Boro varieties will be determined
	Expt.1.3.7 Effect of urea super granule for increasing yield of local Aman rice in tidal submergence ecosystem of Bangladesh	Yield of local Aman variety under non-saline tidal

	Progress: Local varieties produced around 2.0 to 3.0 t ha^{-1} grain yield by farmers practice or without fertilization. But 3.0 to 4.0 t ha^{-1} grain yield could be obtained through UDP by cultivating local Aman varieties in tidal submergence areas of Bangladesh	submergence will be increased
	Expt.1.3.8 Crop productivity improvement by introducing modern variety and fertilizer management in Pirojpur, Gopalganj and Bagerhut region (PGB-IADP ongoing) **Progress:** In Gopalganj BRRI dhan62 gave comparable yield and matured 2 weeks earlier than BRRI dhan33 in T. Aman, 2014, where farmer could cultivate profitable Robi crops. In Boro season, BRRI dhan60 gave similar yield with BRRI dhan29 and matured 1-2 weeks earlier in Boro, 2014.	Total crop productivity in Pirojpur, Gopalganj and Bagerhut region will be increased
	Expt.1.3.9 Effect of nitrogen on growth and yield of some drought tolerant rice varieties **Progress:** BRRI dhan57 with urea doses 100 kg ha^{-1} produced higher grain yield (4.05 t ha^{-1}) than NERICA 1 and NERICA 10.	Optimum dose of N for BRRI dhan57 will be determined
	Expt.1.3.10 Application of urea super granule for increasing rice yield in tidal submergence ecosystem during Aman season **Progress:** Deep placement of USG gave yield advantages by 0.5 to 1.0 t ha^{-1}.	New management method of USG for tidal submergence ecosystem will be identified
	Expt.1.3.11 Field evaluation of different fertilizer management models for lowland rice cultivation **Progress:** Nutriment management following rice crop manager, SRDI model and BARC model gave similar yield.	Suitable fertilizer management models for lowland rice cultivation will be identified
4	**1.4 Yield Maximization**	
	Expt.1.4.1 Validation of weed control option and crop management for yield maximization of BRRI dhan56 in draught condition at Rangpur region in T. Aman season **Progress:** Crop management 1 (25 days old seedling with 20 x 15 cm spacing, 2 seedlings per hill and 4th week of July transplanting) with any one tested weed management (Pre emergence herbicide + one hand weeding or Post emergence herbicide + one hand weeding or Pre emergence herbicide + Post emergence herbicide) option may adopted for higher yield.	More than one ton/ha yield advantage over existing farmer's practice
	Expt.1.4.2 Validation of weed control option and crop management for yield maximization of BRRI dhan57 in draught condition at Rangpur region in T. Aman season **Progress:** Crop management 1 (25 days old seedling with 20 x 15 cm spacing, 2 seedlings per hill and 4th	More than one ton/ha yield advantage over existing farmer's practice

	week of July transplanting) with any one tested weed management (Pre emergence herbicide + one hand weeding or Post emergence herbicide + one hand weeding or Pre emergence herbicide + Post emergence herbicide) option may adopted for higher yield.	
	Expt.1.4.3 Validation of weed control option and crop management for yield maximization of BRRI dhan62 at Rangpur region in T. Aman season **Progress:** Crop management 1 (25 days old seedling with 20 x 15 cm spacing, 2 seedlings per hill and 4th week of July transplanting) with any one tested weed management (Pre emergence herbicide + one hand weeding or Post emergence herbicide + one hand weeding or Pre emergence herbicide + Post emergence herbicide) option may adopted for higher yield.	More than one ton/ha yield advantage over existing farmer's practice
5	**1.5 Weed Management**	
	Expt.1.5.1 Weed control methods on productivity of direct dry seeded rice in Aus season **Progress:** In direct dry seeded rice herbicides (Bispyribac sodium and Pritilachlor with Pyrazosulfuran ethyl) controlled weeds effectively and ultimately a higher paddy yield was achieved.	Suitable herbicide for direct dry seeded Aus rice will be selected
	Expt.1.5.2 Validation of different integrated weed control options for yield maximization in Boro season **Progress:** Higher grain yield was achieved with application of herbicides (Pritilachlor and Pyrazosulfuran ethyl).	Suitable herbicide for Boro rice will be selected
	Expt.1.5.3 Effect of N levels and weed management on weed abundances of hybrid rice in Boro season under AWD irrigation system **Progress:** Maximum weed abundances were observed in unweeded plots. BRRI hybrid dhan2 performed highest grain in the N level of 160Kg ha^{-1} with pre+post emergence herbicide application and weed free by 3HW treatments.	Suitable herbicide for Boro rice in AWD irrigation system will be selected

Soil Science

Research Progress 2014-15

Research Progress	Expected output
Program Area: Crop-Soil-Water Management	
1. Project: Fertility assessment of rice soils and nutrient use efficiency in rice (open)	

Expt. 1.1. Updating fertilizer doses through SSNM for advanced lines and BRRI released rice varieties **T. Aman 2014** **PQR ALART materials** Four PQR ALART materials were evaluated and compared with BRRI dhan37 to determine N, P and K rates. All PQR ALART materials produced about 2 t/ha grain yield. However, ALART materials were 10 days earlier than BRRI dhan37. Omission of N, P and K from complete treatment had no effect on grain yield of the tested genotypes indicating that a maintenance dose of fertilizer is enough for these entries. **RLR ALART materials** Three RLR ALART materials were evaluated against BRRI dhan32 and BRRI dhan49. BR7638-7-2-5-2 produced the highest grain (7.04 t/ha), which was significantly higher than BRRI dhan49 (6.66 t/ha). BRRI dhan32 produced the lowest grain yield (5.01 t/ha). Estimated N doses for BR7468-12-1-1-1-1, BR7472-16-2-1-2-1 and BR7638-7-2-5-2 were 111, 123 and 135 kg/ha, respectively. Estimated P doses for BR7472-16-2-1-2-1 and BR7638-7-2-5-2 were 22 and 27 kg/ha, respectively. The RLR materials were K efficient and estimated K dose for BR7472-16-2-1-2-1 was only 34 kg/ha. **Boro 2014-15** **PQR ALART materials** Three PQR ALART materials were evaluated against BRRI dhan50 and BRRI dhan63. All PQR lines gave slightly higher grain yield than BRRI dhan50. However, BRRI dhan63 produced slightly higher grain yield than BR7781-10-2-3-2 with complete nutrient management. BR7369-10-5-2-3 produced the highest grain (5.79 t/ha) followed by BR7369-52-3-2-1-1 (5.59 t/ha). BRRI dhan50 produced the lowest grain (5.00 t/ha). Estimated N doses were 145, 160 and 190 kg/ha, P doses were 9, 7 and 9 kg/ha, and K dose were only 28, 14 and 27 kg/ha, for BR7781-10-2-3-2, BR7369-10-5-2-3 and BR7369-52-3-2-1-1, respectively. **Micronutrient ALART materials** Two micronutrient ALART materials were evaluated with BRRI dhan28 and BRRI dhan64. Tested ALART materials gave similar yield with check varieties. Estimated N doses were 176 and 155 kg/ha, P doses were 54 and 50 kg/ha, and K dose were only 24 and 13 kg/ha, for BR7833-11-1-1-3-4 and BR7830-16-1-5-9-9, respectively. **Short duration ALART materials** Nerica mutant was evaluated with BRRI dhan28 and BRRI dhan45	Optimum fertilizer doses

for nutrient requirement and yield performance. It gave similar grain yield with check varieties but required 4 more days for maturity than BRRI dhan28 and 6 days than BRRI dhan45. Estimated N doses were 143, 164 and 140 kg/ha, P doses were 40, 35 and 46 kg/ha, and K dose were 32, 31 and 28 kg/ha, for Nerica Mutant, BRRI dhan28 and BRRI dhan45, respectively.	
Expt. 1.2. Effect of nitrogen and potassium rates on modern rice cultivation Five doses of K (0, 50, 100, 150 and 200 kg/ha) in the main plot and four doses of N (0, 50, 75 and 100 kg/ha in T. Aman and 0, 100, 120 and 140 kg/ha in Boro season) in the subplots were tested with BRRI dhan49 in T. Aman 2014 and BRRI dhan29 in Boro 2014-15. In T. Aman season, the highest grain yield was recorded with BRRI dhan49 (5.64 t/ha) when 150 kg K/ha and 75 kg N/ha were used; but in Boro season, the highest grain yield in BRRI dhan29 (6.57 t/ha) was obtained when 150 kg K/ha and 100 kg N/ha were used.	A suitable ratio of N and K nutrients for rice cultivation
Expt. 1.3. Appropriate N and K dose for targeted rice yield under AWD situation Two promising lines (IR83140-B-36-B-B and IR83142-B-71-B-B) and two check varieties (BRRI dhan28 and BRRI dhan29) were tested under five fertilizer management options at BRRI, Gazipur (T_1 = Control, T_2 = Standard dose of NPKS, T_3 = 25% more NK + PS, T_4 = 50% more NK + PS and T_5 = 75% more NK + PS) in Boro 2014-15. Promising line IR83140-B-36-B-B produced the highest grain yield (5.64 t/ha) in T_5 treatment, which was statistically identical with T_4 (5.53 t/ha). IR83142-B-71-B-B produced the highest grain yield of 5.73 t/ha with T_4 treatment, which was statistically similar with T_5 (5.48 t/ha). On the other hand, check varieties BRRI dhan28 produced the highest grain yield (5.63 t/ha) with T_5, which was statistically similar with T_4 (5.49 t/ha). BRRI dhan29 did not show any yield advantage over recommended dose (T_2), though the highest grain yield was found in T_4 treatment.	Optimum fertilizer doses under AWD conditions
Expt.1.4. Evaluation of USG and PU applicator on N–use efficiency for rice cultivation (collaboration with FMPHT Division) Similar grain yield was obtained with application of N fertilizer using different doses and different methods but slightly higher agronomic use efficiency was observed with the application of 70% N of recommended dose as PU by hand broadcasting in T. Aman season 2014. Nitrogen application by PU and USG applicators gave similar result in terms of yield and N use efficiency.	Improved N use efficiency in rice
Expt. 1.5. Development of fertilizer package for low input rice variety (BRRI dhan69) In Boro 2014-15 season, seven fertilizer packages were evaluated for low input rice variety, BRRI dhan69 and compared with BRRI dhan58. The highest grain yield of BRRI dhan58 (5.60 t/ha) was obtained with recommended fertilizer dose, which was statistically	Optimum fertilizer dose for low input rice variety

identical with 10% less of recommended dose (5.46 t/ha). Twenty percent less of recommended fertilizer dose significantly reduced the grain yield of BRRI dhan58. However, grain yield of BRRI dhan69 was statistically identical up to 20% less of recommended dose and then grain yield reduced significantly. So, 20% less of recommended dose (240-72-102-48-4.8 kg/ha urea-TSP-MOP-Gypsum-$ZnSO_4$, respectively) was enough for achieving the highest grain yield of BRRI dhan69.	
2. Project: Identification and management of nutritional disorder	
Expt. 2.1. Long-term effect of some macro and micro nutrients on yield and nutrition of low land rice (Open) **T. Aman 2014** Zinc omission plot produced the highest rice grain (4.90 t/ha), which was statistically identical with complete treatment (4.80 t/ha). Omission of N, P, K and S significantly decreased rice yield to 2.96, 3.65, 3.56 and 3.96 t/ha, respectively. Among organic materials treated plot cow dung showed the highest rice yield (4.02 t/ha) followed by mustard oil cake (3.84 t/ha) and poultry manure (3.75 t/ha). However, the yield differences among the organic material treated plots were insignificant. Different rates of potassium in the complete treatment significantly influenced rice yield of BRRI dhan49. The highest rice yield (4.80 t/ha) obtained with 80 kg K/ha and the lowest (3.79 t/ha) was with 40 kg K/ha. **Boro 2014-15** In Boro 2014-15, complete treatment gave 6.68 t/ha grain yield, which significantly reduced to 2.1, 2.62, 3.90 and 3.95 t/ha due to omission of all nutrients, N, P and K, respectively. Decreases in grain yields due to S and Zn omission were insignificant. Application of poultry manure @ 2 t/ha with IPNS based chemical fertilizer produced the highest grain yield (6.92 t/ha), which was statistically similar with complete fertilizer treatment. Application of cow dung and mustard oil cake with IPNS based chemical fertilizer produced statistically similar but lower grain yield with complete fertilizer treatment. Reduced dose of potassium @ 60 kg K/ha produced similar grain yield with complete treatment but K at 40 kg/ha significantly reduced grain yield of BRRI dhan29. Complete fertilizer treatment gave the highest straw yield (5.62 t/ha) followed by poultry manure + IPNS based chemical fertilizer (5.22 t/ha). Omission of N, P, K, S and Zn decreased straw yields by 3.17, 0.98, 2.08, 0.68 and 0.86 t/ha, respectively. Application of poultry manure with IPNS based chemical fertilizer may be a good option for rice cultivation to maintain sustainable productivity. Other organic materials like cow dung also can play a vital role in this regard.	Long-term yield trend as well as soil fertility status

Expt. 2.2. Effect of intensive rice cropping on rice yield under continuous wetland condition (Open) An experiment on continuous wetland rice culture is initiated since 1981 at BRRI, Gazipur. Grain yield in control plot was 0.52-2.01 t/ha irrespective of season during 2013-14. In 2014, annual rice production in control plot was 4.25 t/ha. However, its reversed management (addition of NPKSZnCu fertilizer) resulted in 11.98 t/ha/yr grain production, which was similar to complete fertilizer treatment (12.29 t/ha/yr). It indicates that complete fertilization can recuperate soil productivity even after a long period of rice cultivation. Results indicated that additional use of Cu is not necessary for rice production. In Boro 2014-15 season, grain yield of BRRI dhan50 was only 0.50 t/ha, which increased up to 4.32 t/ha with NPKSZn fertilization.	Yield trend and nutrient depletion pattern
Expt. 2.3. Integrated nutrient management (INM) for double and triple rice cropping pattern for maximizing yield and sustaining soil fertility (Open) This experiment was initiated during 2008/09 Boro season at BRRI, Gazipur having variable nutrient management options. **Boro 2013-14** In Boro 2013-14, under double cropping pattern both STB dose and 50% STB + mixed manure (MM) produced significantly higher grain yield than farmers' practice (FP). However, STB dose and 50% STB + mixed manure (MM) produced statistically similar grain yield in this season under double and triple cropping pattern. The highest grain yields of 5.78 t/ha and 5.59 t/ha were obtained with STB under double and triple cropping pattern, respectively. **T. Aus 2014** The highest grain yield (3.00 t/ha) of BRRI dhan43 was found in 50% STB + MM treatment which was statistically similar with STB dose (2.89 t/ha). **T. Aman, 2014** In T. Aman 2014, under double cropping pattern both STB dose and 50% STB + mixed manure (MM) produced significantly higher grain and straw yield than farmers' practice (FP). However, the highest grain yield (5.28 t/ha) was found with 50% STB + MM. Under triple cropping pattern the highest grain yield (3.37 t/ha) was found with 50% STB + MM which was statistically similar with STB dose. It may be concluded that STB(100%) dose of fertilizer and integrated nutrient management (INM) are good options for obtaining higher rice yields in double or triple rice cropping pattern. **Annual yield in 2014** STB dose gave the highest annual rice yield of 10.89 and 11.77 t/ha	Fertilizer management for sustainable yield and soil fertility

under double and triple rice cropping, respectively. However, 50%STB+MM gave more or less similar annual grain yield of 10.60 and 11.66 t/ha under double and triple cropping pattern, respectively. **Boro 2014-15** Similar with Boro 2013-14, under double cropping pattern both STB dose and 50% STB + mixed manure (MM) produced significantly higher grain yield than farmers' practice (FP). However, STB dose and 50% STB + mixed manure (MM) produced statistically similar grain yield in this season under double and triple cropping pattern. The highest grain yields of 5.13 t/ha and 5.22 t/ha were obtained with STB under double and triple cropping pattern, respectively.	
Expt.2.4. Validation of BRRI fertilizer management technology (Boro, T. Aus and T. Aman rice) **Tidal Flood Ecosystem (Barisal region)** Rice straw @ 4.5 t/ha applied with IPNS based chemical fertilizer performed equally with recommended fertilizer dose to get satisfactory grain yield and it might have improved soil health. **Submergence and cold prone area (Rangpur region)** In Rangpur region, the results of all locations revealed that BRRI recommended fertilizer dose and rice straw applied with IPNS based chemical fertilizer performed better to get satisfactory grain yield than FP.	Dissemination of fertilizer management technologies among the farmers.
Expt. 2.5. Performance of vermicompost and poultry manure on rice yield and soil health In Boro 2014-15, five doses of vermicompost @ 0.5, 1.0, 1.5, 2.0 and 2.5 t/ha along with poultry manure was imposed as treatments to compare their performance in rice cultivation. The highest grain yield (4.8 t/ha) of BRRI dhan29 was obtained with application of 0.5 t/ha vermicompost. The highest straw yield, tiller and panicle number were found with same treatment. Nonetheless, application of poultry manure @ 2 t/ha produced similar grain yield (4.7 t/ha) with 0.5 t/ha vermicompost treated plot.	Determination of vermicompost rate for optimum yield of BRRI varieties.
3. Project: Greenhouse gas (GHG) emission study **Expt. 3.1.Greenhouse Gas (GHG) emission trial at BRRI** Emission of nitrous and nitric oxides from rice field is blamed for global warming. Experiments were initiated at BRRI, Gazipur to minimize GHG emission from N fertilizers. The amount of ammonium-N was significantly higher in prilled urea (PU) treatment compared to deep placement of either USG or NPK briquette in T. Aus & T. Aman 2014 and Boro 2014-15. In T. Aus and T. Aman 2014, increasing N rates didn't show significant yield advantage, but UDP could reduce N use by 25-50% without sacrificing yield. In Boro 2015, deep placement of urea @ 104 kg N ha^{-1} produced significantly higher grain yield than PU treatment at similar rate of	Option for mitigation of GHG emission

PU in both AWD and continuous standing water (CSW) conditions. Nitrous oxide (N_2O) and nitric oxide (NO) emission were higher in PU treatment under CSW condition, while it was lower in AWD condition.	
4. Project: Evaluation of new fertilizers	
Expt. 4.1. Performance of NP compound fertilizer with Boro rice Field experiments were conducted in Boro 2014-15 at BRRI, Gazipur and at BRRI R/S, Sonagazi, Feni. The following treatments were used to evaluate the NPC and DAP with BRRI dhan29 rice cultivation: T_1 = P control, T_2 = S control (P as DAP), T_3 = DAP (100% N), T_4= NPC (100% N), T_5= DAP (30% less N of T_3), T_6 = NPC (30% less N of T_3). **Gazipur site** Phosphorus control plot produced only 1.97 t ha^{-1} grain yield that increased with added P along with two N rates. At lower N doses, application of P either from DAP or NPC produced similar grain yield, but performance of NPC was slightly better than DAP. It was observed that 30% less N produced statistically similar grain yield with 100% N irrespective of P sources. It can be inferred that 30% N could be saved without significant reduction of rice yield. **Sonagazi Site** It was found that application of P from two different sources and N rates in T_2 to T_6, grain yield decreased compared to P-control plot, though the differences were statistically insignificant. Application of P either from DAP or NPC resulted in similar grain yields (4.66-4.93 t ha^{-1}). It is noticeable that NPC at lower N dose produced 250 kg ha^{-1} more yield than DAP irrespective of N doses indicating that 30% N could be saved by using NPC fertilizer without significant yield reduction. The effect of NPC fertilizer on Boro rice yield was promising. It helped in obtaining comparable grain yield with DAP and saved about 30% N. It may consider as a new fertilizer in Bangladesh.	New fertilizer
5. Project: Soil Microbiological Studies	
Expt. 5.1. Influence of fertilizer management on microbes and soil health The highest bacterial population was found in cow dung and poultry manure amended treatment followed by complete fertilizer treatment. Free living N_2 fixing bacterial population was higher than phosphate solubilizing bacteria. There was significant variation in bacterial population found according to soil depth. Mostly higher bacterial population concentrated 0-20 cm depth.	Nutrient release patterns as an indicator of soil health
Expt. 5.2. Effect of long term nutrient management on microbial growth at variable soil depth Total and beneficial microbial population determined from different soil depth (0-100) of long-term missing element experiment. In the complete fertilizer treatment, total microbial population was higher up to 0-21 cm depth, while in poultry manure amended treatment, it was high up to 56-81 cm depth. The lowest population was found in	Beneficial microbial population as an indicator of soil health

the control treatment. In poultry manure treatment, PSB population was higher (up to 56-81 cm depth) than control and complete treatment, while free living N_2 fixing population was high in complete treatment. About 4×10^7 anaerobic bacteria population was found in 61 -100 cm soil depth	
Expt. 5.3. Formulation and evaluation of multistrain biofertilizer for rice production Combinations of 20 carrier materials were tested to prepare multistrain biofertilizer. Combination of rice straw (70%), mustard oilcake (19%) and sugarcane molasses (1%) were selected as best carrier material to grow free living N2 fixing and phosphate solubilizing bacteria (PSB).	Biofertilizer for rice yield improvement
Expt. 5.4. Isolation and characterization of plant growth promoting bacteria from saline and acidic soil Total microbial population was determined from acidic soil (pH, 5.0). Two types of free-living N_2 fixing bacteria was isolated form acidic soil (pH, 5.0). Isolation and enumeration of saline soil bacteria is in progress.	Isolation of beneficial microbes
Expt. 5.6. Bioremediation of Arsenic contaminated paddy soils Isolation of arsenic resistant bacteria is in progress	Isolation of arsenic resistant bacterial strains

Irrigation and Water management Division

Research Progress 2014-2015

Sl. No.	Research Progress	Expected Output
	Sub-Program: Irrigation and Water Management	
Sub-Sub-Program I: Water Use Efficiency Improvement in Irrigated Agriculture		
01	**Water Requirement** ***Experiments:***	
	1.1. Development of Soil moisture declination model for alternate wetting and drying irrigation for Rice cultivation **Progress:** Comparison of evapotranspiration, seepage & percolation, effective rainfall, irrigation requirement and irrigation data indicated a relationship among them. The study results indicated that soil moisture content in the upper root-zone recedes below the field capacity when the perched water level declined below 20 cm. A soil moisture characteristics curve will be prepared in the next year for better explanation of the study result.	Development of model for prediction of efficient irrigation schedule.
	1.2 Validation of AquaCrop model and effect of USG in rice production under AWD water management **Progress:** The AquaCrop model was calibrated to predict biomass and crop grain yield under three irrigation water regimes. Based on indicators of evaluation for biomass and the required irrigation	Prediction of crop yield and water saving options by using AquaCrop

	amounts, the AWD-15 irrigation regime appears to be the best water-saving option for rice production during the dry season in Bangladesh. Regardless, the obtained season-end metrics in terms of simulated biomass and crop yield are suggesting high potential for the AquaCrop model to be reliably used in e.g. irrigation scheduling, yield prediction or potentially in climate related scenario studies in Bangladesh.	Model
	1.3 Delineation of areas having water shortage during Boro rice cultivation in Northwest Bangladesh **Progress:** A questionnaire has been developed based on the problems faced by the farmers of groundwater declined areas.	Development of options for sustainable groundwater management in agriculture
	1.4 Optimization of irrigation water for maximum year round production **Progress:** BRRI dhan49 and BRRI dhan62 were cultivated in T. Aman season. Yield of BRRI dhan49 and BRRI dhan62 were 3.88 and 4.32 t/ha, respectively. Rainfall and supplementary irrigation data were recorded for analysis. After T. Aman harvest Mustard, Lentil, Potato and Wheat were grown in respective plots. BRRI dhan29 was transplanted on 15/01/2015. Mustard, Lentil and Potato were harvested already. BRRI dhan28 and BRRI dhan48 were transplanted after Mustard and Lentil harvest.	Selection of cropping patterns for higher productivity, higher economic benefit and lower irrigation requirement
Sub- Sub Program II: Utilization of Water Resources in Rainfed Environment		
02	**Water Management for rice cultivation in climate change environment** ***Experiments:***	
	2.1 Terminal drought mitigation through integrated approaches in T. Aman cultivation **Progress:** BRRI dhan33 suffered comparatively less drought than BR11 due to its shorter growth duration. From the analysis it can be said that short duration variety would be suffered drought both reproductive and ripening stages if it is transplanted beyond 24 July. For long duration variety, drought amount increased with late transplanting. The analysis shows that long duration variety faces less drought during critical stages (reproductive & ripening stags) when it is transplanted not beyond 17 July. But it suffers from more drought during critical stages if it is transplanted beyond 24 July.	Development of a transplanting period for low risk of drought occurrence during critical stages of T. Aman rice.
	Expt. 2.2. Determination of suitable time for application of supplemental irrigation in T. Aman **Progress:** Supplemental irrigation was applied based on the parched water table in the field. Three depths 15 cm, 20 cm and 25 cm below the ground surface were used for irrigation scheduling treatments. Since, no significant difference was found among the treatments therefore it is assumed that the yield may be hampered when perched water table remains below 25 cm. If it is happened than a recommendation may be drown than supplemental irrigation should	Determination of appropriate time for applying supplemental irrigation in T. Aman

	be given when perched water table remains at 25 cm. Further study is needed.	
Sub- Sub Program IV: Sustainable Management of Groundwater		
04	**Surface and Ground Water Assessment** ***Experiments:***	
	4.1 Monitoring of groundwater fluctuation and safe utilization in different geo-hydrological regions **Progress:** Weekly groundwater table monitoring data has been taken in BRRI Gazipur and from different regional stations of BRRI. Hydrograph was prepared for each of the stations. A separate graph was prepared with the maximum and minimum groundwater table data of the monitoring stations.	Determination of declination rate of groundwater level in different regions of Bangladesh
Sub- Sub Program V: RENEWABLE ENERGY		
05	**Project Title: RENEWABLE ENERGY** ***Experiments:***	
	5.1 Effectiveness of solar pump for irrigated rice **Progress:** Surface water is being pumped from a pond at 3 m head. Variation in discharge was found in different months and daytime. In September 2014, the highest discharge rate was 191 lit/min at 2.0 pm and average discharge rate was 45.5 m^3/day. In November and December the maximum discharge rate recorded at 60 m^3/day and 52 m^3/day, respectively. In January, the discharge rate was low about 48 m^3/day and in February it's recorded at 52 m^3/day	Selection of an effective pump and solar panel for rice irrigation

Plant Physiology Division
Research Progress 2014-15

Sl. No.	Research Program	Expected output
1	**Salinity Tolerance**	
1.1	Screening for salinity tolerance of advanced breeding materials at the seedling stage	Among 30 genotypes, only 12 breeding lines were moderately tolerant at the seedling stage.
1.2	Screening for Salinity Tolerance of INGER Materials at the Seedling Stage	Among 40 genotypes, only 11 INGER materials were tolerant to moderately tolerant at the seedling stage.
1.3	Screening for Salinity Tolerance of OT Materials at the Seedling Stage	Among 43 genotypes, only 8 OT materials were moderately tolerant at the seedling stage.
1.4	Screening for salinity tolerance of STBN materials at the seedling stage	Among 27 genotypes, only 19 STBN materials were tolerant to moderately tolerant at the seedling stage.
1.5	Characterization of advanced breeding materials for salinity tolerance at reproductive stage	Out of six advanced breeding lines only four lines namely IR73055-8-1-1-3-1, IR78761-B-SATB1-28-3-26, IR78761-B-SATB1-68-6 and IR78761-B-SATB1-28-3-24 showed the most tolerant ability at different salinity level according to yield potentiality and tolerance ability.
1.6	Comparative physiological study of salt tolerant varieties at reproductive stage	Considering yield potentiality and other physiological parameters BRRI dhan47, BINA dhan10 and BINA dhan8 showed better salt tolerance than IR58443-6B-10-3 and IRRI 154 at reproductive stage.
1.7	Evaluation of boro varieties at different salinity stress in temperature variability	Identify the level of tolerance of different genotypes and the safe level of soil and water salinity for growing the genotypes.

Sl. No.	Research Program	Expected output
1.8	Identification of new sources of salinity tolerance of BRRI genebank germplasm	Eleven rice germplasms were identified as moderately tolerant (SES score 5) out of 200 genotypes.
1.9	Mapping QTLs for salinity tolerance of Horkuch at reproductive stage	Phenotyping of both populations was completed but data processing and genotyping is on-going.
1.10	Mapping QTLs for salinity tolerance of Ashfal balam at seedling and reproductive stage	Linkage map construction completed but phenotyping will begin in September/October 2015.
2	**Drought tolerance**	
2.1	Screening germplasm for drought tolerance at reproductive phase	Seed multiplication was done for detail study.
2.2	Screening germplasm for deep rooting ability	Identify new sources of genotypes having deep rooting ability
2.3	Conformation of performance of some breeding lines under drought stress at reproductive phase	Evaluation of ALART and PVT materials under control drought condition in the net house.
2.4	Characterization of some selected rice genotypes	Characterize rice germplasm which can tolerate water stress at reproductive stage
3	**Submergence tolerance**	
3.1	Characterization of germplasm against complete submergence	Some 108 rice genotypes along with the tolerant check FR13A and susceptable check BR5 were characterized. Among the tested genotypes, 6 non-elongating type genotypes namely Muirol, Bhoban, Kalaba, Kerani dhan, Thakor and Maitya cheng showed better survival and after recovery.
3.2	Effect of submergence on rice genotypes under different water turbid condition	Determine the effect of submergence under different water turbid condition
4	**High temperature tolerance/Heat tolerance**	
4.1	Screening for heat tolerance rice genotype	Some 57 rice genotypes of different sources like BRRI developed Aus and Boro varieties, Gene Bank accessions, F2 populations, exotic or indigenous cultivar along with tolerant check N22 were screened for heat tolerance. Among them Acc. No. 97,102,133 and Kachalath can be used as donor parent to develop heat tolerant variety.
4.2	Marker assisted selection for introgression of spikelet fertility loci (qSF4.1 and qSF4.2) from N22 in to two Bangladeshi mega rice variety BRRI dhan 28 and 29	At BC_1F_1 5 & 8 progenies from BRRI dhan28/N22 and BRRI dhan29/N22 were identified having the QTLs in different combinations and phenotypically very close to its recipient. Selected progenies were backcrossed to develop BC_2 progeny.

Sl. No.	Research Program	Expected output
4.3	Development of heat tolerant varieties through conventional pedigree selection method.	At F_2, 11 progenies from 5 crosses were selected based on spikelet fertility >50%.
4.4	Heat tolerance for advance breeding	Selection of advance breeding line for developing heat tolerant variety.
5	**Cold Tolerance**	
5.1	Screening for cold tolerance of IRTON materials	Germination percentage of the entry from IRRI was very poor. Six entries out of 24 did not germinate. Growth duration of most the tested entries were significantly higher than BRRI dhan28 and BRRI dhan36. Among the tested genotypes nine entries (HR 20654-54-3-5, DASANBYEO, HANGANGCHAL 1, MILYANG 240, IR68333-R-R-B-19, IR10K153, IR 11K305, NAMCHEONBYEO and SAEGAEJINMI) were selected as moderately tolerant to cold with other good agronomic characteristics specially yield.
5.2	Evaluation of selected advance rice genotypes for cold tolerance at seedling stage	On the basis of seedling vigor at seedbed, the advance breeding lines IR77496-31-2-1-3-1 and IR62266-42-6-2 showed tolerant to cold at seedling stage than checks and other tested advanced genotypes. Advanced breeding lines BR7812-19-1-6-1-P4 and BR7813-1-3-1 had higher recovery after cold spell.
5.3	Evaluation of IRTON materials for cold tolerance	Growth duration of all the tested entries was significantly higher than BRRI dhan28 and BRRI dhan36 except GAYABYEO. Among the 23 tested genotypes five entries IR87322-65-2, IR05K106, IR10K152, IR10K148 and SAEGYEJINMI) were selected as moderately cold tolerant for whole growth period with other good agronomic characteristics specially yield. Other two genotypes HANAREUM and MILYANG 240 had better vegetative growth but did not show tolerant at reproductive phase.
5.4	Screening for cold tolerance at seedling stage under natural condition	The mean temperature of whole experimental period was above critical (13 ºC) temperature of rice at seedling stage. As a result, none of the rice genotypes showed cold injury symptom. So, the rice genotypes could not be screened for cold tolerance properly. 100 germplasms were considered for this experiment.
5.5	On farm evaluation of polythene cover seed bed technique in Rangpur region	All the tested seedling parameters namely leaf number, shoot length, root number, shoot fresh weight, shoot dry weight, root dry weight and seedling strength increased significantly under polythene covered seedbed than control. The

		farmers liked the technique of polythene covering seedbed as they were able to produce quality seedlings and covered more area compared to uncovered area from their seedbed during cold period.
5.6	Effect of seed invigoration on the growth of seedling in low temperature condition	Salt priming was found most effective compared to hydro-priming and non-primed control treatment.
6	**Seed physiology**	
6.1	Effect of seedbed media on growth of seedling in low temperature condition	Seedbed amended by the mixture of rice husk and mud was found suitable for raising seedling to overcome low temperature stress during Boro season.
7	**Growth Studies**	
7.1	Photo-sensitivity test of recently BRRI released modern T. Aman varieties	On the basis of BVP and PSP BRRI dhan49, BRRI dhan51, BRRI dhan52, BRRI dhan53, BRRI dhan56, BRRI dhan57 are weakly photoperiod-sensitive, BRRI dhan54 is strongly photoperiod-sensitive and BRRI dhan62 is photoperiod insensitive variety.
7.2	Evaluation of physiological attributes of aerobic rice at controlled watered condition	Development of less water requiring variety.
7.3	Determination of growth stages of newly released rice varieties as affected by sowing time	At different sowing time growth stage may be differ due to temperature variation.
8	**Climate and rice**	
8.1	Manual weather station data recording, transfer, storage and maintenance	Daily weather data had been collecting and preserving from BRRI HQ Gazipur and other 6 BRRI Regional Stations like Comilla, Rajshahi, Rangpur, Bhanga, Barisal and Habigonj since establishment to till date.
8.2	Automatic weather station data recording, transfer, storage and maintenance	The weather data of five automatic WatchDog weather stations situated in BRRI HQ and Regional Stations were collected and stored.

Entomology Division

Research Progress 2014-15

Sl. No.	Research Progress (Programme area / Project with duration)	Expected Output
Project :I Survey and Monitoring of Rice Arthropods		
1.	**Title of the Expt.:** Arthropods monitoring at BRRI farm. **Achievement/Progress:** Incidence of rice insect pests and their natural enemies along with their damage intensities was monitored weekly at BRRI farm Gazipur. Data collected from 5 different habitats (seed bed, grass fallow, upland and irrigated rice, rice ratoon) in Aus, T. Aman and Boro seasons 2014-15. In Aus 2014, green leafhopper dominated in seed bed, grass fallow, upland and irrigated rice environment. Rice bug was most abundant in ratoon. In this season spider dominated in all five habitats. In T. Aman season, highest population of grass hopper observed in seed bed, ratoon and grass fallow habitats. Green leafhopper was dominated in irrigated rice. Among the natural enemies LBB, spider, carabid beetle and damselfly dominated in all the habitats. In Boro 2015 season, grass hopper was most abundant in seed bed, ratoon, grass fallow and irrigated rice. Predator lady bird beetle and spider dominated in seed bed, ratoon, grass fallow and irrigated rice.	Incidence patterns of insect pests and their natural enemies are known.
2.	**Title of the Expt.:** Incidence of insect pest and natural enemies in light trap. **Achievement/Progress:** Rice insect pests and their natural enemies were monitored by using light traps during July 2014 to June 2015 at BRRI farms in Gazipur, Barisal, Rajshahi, Comilla and Sonagazi. Brown planthopper population were higher (94,917) followed by green leafhopper (62,222), yellow stemborer (47816) and whitebacked planthopper (45,182 no.) in all five locations. Brown planthopper dominated (80,940) in Gazipur, yellow stemborer (29,333) in Barisal and green leafhopper (14,513) in Rajshahi. Among the natural enemies green mirid bug, spider, lady bird beetle, carabid beetle and ground beetle were most prevalent. Highest population of green mirid bug (57,172) observed in Gazipur.	Long term record of light trap incidence will help to study the effect of climate change on rice insects and natural enemies.
3.		The expected outputs after the completion of this project would be-

	Title of the Expt.: Construction of epidemiology information interchange system for migratory disease and insect pests in Asia region (AFACI Project, Duration : 2013-2016) **Achievement/Progress:** Monitoring of planthoppers with light trap: • Light trap attracted considerable number of winged adult BPH than WBPH from the 3rd week of October to the end of November/ 2014 both at BRRI HQ, Gazipur and Barisal. The peak incidence of BPH was recorded in the 2nd week of November/2014 in both locations. • Population of WBPH was comparatively lower than BPH during this period. However, peak numbers were recorded in November/2014 and May/2015. • Among the natural enemies, green mired bug population was considerably higher in BRRI HQ, Gazipur than Barisal; indicating their density dependence with BPH population build-up. Monitoring of planthoppers with yellow sticky trap (YST): • Monitoring by YST during T. Aman 2014 indicates that the rice planthopper incidence started from 2nd week of September 2014. Peak incidence was found at Kanchaneswar on October 29 and that was from October 29 to November 5 at Kasta, and again highest on October 29 at Aurangail then decreased until harvest of the crop. • Among the natural enemies, green mirid bug population was higher in Kasta on Novemver 5 than the other locations, and the population was comparatively lower in kanchaneswar than Aurangail. Spider population was almost similar during the observation period. • In Boro 2015, BPH and WBPH population tended to increase at Dobila, Hamkuria and Washin from the 1st week of April and the peak population was in the end of April. Natural enemies were also observed all the year round. Monitoring of planthoppers with aerial YST: • RPH (BPH, WBPH and SBPH) and natural enemy (GMB and spider) were more active in the	i) Concrete cooperative network in human or organizational level for interchanging epidemiology information of rice planthoppers and viruses ii) Improvement of scouting quality and standardization of scouting information among the member countries iii) Enhancement of diagnosis techniques for accurate identification in field conditions iv) Elucidation of planthopper and virus migration in Asia region.

	Boro seedbed. • Higher number of insects was caught at 4.88 m height traps than the other one (2.44 m). • Aerial movement of rice planthopper (RPH) in space do exist and it was higher in Dobila followed by Hamkuria and Washin. Planthopper sample collection and delivery: • Around 120 air dried samples of RPH (BPH, WBPH and SBPH) are now ready for sending to Korean Principal Investigator for molecular analysis. RPH forecasting and management: • Incorporated data in AMVIS website was easy to understand on the RPH incidence and their outbreak in the project implementing countries in Asia • Seasonal occurrences of RPH are known for T. Aman and Boro season rice which is helpful in prediction of outbreaks of RPH. • Farmers in the project area have been informed earlier about the incidence of RPH. • Thereby, Extension workers can apply suitable management practices to manage RPH at appropriate time. • Information on outbreaks of RPH shared among the member countries in Asia through the internet platform of AMIVS which is helpful in prediction of possible outbreaks of RPH among member countries.	
Project II: Studies on rice insect pest and natural enemy ecology		
4.	**Title of the Expt.:** Climate change impacts, vulnerability and adaptation: Sustaining rice production in Bangladesh. **Achievement/Progress:** Global warming is expected to increase/decrease frequency of rainfall/precipitation, drought intensity and solar radiation which may affect rice ecosystems particularly arthropods e.g., pests and their natural enemies. The present study discuss influences of climatic variations from almost two decades, on yellow stem borer (YSB), brown planthopper (BPH), green leafhopper (GLH) and their natural enemies (spider, lady bird beetle-LBB, green mirid bug-	The impact of climate change on water resources and rice yields in the selected rice growing sub-division are determined

	GMB). Light trap and sweep net catches of arthropods from different rice habitats shows a strong bi-annual periodicity for BPH, YSB and GMB. The increasing trend, in the GLH, LBB and SPIDER abundance series between 1996 and 2005 has flattened out and is decreasing from 2006 to 2012. This indicates a periodic, slowly varying population abundance characteristic. Two different sampling methods showed different association with climatic variables particularly GLH population.	
Project III: Crop Loss Assessment		
5.	**Title of the Expt.:** Relationship between Gall midge damage and yield loss. **Achievement/Progress:** Yield loss occurred in gall midge infested hills compared to control hills. Highest yield loss occurred in BRRI dhan52 (18.08%) where 16.70% onion shoot observed (ranged 7.69 to 25%) followed by BRRI dhan49 (15.19%) where 14.94% onion shoot appeared (ranged 6.67 to 23.08%). The results indicated that 1% damage of tillers at mid-tillering stage caused 1.08 and 1.02 % yield loss of BRRI dhan52 and BRRI dhan49, respectively at field condition.	Damage loss and its relation to infestation severity in gall midge prone areas are determined.
Project IV: Evaluation of Chemicals and Botanicals against Rice Insect Pests		
6.	**Title of the Expt.:** Test of different candidate insecticides against major insect pests of rice. **Achievement/Progress:** A total of 108 commercial formulations of insecticides were evaluated against brown planthopper (BPH) and yellow stemborer (YSB). Among those 83 were found effective (81 against BPH and 2 against YSB). Effective commercial formulations were recommended to PTAC for registration and commercial use.	Effective insecticides are identified against different insect pests and recommended for registration.
Project V: Integrated Pest Management		
7.	**Title of the Expt.:** Conservation of natural enemies through ecological engineering approaches **Achievement/Progress:** Highest natural enemies, per cent parasitism by *Trichogramma zahiri* were observed in rice field nearby nectar-rich flowering plants. However, least natural enemies and parasitism were found in rice field where four times (continuous/ prophylactic) insecticides were applied. Moreover, there was no yield reduction observed in rice field surrounding by flowering plants compared with insecticide application. So, farmers should avoid the toxic and hazardous insecticides to control the insect pests by growing nectar-rice flowering plants on the	It has avoided insecticide spraying in the early crop stages by enhancing the buildup of different natural enemies in rice eco-system.

	bunds of surrounding rice crops.	
8	**Title of the Expt.:** Validation of BRRI Recommended Practices for Insect Pest Management **8.1. During Aus 2014 Season** **Achievement/Progress:** During the experimental period insect infestation remained below the economic threshold level (ETL). Green leafhopper (GLH), white leafhopper (WLH) grasshopper (GH), yellow stem borer (YSB), white stem borer (WSB), leaf roller (LR), rice hispa (RH), field cricket (FC), rice bug (RB), caseworm (CW), long horned cricket (LHC), dead heart (DH) and onion shoot (OS) were found in fortnightly sweeping and hill counting. No significant differences were observed for insect number and infestation among the treatments. More or less same insect pests were also observed in Barisal region. Highest number of RH found in Barisal region (0.38/20 hill) followed by LHC, YSB and GLH. Very small number of BPH and WBPH also observed at Barisal region. Among the natural enemies spider (SPD), damsel fly (Dam. fly), and dragon fly (Drag. fly), ladybird beetle (LBB), carabid beetle (CBB) and long horned grasshopper (LHG) were found in sweeping. Damsel fly, CBB and LHG not found in T_1 during sweeping where fortnightly used insecticide. Except LBB, other natural enemies were found lowest in T_1 (insecticide treated plots) during 20 hill counting. During 20 hill counting no LBB and lowest number of CBB were observed in T_1 at Barisal region. Thus, it was indicated that continuous use of insecticide has the detrimental effect on the population of natural enemies. Initially, treatments T_2 and T_3 were refrained from insecticide used at the early crop stages (30 - 40 DAT) in all the locations. As a result natural enemy populations increased (though definite trend was found) both in T_2 and T_3 which might reduce pest population below the ETL. Therefore, no insecticide was used in T_2 and T_3. So, it should be avoid continuous/indiscriminate use of insecticide at early crop stage (30-40 DAT) to conserve natural enemy in the rice field. No significant difference in yield was observed in other three treatments (T_1, T_2 and T_3) for both the locations. In T_1 insecticides (Carbofuran 5G@10.0kg/ha) were applied four times but no yield advantage was observed over the treatment T_2 and T_3 where perching and sweeping were done without use any insecticide. Therefore, it was found that	Farmers are now benefited for controlling major insect pests of rice by using BRRI recommended practices.

	continuous use of insecticide had no effect on yield and yield contributing characters of rice when insect infestation below the ETL. So, farmers should avoid continuous/ indiscriminate use of insecticide which ultimately save production cost and save the environment from insecticidal pollution. **8.2. During T. Aman 2014 Season** **Achievement/Progress:** During the experimental period insect infestation in both Rangpur and Barisal region was below the economic threshold level (ETL). Yellow stemborer (YSB), dead heart (DH), rice leaf roller (RLR), caseworm (CW), long horned cricket (LHC), grasshopper (GH), green leafhopper (GLH), brown planthopper (BPH) and rice bug (RB) were found in Pirganj and Taraganj in fortnightly sweeping and hill counting (Fig. 1&3). Caseworm (CW), LHC, GLH and BPH were not found in Taraganj and RB was not appeared in Pirganj during hill counting. Highest number of YSB found in both the locations of Pirganj and Taraganj followed by RLR during sweeping. Rice leaf roller population was found also highest in both the locations during sweeping. Similar insect infestation was observed at Barisal region during hill counting. One think is remarkable that rice hispa adult (RHA) and rice hispa grub (RHG) and their damages were also observed at Barisal region which normally not found at Rangpur region. Among the natural enemies spider (SPD), ladybird beetle (LBB), staphylinid beetle (STB), carabid beetle (CBB) and damsel fly (Dam. fly) were noticed both in Pirganj and Taraganj. In 20 hill count study STB was not found in T_1 both the locations of Pirganj and Taraganj where continuously insecticide was used. Again, lowest CBB and Dam.fly was found at Pirganj and Taraganj respectively in the same treated plot. Similar detrimental effect of insecticide on natural enemies was also observed at Barisal region during hill counting. Thus, the findings indicated that use insecticide has the detrimental effects on natural enemies in the rice field. No significant differences in yield was observed in other treatments (T_1, T_2 and T_3) in both the locations. In T_1 insecticide (Carbofuran 5G@ 10.0kg/ha) was applied five times but no yield advantage was observed. In T_2 & T_3 only perching and sweeping were done fortnightly or when necessary without use any insecticide but no yield reduction was observed. More or less same findings was also observed at	

	Barisal region. Therefore, it was concluded that continuous use of insecticide had no effect on yield and yield contributing characters of rice when insect infestation below the ETL. So, farmers should avoid continuous/ indiscriminate use of insecticide which ultimately save production cost and save the environment from insecticidal pollution.	
Project VI: Host Plant Resistance		
9.	**Title of the Expt.:** Screening of elite breeding lines, rice germplasm and rice varieties. **Achievement/Progress:** A total of 79 entries were tested under controlled conditions in green house against brown planthopper (BPH), 49 against white backed planthopper (WBPH), 68 against green leafhopper (GLH) and 3 against gall midge (GM) during the reporting period. In addition 7 F_2 materials also tested against BPH. Out of 79 entries 19 were found moderately resistant against BPH. Among the 49 entries 12 were selected as moderately resistant against WBPH. Among the 68 entries tested against GLH 2 entries were found moderately resistant. Among 3 AYT materials none were found resistant against GM. Out of 7 F_2 materials two were confirmed as moderately resistant.	Resistant/tolerant germplasm are identified to different insect pests.
10.	**Title of the Expt.:** Screening of elite breeding lines, germplasm and rice varieties against gall midge (GM). **Achievement/Progress:** A total of 63 rice germplasm collected from GRS Division were screened against GM during the reporting period from July 2014 to June 2015. Among 63 rice germplasm, Muktahar (Acc # 156) and Koha binni (Acc# 208) were recorded as moderately resistant (MR) (6-10% OS) to resistant (0-1% OS) against GM at glasshouse condition.	Gall midge resistant / tolerant sources are identified are used in breeding programme.
	Project VII: Vertebrate Pest Management	
11	**Title of the Expt.:** Evaluation of different control measures against field rat **Achievement/Progress:** The experiments were conducted during transplanting of Boro/2015 rice. Four treatments were executed in 20 replicates individually with different management options. Live/dead rat(s) were observed for 10 consecutive nights. Fumigation with Phostoxin tablet caused the death of 9 rats out 20 active burrows indicating 45%	Efficiency of different control measures are understood for better rice filed rat management

	reduction of active rats. However, similar results were recorded from Zinc Phosphide (<2%) bait mixed with wheat @ 5g bait in each burrow. Single capture live trap with lucrative bait (coconut oil + dried paddy wrapped by nylon net) caught highest number (15) of rat resulting 7.5% trap success in 10 consecutive nights.	

Plant Pathology Division

Research Progress 2014-15

Sl. No.	Research Progress	Expected Output
	Program Area/Project: Pest Management (Plant Pathology)	
01	**Survey and monitoring of rice diseases in selected climate vulnerable ecosystems** In T. Aman season, incidence and severity of sheath blight was highest followed by false smut and bacterial leaf blight in all the survey sites. In the Boro season, neck blast was in epidemic in all selected areas in the country. Incidence of other diseases was mostly insignificant.	The study will generate information on the current status of different rice diseases in Bangladesh.
02	**Confirmation of the standard differential set of blast isolates** Depending on the preservation potentiality, rate of sporulation and consistency in reaction, fifteen isolates were confirmed as standard differential blast isolates for Bangladesh.	This study is expected to generate a standard differential set of blast isolates.
03	**Identification of major blast resistant genes in land races of Bangladesh using MAS and pathogenicity** Estimation of blast resistance genes in 350 land races and 50 HYV have already started with the collaboration of JIRCAS, Japan. Genotyping of these germplasms using 74 SSR markers distributed over the 12 chromosoms have already done and found two major groups Japonica and Indica. Again, Indica group was divided in to *Aus* and *Indica* sub species. Nipponbare was comprised in Japonica and Kasalath was in Aus subspecies. We are assuming, highly blast resistant materials are in *Aus* sub group. Pathogenicity tests using twenty International differential blast isolates and including 10 selected	Identification of resistant sources against blast.

	Banlageshi isolates are now doing in JIRCAS, Japan laboratory.	
04	**Screening advanced breeding lines against BB and ShB** In T. Aman 2014, out of 60 materials, four materials (BR 7472-16-2-12-1, IR 73055-8-1-1-3-1, weed tolerant rice, IR 78761-B-SATB1-28-3-2b) showed moderately resistant reaction against *Rhizoctonia solani* pathogen while six materials (IR 77542-551-1-1-1-1-2, BR7965-6-1-4, IRBB 65, IRBB 21, BR 8219-16-2, BR 7941-41-2-2-2-4) showed MR reaction against *Xanthomonas oryzae* pv. *ovizae.* Based on natural incidence, in Boro 2015, among 51 tested materials, 21 were found as moderately resistant and 11 were moderately susceptible against bacterial blight disease.	Identification of resistant sources against BB and ShB.
05	**Pyramiding major blast resistant genes into BRRI dhan29 and premium quality rice** Introgression of blast resistance genes in popular BRRI varieties are now going on. Before gene pyramiding, now we are developing Near Isogenic Lines (NILs) and finally these lines will be used for pyramiding. BC2F1 population now in our hand. We are using BRRI dhan28, BRRI dhan29 and BRRI dhan34 are using as recurrent parent and *indica* source of *Pita-2, Pi9,* Pish and *Pi40* are as donor.	Development of blast resistant rice variety.
06	**Introgression of blast resistant gene into BRRI dhan47** The cross was made between BRRI dhan47 and IRBL9-W (*Pi 9 gene*) and IR65482-4-136-2-2 (*Pi 40*). F_1 generation was obtained.	Development of salt tolerant blast resistant rice variety.
07	**Purification of locally improved Aus variety Mala through pure line selection for Barisal region** Popular variety Mala cultivated mostly at Barisal region during Aus season which is developed by out crossing from BR2. But we found different morphological characteristics between local Mala and BR2. Among the tested pure lines, HRP (Mala)-7-10 was found best considering agronomic and yield characteristics. Further purification as well as increasing of pure and healthy seeds of HRP (Mala)-7-10 are now going on with the collaboration Plant Breeding Division, BRRI.	The study is expected to develop a locally adapted high yielding rice variety.
08	**Evaluation of blast resistant multiline varieties of IR64**	The study is expected to generate Blast

	Blast screening hub with a view to develop a congenial environment for rice blast resistant materials screening has already established at BRRI HQ, Gazipur with the collaboration of JIRCAS, Japan. Around 100 neck blast infected panicles were collected from the field of IR64. IR64 produced an average yield of 4.2 t/ha. The seeds of blast resistant multiline varieties have already collected from JIRCAS, Japan and now are multiplying for large scale evaluation. There is a possibility to select any of the line as first blast resistant rice variety in Bangladesh.	resistant multilines.
09	**Evaluation of blast resistant multiline varieties of IR49830 in tidal non-saline ecosystem of Barisal** Considering the disease reaction and agronomic acceptance three lines such as IRBL9-W, IRBLta2Pi and IRBLsh-T (containing both blast and submergence resistant gene (s) along with taller seedling height) were found suitable for tidal non saline eco-system. Among them IRBLsh-T line produced highest yield of 5.01 and 4.88 t/ha in BRRI R/S, Further investigations especially G x E interaction is essential before selecting of these materials as prospective. Barisal and farmers field at Bakergonj, Barisal, respectively.	The study is expected to generate blast resistant multilines for tidal non-saline ecosystem.
10	**Development of mass inoculation technique of false smut disease** The initial work i.e. clamydiospore germination from the red dust of false smut infected grains and subsequently ascospores production on oat culture for inoculation have already done. Preliminary study on spraying spore suspension during flowering and inject inocula in the flag leaf sheath before flowering both in the field and controlled conditions have been done. But expected results not yet found from this experiment. The experiment is going on. Hopefully, we will able to develop mass inoculation technique.	Development of a rapid screening method.
11	**Impact of climate change on rice blast and false smut disease development** To find out the reasons of rice blast and false smut disease outbreak, intensive survey both in Rajshahi and Barisal regions are now doing in T. Aman since 2012. In addition, manipulating temperature and humidity in laboratory, disease development progress was also investigated. High humidity drizzle raining at flowering favored outbreak both diseases.	Better understanding of the epidemiology of rice blast and false smut diseases.

12	**Identification of red eelworm and damage phenomenon on rice** A base line survey were conducted regarding red eel worm incidence, severity, affecting area, prevailing control strategy and farmer's opinion regard the pest. Based on this information future work plan will be prepared.	This study is expected to generate information whether red eel worm cause significant damage to rice and to develop management package for controlling the pest.
13	**False smut disease of rice: Distribution, severity and yield loss in Bangladesh and development of a qualitative modelling framework** This study establishes soil as the absolute dominant source of initiation of the epidemic. The analysis did not find evidence of any long- or short-distance primary and/or secondary sources of infection. Results show that the spread of the disease was not similar between and within the fields and even some fields were almost disease free. Symptom recorded on ratoons. The disease tended to be prominent towards proximity of drainage channels. It suggests development of a soil testing tool for quantifying inoculum potential in a field to ascertain the risk of the disease.This study developed a simple model, FLYER, to instantly estimate the YL by visual field inspection. The model was successfully validated and tested with data from Bangladesh, Egypt, India and Japan. A rapid yield loss measuring chart has been developed for farmers and frontline extension.	Forecasting of rice false smut disease.
14	**Effect of Brine solution on rice seed borne disease, germination and seedling vigour** Among six treatments, 30% concentration of brine solution showed good germination percentage, higher seedling growth and vigor than other treatments. But minimizing of seedborne disease on seed surface is not up to the mark. So, further trial should be needed for more confirmation.	Effective control of rice seed borne diseases.
15	**Management of seedling blight disease in seedling raising for mechanical transplanter** Seed treatment with Pyracloztrobin (0.2%) was found effective.	Effective control of seedling blight.
16	**Evaluation of new chemicals against False Smut disease of rice** Twelve chemicals of different groups either single or combined are tested against false smut under field	Effective chemical control of false smut.

	conditions of BRRI HQ, Gazipur and BRRI RS, Rajshahi. Among the tested chemicals, spraying propiconazole group fungicides (Tilt) during flowering found best in controlling false smut. Susceptible variety BRRI dhan49 was used as test variety.	
17	**Evaluation of new chemicals against Sheath Blight and blast** Among the twenty four fungicides, only six fungicides i.e. Avtar, Palki 75 WG, Mactivo 75 WG, Navera, Bravo and Seltima successfully controlled rice sheath blight disease (above 80%) in the year 2014. These six fungicides will undergo in next season for further confirmation. Where as, out of twenty eight fungicides, only five i.e. Palki 75 WG, Indofil's Baan, Mactivo 75 WG, Navita 75 WG and Trigger 75 WP were successfully controlled rice blast disease (above 80%) in the year 2013 & 2014 and recommended for registration.	Effective chemical control of ShB and blast.
18	**Development of false smut management packages** Now a days, false smut becoming major disease of rice all over the world though it was considered previously as sign of good harvest. To manage this disease successfully, five points were considered: 1) varietal response to the disease; 2) nutrient up take response to this disease; 3) botanicals response to this disease; 4) synthetic chemicals response to this disease and 5) finally climatic factors response to this disease. To select more than one option as package is better than the application of single one. This is one of the research works of PhD student. This experiment will be continued up to T. Aman 2015 season and not yet summarized the results.	Effective management of false smut.
19	**Effect of organic amendment to minimize blast in rice** Among the treatments T3 (Nativo) found best followed by T5 (rice husk ash + Nativo) to control blast disease in terms of lowest neck as well as node blast disease incidence. Blast incidence in T3 and T5 was similar as in T7 (Healthy control). In addition grain yield was found higher and no significant difference was found in T3 and T5 treatments and also higher grain yield was obtained in comparison to T7.	Effective management of blast.

20	**Chemical control of bacterial leaf blight of rice** Among eleven chemicals, none of effective chemicals was found for controlling bacterial blight disease in the first trial.	Effective chemical control of bacterial leaf blight.
21	**Demonstration on integrated rice disease management in farmers' field** A total of twenty three demonstrations were executed in greater Barisal and Rangpur regions under IAPP project. BRRI recommended practices performed better than farmer practices.	Minimize yield loss through effective management of different diseases of rice.
22	**Specialized training on rice disease management and healthy seed production** A total of six training on rice disease management and healthy seed production were conducted in three upazilas of Kustia district under MIAD project. A total of 144 Sub Assistant Agriculture Officer (SAAO) were trained on different rice diseases.	Increase knowledge and skill of SAAO on rice disease management and healthy seed production.
23	**Integrated management of false smut disease of rice** Disease incidence was associated with rainfall during flowering and heading stages. Nativo showed positive effect in all three locations to control the disease.	Effective management of false smut.

Rice Farming Systems Division

Research Progress 2014-15

Sl. no.	**Research progress**	**Expected Output**
Programme Area: **Rice Farming Systems**		
01	1. Rice Farming Systems Division	
	Project 1: Survey on Cropping Patterns of Bangladesh **One** survey has been executed. **1.1.** Study of existing cropping systems in the South-Western Bangladesh • Data were collected using pretested questionnaire from 19 upazilas. The collected data are under process. **Project 2:** Development of Resource Conservation Technologies **One** experiment has been executed.	Information on land use, crops and cropping patterns, constraints and probable solution of crop production, scope and opportunity for intensification and diversification of agricultural production systems will be generated. Resource conserving and agro-

	2.1. Evaluation of different cropping patterns for their water requirement in medium highland ecosystem • The experiment was conducted during Kharif I-2014 to Rabi 2014-15 seasons. Five cropping patterns viz., Tomato (BARI hybrid tomato-5)- Mungbean (BARI mug-6)- T. Aman (BRRI dhan49), Wheat (BARI gom-26)-Mungbean (BARI mug-6)- T. Aman (BRRI dhan49), Potato (BARI alu-7)-T. Aus (BRRI dhan48)-T. Aman (BRRI dhan49), Lentil (BARI masur-7)-T. Aus (BRRI dhan48)- T. Aman (BRRI dhan49) and Chickpea (BARI chola-9)- T. Aus (BRRI dhan48)- T. Aman (BRRI dhan49) were evaluated along with the check Boro (BRRI dhan28)-Fallow- T. Aman (BRRI dhan49) in RCB design with three replications. Tomato (BARI hybrid tomato-5)- Mungbean (BARI mug-6)- T. Aman (BRRI dhan49) was best inrespect of water use efficiency, REY and gross margin. **Project 3:** Development of Cropping Systems and Component Technologies for Favorable Environment (Irrigated condition)	economically profitable cropping patterns will be developed for increasing system productivity.
	Ten experiments have been executed *3.1.* ***Development of Vegetables, fish and fruit system in mini pond*** • The experiment was conducted during 2014-15 at BRRI, Gazipur. The treatments were : T_1= Aroid+Fish (Stocking density: 07 piece/m^2) in the pond and vegetable and fruit on the bank of the pond, T_2= Aroid+Fish (Stocking density: 04 piece/m^2) in the pond and vegetable and fruit on the bank of the pond, T_3= Aroid in the pond and vegetable and fruit on the bank of the pond and T_4= Fish in the pond (Stocking density: 04 piece/m^2) and vegetable and fruit on the bank of the pond. Fish species was Monosex Telapia. **3.2.** Long-Term Effect of Three Cropped Cropping Patterns on the Agro-Economic Productivity and Soil Health • The treatments were: Boro-Fallow-T Aman, Boro-T Aus-T Aman, Maize-Mungbean-T Aman, and Potato-Boro-T Aman. The highest REY (22.34 t/ha) was obtained from Potato-Boro-T Aman cropping pattern followed by Boro-T Aus-T Aman (15.73 t/ha), Maize-Mungbean-T Aman(14.51 t/ha). *3.3.* ***Evaluation of maize intercropping technologies to develop suitable cropping pattern packages for maize***	Shallow depth mini pond system to maximize the food production will be developed. Impact of improved cropping pattern in respect of productivity and soil health will be assessed. Suitable maize intercropping system for higher income will be developed.

	based cropping pattern in Chuadanga A study was conducted at farmer's field of Chuadanga Sadar, during Kharif I-2014 to Rabi 2014-15 seasons. Three cropping patterns viz., Maize+Bushbean-Sweet gourd-T. Aman, Maize+Spinach-Sweet gourd-T. Aman, Maize+Potato-Sweet gourd-T. Aman, Maize+Red Amaranth-Sweet gourd-T. Aman and Maize+Coriander-Sweet gourd-T. Aman were evaluated along with the check Maize-Sweet gourd-T. Aman in RCB design with three replications. Significantly highest MEY (31.02 t/ha) was obtained from Maize+Potato-Sweet gourd-T. Aman pattern along with 69% higher gross margin compared to others patterns.	
	3.4. Development of high intensity Cropping Pattern for greater Kushtia • An experiment was conducted at the farmer's field during the period from April 2014 to June 2015. Three cropping patterns viz., Mustard (BARI sarisha-14)-Mungbean (BARI mug-6)-T. Aus (BRRI dhan48)-T. Aman (BRRI dhan57), Maize (BARI hybrid bhutta-7/Indian hybrid varity)+Spinach (Local)-Sweet gourd (BARI misti kumra-2)-T. Aman (BRRI dhan57) and Maize (BARI hybrid bhutta-7/Indian hybrid varity)+Potato (Cardinal)-T. Aus (BRRI dhan48)-T. Aman (BRRI dhan57) were evaluated along with the check Maize (BARI hybrid bhutta-7/Indian hybrid varity)-Fallow-T. Aman (BRRI dhan57/BRRI dhan49) in RCB design with three replications. Highest REY was found from Maize+Potato/Pumpkin-T. Aus-T. Aman cropping pattern (25.69 t/ha) followed by Maize+Spinach-T. Aus-Aman cropping pattern (17.93 t/ha) and Maize –T. Aman (16.26) cropping pattern and lowest was found from Mustard-Mungbean-Aus-Aman (15.15t/ha) cropping pattern. **3.5.** Validation of improved cropping systems for greater Kushtia • Seven farmers were selected in each block to conduct each improved cropping system trial. Four improve cropping pattern trial was conducted in 12 different blocks. In each trial, a improved cropping pattern was tested against an existing cropping pattern. In case of improved cropping pattern Mustard-Boro-T. Aman, REY (12.27- 13.93 t/ha) was significantly higher than the existing Boro-Fallow-T. Aman pattern (10.22-11.65 t/ha). In case of improved cropping pattern Maize-Mungbean-T. Aman, REY (13.67- 13.86 t/ha)	Intensified profitable cropping pattern will be developed. Cropping pattern technologies will be validated and disseminated.

	was significantly higher than the existing Maize-Fallow-T. Aman (11.00-14.42 t/ha) except one location. In case of improved cropping pattern Maize-Til-T. Aman, REY (15.60 t/ha) was significantly higher than the existing Maize-Jute-T. Aman (14.01 t/ha).	
	• In case of improved cropping pattern Maize-Til-T. Aman, REY (40.06 t/ha) was significantly higher than the existing Maize-Jute-T. Aman (30.23 t/ha). **3.6** Effect of fertilizer management on yield of double transplanted Aman and Boro rice under T. Aman-Boro cropping systems • The experiment was conducted during T. Aman 2014 and Boro 2014-15 seasons. The design was RCB with three replications. In T. Aman season, treatments were: Planting methods under different time of transplanting: T_1= Normal transplanting with 60 DOS (TP: 25 Sep; Sowing: 25 Jul.), T_2= Normal transplanting with 45 DOS (TP: 25 Sep.; Sowing: 10 Aug.), T_3= Normal transplanting with 30 DOS (TP: 25 Sep.; Sowing: 25 Aug.), T_4= Double transplanting (No fertilizer in 1st transplanted plot; All seedling removed), T_5= Double transplanting (1st split urea in 1st transplanted plot; All seedling removed), T_6= Double transplanting (Full fertilizer in 1st transplanted plot; 75% seedling removed) and T_7 = Remaining 25% seedlings in fully fertilized 1st transplanted plot. In Boro season, T_1= Normal transplanting with 80 DOS (TP: 25 Feb.; Sowing: 05 Dec.), T_2= Normal transplanting with 60 DOS (TP: 25 Feb.; Sowing: 25 Dec.), T_3= Normal transplanting with 40 DOS (TP: 25 Feb.; Sowing: 15 Jan.), T_4= Double transplanting (No fertilizer in 1st transplanted plot; All seedling removed), T_5= Double transplanting (1st split urea in 1st transplanted plot; All seedling removed), T_6= Double transplanting (Full fertilizer in 1st transplanted plot; 75% seedling removed) and T_7 =Remaining 25% seedlings in fully fertilized 1st transplanted plot. Nitrogen, P, K, S and Zn were applied as per recommendation. In T. Aman season, the grain yield ranged from 3.83 to 4.90 t/ha among the treatments. The treatment effect on grain yield was significant ($p \leq 0.05$). The highest grain yield was obtained with the T_4 treatment (4.90 t/ha.), followed by the T_5, T_6 and T_2 treatments, and minimum under T_1 (3.83 t/ha) treatments. In Boro season, the grain yield of rice was significantly affected by different treatments ($p \leq 0.05$). Highest grain yield was obtained from T_5 (8.55	Optimum fertilizer management package for double transplanted rice will be developed. Recommended fertilizer package will be validated and the better option will be adopted.

	t/ha) treatment, followed by the T_4 and T_2 treatments. The lower and statistically similar grain yields were observed from T_7 (6.07 t/ha) and T_1 (6.82 t/ha) treatments. **3.7.** Evaluation of fertilizer management options in major crops in Kushtia region • Each of ten farmers of Hanurbaradi and Shuvorajpur block were selected for this trial during Kharif-II 2014 and Rabi 2014-15 seasons. Each farmer's field was divided into three parts to imply the treatments viz., BRRI recommended fertilizer dose, soil test based fertilizer dose and farmer's usual fertilizer dose. In Chuadanga, BRRI recommended fertilizer management and farmer's practice gave similar grain yield. Whereas soil test based fertilizer treatment resulted significantly lower grain yield compared to other treatments in T. Aman season. Whereas in Boro season, all the options gave similar grain yield. In Meherpur, BRRI recommended fertilizer management and farmer's practice gave similar grain yield in T. Aman season. Whereas soil test based fertilizer treatment gave significantly lower grain yield compared to other treatments. In Boro season, BRRI recommended treatment gave significantly higher grain yield. Whereas soil test based fertilizer treatment and farmer's practice gave the similar grain yield. **3.8.** Nitrogen management options in Boro and T. Aman rice under Boro-Fallow-T. Aman cropping system • The treatments were: i) One third of N was applied at IT stage + one third at AT stage + one-third at PI stage (N_1); ii) One-half at IT stage + another-half at PI stage (N_2); iii) One third at IT stage + two-third at PI stage (N_3); (iv) One-fourth at IT stage + one-fourth at AT stage+ half at PI stage (N_4); v) Half at IT stage + another half at AT stage (N_5) and vi) N-control (N_6). BRRI dhan44 in T. Aman season and BRRI dhan28 and BRRI dhan29 in Boro season were grown. In T. Aman season, each treatment received 70 kg N/ha as urea and in Boro season, 119 kg N/ha and 136 kg N/ha as urea for BRRI dhan28 and BRRI dhan29, respectively. In T. Aman season, timing of N application treatments had significant effect ($p<0.01$) on grain yield. Significantly higher grain yield (5.50 t/ha) was observed in N_4 treatment followed by N_3 (5.47 t/ha), N_2 (5.33 t/ha) and N_1 (5.13 t/ha) treatments. In Boro season, higher	Best nitrogen management option of rice in Boro-Fallow-T. Aman cropping pattern will be developed. Nitrogen use efficiency of different nitrogen application method will be determined. Cropping pattern technologies will be validated and disseminated.

	grain yield was obtained from the N_3 treatment (7.10 t/ha) followed by the N_2 (6.88 t/ha), N_4 (6.78 t/ha) and N_1 (6.70 t/ha) treatments and lower was in the N_6 (3.23 t/ha) treatment in BRRI dahn28 (Table 42). In BRRI dhan29, significantly higher grain yield was observed in N_4 (7.80 t/ha) treatment compared to all other treatments and lower was in the N_6 (3.15 t/ha) treatment. BRRI dhan29 achieved higher grain yield compared to BRRI dhan28, irrespective of different N treatments. **3.9.** Evaluation of BRRI prilled urea applicator in Boro and T. Aman rice in Boro-Fallow-T. Aman cropping system • The experiment was conducted in T. Aman and Boro seasons of 2014-15. There were five treatments: (i) Hand broadcasting of prilled urea as per BRRI recommendation (T_1), (ii) USG application by applicator (2.7 g/4 hills) (T_2), (iii) Prilled urea application by applicator (70% of the recommended urea in broadcasting) (T_3), (iv) Hand broadcasting of prilled urea as per T_3 dose (T_4) and (v) N-control (T_5). BRRI dhan44 and BRRI dhan28 were grown in T. Aman and Boro season, respectively. The significantly higher grain yield was obtained from T_1 (5.66 t/ha) treatment followed by T_3 (5.60 t/ha) and T_2 (5.53 t/ha) treatments. The lowest yield was observed in T_5 (4.16 t/ha) treatment. In Boro season, the highest grain yield was obtained from T_3 (6.73 t/ha) followed by T_1 (6.22 t/ha) treatments in BRRI dhan28. The lowest yield was observed in T_5 treatment (3.65 t/ha).	Double crop cropping pattern for saline environment will be developed.
	3.10. Testing of different cropping pattern in Rangpur region • Four different cropping patterns namely; Potato (Diamont)-Maize (NK-40)-T. Aman (BRRI dhan57), Potato (Asterix)–Boro (BRRI dhan55)–T. Aman (BRRI dhan49), Wheat-Mungbean-T. Aman, Potato – Boro (BRRI dhan28)-T. Aman (BRRI dhan49) with four check pattern was tested at six dispersed farmers' filed. About 9 to 24% more gross margin was found in all of the proposed cropping pattern. The highest REY of 27 t/ha was observed in Potato (Diamont)-Maize (NK-40)-T. Aman (BRRI dhan57) cropping pattern followed by potato based cropping pattern. **Project 4.** Development of Cropping Systems and	Suitable sunflower variety and spacing will be identified for different gradients of saline soil.

	Component Technologies for Saline environment **Five** activities have been executed. **4.1.** Evaluation of different cropping patterns in saline area • The Treatments were: CP1= T. Aman-Dibbled sunflower; CP2=T. Aman-Zero tilled wheat (strip tilled); CP3=T. Aman-Zero tilled wheat (line sown), CP4=T. Aman-Spinach (broadcast, line sown); CP5= T. Aman-dibbled Okra; CP6= Fallow-Fallow-T. Aman (Check) following RCB design with six replications. On an average, transplanted Aman rice produced 4.15, 4.48 and 4.66 t ha^{-1} grain yield in low, moderate and high saline area, respectively. BRRI dhan53 yield range was 4.06 to 4.23 t ha^{-1}. The medium and high saline sites, farmers cultivated BRRI dhan54 which produced grain yield of 4.37-4.50 t ha-1 and 4.72-5.54 t ha-1, respectively. Wheat yield was reduced more than 50% in high saline area compared to the yield of low and medium saline area. Indian spinach sown in line without tillage and by dibbling method produced a yield of about 30 and 26 t ha-1 which was slightly reduced in medium saline area and reduced by about 15% in high saline area. The study showed the feasibility of sunflower in different gradient of salinity, wheat and spinach in low and medium saline area. **4.2.** Evaluation of sunflower varieties and spacing under different gradient of salinity • Treatment was variety and spacing. Variety were: V1=BARI sunflower2, V2=Hysun33, V3= Advanced line and spacing were: S1=75 cm X 45 cm, S2= 60 cm X 45 cm and S3= 45 cm X 30 cm following RCB design with six replication. Irrespective of spacing, the hybrid variety of sunflower, Hysun33 produced higher seed yield in low, medium and high salinity level.Hysun33 produced higher seed yield at the spacing 60 cm x 45 cm in low (2.85 t ha^{-1}), medium (2.73 t ha^{-1}) and high salinity (2.00 t ha^{-1}) level. The average yield of turmeric and zinger were 13.62 &8 t/ha **4.3.** Evaluation of fertilizer recommendation in rice-dibbled sunflower cropping sequence under different gradient of salinity • Fertilizer management were; F1= Full recommended fertilizer in rice in rice and sunflower (RR); F2= Full	Location specific fertilizer dose will be determined for Rice-Sunflower cropping pattern. Location specific salt tolerant variety and the benefit of the improved fertilizer dose will be demonstrated. Farmer's knowledge about rice-based technology in saline soils will be improved and farm productivity will be increased.

	recommended P and K fertilizer in rice and sunflower (N omission); F3= Full recommended N and K fertilizer in rice and sunflower (P omission) F4= Full recommended P and N fertilizer in rice and sunflower (K omission); F5= Farmers' practice in rice and sunflower (FP) following RCB design with 3 replication. **4.4.** Evaluations of agronomic options for increasing the productivity of Boro rice in saline soils • Treatments were: BINA dhan10,DS: Dec. 05, TP: Jan 10, 2-3 seedling/hill; BINA dhan10, DS: Nov. 25, TP: Jan 10, 5-6 seedling/hill; BRRI dhan61,DS: Dec. 05, TP: Jan 10, 2-3 seedling/hill; BRRI dhan61, DS: Nov. 25, TP: Jan 10, 5-6 seedling/hill; BRRI hybrid dhan3, DS: Dec. 05, TP: Jan 10, 1-2 seedling/hill; BRRI hybrid dhan3, DS: Nov. 25, TP: Dec 30, 1-2 seedling/hill; BRRI dhan28, DS: Dec. 05, TP: Jan 10, 2-3 seedling/hill; viii)BRRI dhan28, DS: Nov. 25, TP: Jan 10, 5-6 seedling/hill; BRRI dhan28, DS: Nov. 15, TP: Dec 20, 5-6 seedling/hill; BRRI dhan28, DS: Nov. 25, TP: Jan 10, 5-6 seedling/hill, 90 kg additional S/ha following RCB design with 3 replication. The highest grain yield (6.27 t ha^{-1}) was obtained from BRRI hybrid dhan3 transplanted 10 days earlier compared to farmers' average transplanting date (10 January) which was similar to BRRI hybrid dhan3 at normal planting date, BINA dhan10 both with 2-3 and 5-6 seedling $hill^{-1}$, BRRI dhan61 with more number of seedling (5-6 $hill^{-1}$). **4.5.** Farmers' participatory demonstration of rice-based technology in saline area of Satkhira district • There was no significant difference between BRRI dhan53 and the existing popular variety Jamaibabu. However, the numeric more grain yield and higher market price of BRRI dhan53 due to finer grain resulted higher gross return and gross margin. BRRI dhan54 produced significantly higher grain yield (4.47 t/ha) than that of popular variety BR23 (3.86 t/ha). **Project 5.** Development of Cropping Systems and Component Technologies for Non Saline Tidal environment **Five** activities have been executed.	Feasibility of musk melon intercropping with lentil and potato will be identified for Rabi - Jute – T. Aman cropping pattern.

	5.1. Evaluation of musk melon intercropping with lentil in three crop system in tidal non saline ecosystem Musk melon intercropping with lentil in Lentil-Jute-T. Aman cropping pattern was conducted at five dispersed farmer's field during 2014-15. Intercropping system gave significantly higher rice equivalent yield (REY) of 24.46 t/ha than	
Sl. no.	**Research progress**	**Expected Output**
	Lentil-Jute-T. Aman (13.17 t/ha) cropping pattern. The gross margin (GM) of intercropping system was 137% higher than without intercropping system (70747 Tk/ha). The BCR of intercropping and without intercropping system was 1.85 and 1.56, respectively. Musk melon as intercropped with lentil can increase the three crop system productivity at almost double of total REY and GM. **5.2.** Development of three crop systems for medium high tide wetland non saline ecosystem • Inclusion of mustard, wheat, potato, lentil in Fallow-Jute-T. Aman cropping pattern under four different cropping systems was tested at four to twelve dispersed farmer's field during 2014-15. All of the three crop system produced significantly higher REY of 42% to 162% than two crop system of Fallow-Jute-T. Aman cropping pattern (8.57 t/ha). Potato-Jute-T. Aman cropping pattern gave higher REY of 22.47 t/ha among the tested patterns. The gross margin of potato and lentil based three cropped system was 488% and 204% higher than Fallow-Jute-T. Aman system (23746 Tk/ha). The BCR of theses two crop based three crop system was 1.71 and 1.57, respectively. For higher profitability, potato was the best followed by lentil, wheat and mustard as rabi crop in Rabi-Jute-T. Aman cropping pattern. **5.3.** Adaptive trial of BRRI rice varieties in Aman and Boro season • Seven cooperative farmers were selected to conduct the study. Newly released boro rice varieties were taken under this trial. BRRI dhan55, BRRI dhan58, BRRI dhan59, BRRI dhan64 and BRRI dhan68 showed the identical yield level of 6.77 to 7.05 t/ha irrespective of the locations.	Three crop system will be developed. BRRI HYV varieties will be adopted.

Sl. no.	Research progress	Expected Output
	5.4. Demonstration of USG application in Aman and Boro rice • Uses of urea super granule (USG) were demonstrated in more than twenty cooperative farmers' field. All other cultural activities and fertilizer dose will be followed as per BRRI recommendation. BRRI dhan55, BRRI dhan68 and BRRI hybrid dhan3 were used in USG trial. More than 1.0 t/ha higher yield advantage was found in BRRI hybrid dhan3 (8.05 t/ha) than other two varieties. Farmers' showed their interest to use the USG especially to save the amount of urea fertilizer as like in the water logged condition. **5.5.** Testing of different cropping pattern in Barisal region • Inclusion of sunflower and mungbean in Fallow-T. Aus-T. Aman cropping pattern was tested at Amtali, Barguna. Fallow-T. Aus-T. Aman, Fallow-Fallow-T.Aman/Grass pea, Mungbean-Fallow-T.Aman was also trialed at Patuakhali, Jhalkathi and Barisal, respectively. Three to six dispersed farmers' field was taken to carry out this study. This program was initiated in Aman 2014 and not completed the circle. Aus crop is in field at present. **Project 6.** Development of Improved Cropping Systems for drought prone area **6.1.** Evaluation of rice-based cropping pattern in partially irrigated ecosystem • The treatments were five cropping patterns viz., Tomato (BARI hybrid tomato-5)-Mungbean (BARI mug-6)-DS Aman (BRRI dhan57) (CP_1), Tomato (BARI hybrid tomato-5)-Mungbean (BARI mug-6)-DS Aman (BRRI dhan56) (CP_2), Tomato (BARI hybrid tomato-5)-Mungbean (BARI mug-6)-DS Aman (BRRI dhan62) (CP_3), Tomato (BARI hybrid tomato-5)-Mungbean	USG uses in farmer's fields will be disseminated. Suitability of the cropping pattern identified and disseminated. Improved cropping pattern with suitable Aman variety for partially irrigated ecosystem will be developed.

Sl. no.	Research progress	Expected Output
	(BARI mug-6)-DS Aman (BRRI dhan39) (CP_4) and Tomato (BARI hybrid tomato-5)- Mungbean (BARI mug-6)- DS Aman (BRRI dhan33) (CP_5) were evaluated in RCB design with three replications. The REY among the tested patterns ranged from 23 to 28.13 t ha^{-1} and apparently the higher REY was observed in CP_3 followed by CP_4 and CP_2. Higher gross return, gross margin and benefit cost ratio (BCR) were also obtained from CP_3 (Tomato-Mungbean-BRRI dhan62) followed by CP_4 (Tomato-Mungbean-BRRI dhan39) and CP_2 (Tomato-Mungbean-BRRI dhan56) and the lower was found in CP_1. Project 7. Crop Modeling 7.1. Evaluation of different cropping patterns for APSIM model • T. Aman (BRRI dhan49), mustard (BARI sarisha-14), mungbean (BARI mug-6) and lentil (BARI masur-7) were cultivated during 2014-15 and different data for APSIM validation has been collected. T. Aus is in the field. After completion cropping sequence and soil analysis different cropping sequence will be evaluated for APSIM.	APSIM model validated.

Agricultural Economics Division
Research Progress 2014- 15

Program Area: *Socio-Economics and Policy*

Principal program performing unit: Agricultural Economics Division

Sl. No.	Research Progress	Expected output
	Sub-sub Program: I. Rural Institution & Economic Consequences	
2.1	**Farm Level Adoption and Evaluation of Modern Rice Cultivation in Bangladesh** **Duration:** July, 2014 - June, 2015 **Progress:** About 15% data collection and entry were completed	Variety wise adoption rate and constraints of different MVs and LVs be evaluated.

Sub-sub Program: II. Production Economics

2.2	**Estimation of Costs and Returns of MV Rice Cultivation at the Farm Level** **Duration:** July, 2014 - June, 2015 **Progress:** About15% data collection and entry were completed	Profitability, factor and income share of MV rice cultivation be estimated
2.3	**Tracking of Climate Resilient Rice Varieties Developed by BRRI and its Economic Performances at the Farm Level** **ion:** July, 2014-June, 2017 **Progress:** Data of Aman season from Satkhira, Barisal, Rajshahi, and Mymensingh have been collected	Performance of stress tolerant rice varieties be evaluated.
2.4	**Survey on Surface Water Utilization and its Scope for Crop Production in different Hydrological Zones of Bangladesh** **Duration:** June 2013 to June 2016 **Progress:** About 25% data collection and entry were completed	• Location specific availability and scope for crop irrigation identified; • Prospects of surface water utilization for crop irrigation be determined

Sub-sub Program: III. Rice Marketing & Price Policy

2.5	**Value Chain and Marketing of Puffed (Muri) and Flatten rice (Cheera) in Bangladesh** **Duration:**July, 2014 - June, 2015 **Progress:** Questionnaire developed and site selection completed. About 25% work have been done	Suitable varieties and added value from Muri and Cheera production be assessed.

Sub-sub Program: IV. Agricultural Policy & Development

2.6	**Food Habit and Livelihood of Garment Workers in Bangladesh** **Duration:** July, 2015 - June, 2017 **Progress:** Questionnaire has been prepared along with collecting literature review. Check list for focus group discussion has been pre-tested.	The dietary pattern, food habit and livelihood of garment workers be evaluated.
2.7	**Impact of SPDP on Quality Seed and Rice Production** **Duration:** May, 2014 - Oct, 2016 **Progress:** About 10% data collection and entry were completed	Effectiveness of SPDP for increasing rice production be evaluated.

Agricultural Statistics Division

Research Progress_2014-15

S. N.	Research Progress	Expected output
IV: Program Area: Socio-economics and Policy		
1.	**Project: Stability Analysis of BRRI varieties** ***1.1 Experiment/Study:*** Study on G X E interaction of BRRI varieties (In collaboration with Pl. Breeding Div., ARD Regional Stations) ***Research Progress:*** Season, year and location-wise data on yield of BRRI varieties at different regional stations have been generated for twelve years to perform stability analysis according to the model developed by agricultural statistics division.	1. List of varieties with stability measure by season 2. List of varieties that are loosing stability over time and location 3. Bio-physical factors affecting stability of varieties identified 4. Season, year and location-wise database on yield of BRRI varieties
2.	**Project: Multivariate Analysis of BRRI Varieties** ***2.1 Experiment/Study:*** Development and validation of producer and consumer preference model to rice varieties (In collaboration with Agril. Econ.Div.) ***Research Progress:*** • Mathematical models already been developed and modified the models as per suggestion of expert member for producer's and consumer's and producer-cum-consumer preference to rice varieties. • For validation four districts data already been analyzed and partial results presented in Annual research review workshop 2013-14 and another four districts data collection is going on.	1. Factors determining producers' and consumers' preference to a rice variety 2. Functional models describing producers' and consumers' preference to a rice variety
	2.2 Experiment/Study: Efficiency and Environmental Awareness Study of Paddy Farmers in Bangladesh ***Research Progress:*** Data collection is completed and analysis is going on.	1. Investigate the factors affecting the efficiency (technical, economic, environmental) of paddy farmers
	2.3 Activity: Maintenance of rice and rice related variable database ***Research Progress:*** It is a continuous process. Data has been updated with current information.	1. To enrich the database of rice and other cereal/non-cereal crops.

3.	**Project: Spatial database for BRRI varieties** ***3.1 Experiment/Study:*** Suitability mapping of BRRI dhan44, 46, 47, 50 and newly released BRRI varieties including hybrid dhan4. (Collaboration with Pl. Breeding, RFS and ARD) ***Research Progress:*** Work in progress. It will present in internal review workshop 2014-15.	1. A geo-referenced database of BRRI varieties 2. Suitability maps for BRRI varieties
4.	**Project: Geographical Information System (GIS)** ***4.1 Experiment/Study:*** Identification of submergence areas for growing newly developed BRRI varieties (In collaboration with Ag. Econ. and RFS Div.) ***Research Progress:*** Spatial data has been collected for identification of submergence areas for growing newly developed BRRI varieties	1. Maps delineating submerged areas suitable for growing newly developed submergence tolerant BRRI varieties
5.	**Project: Probability Mapping of Weather Variables** ***5.1 Experiment/Study:*** Probability Mapping of Temperature (Maximum & Minimum) and Rainfall at different growth stages of Aus, Aman and Boro rice ***Research Progress:*** Data has been collected and process. We already been presented partial results presented in Annual Research Review Workshop-2013-14.	1. Station wise probability curves of weather variables would be obtained 2. Station wise return periods of the weather variable would be obtained 3. Surface maps for the estimates of weather variables in Bangladesh would be obtained
	5.2 Experiment/Study: The effect of Groundwater level Change in Different Area on Boro Rice Production of Bangladesh ***Research Progress:*** Data collection, processing, map preparation, and analysis is completed for Rajshahi District. Interpretation is going on. It is a continuous program.	1. Understand Groundwater depth in all over of Bangladesh. 2. Evaluate the trend of the groundwater movement and water table fluctuation.

6.	**Project: Information and Communication Technology (ICT)** **6.*1 Activity :*** Management Information System (MIS) of BRRI ***Research Progress:*** • The MIS Software was setup to BRRI server. All scientists & Class 1 officers was connected to MIS Software through BRRI network. • Data entry of the 7 (Seven) modules has been already started in MIS Software. • ICT manpower gets Backup of MIS database every day after 5 P.M.	1. Setup management information system to BRRI. 2. Send MIS data to BARC data bank through VPN.
	6.2. Activity : BRRI Website Management ***Research Progress:*** • The dynamic website (Web Portal) of BRRI is developed by our ICT skill manpower of ICT Cell, Agricultural Statistics Division. • BRRI website is hosted to Mango tech server. • We have included Rice database and Weather database.	1. Add new features in BRRI web portal. 2. Increase hosting spaces.
	6.3. Activity: Management of BRRI Network and Internet connectivity ***Research Progress:*** • We have already given internet connection in 300 computers. • We have increased internet bandwidth speed from 8 Mbps to 12 Mbps. • We have created individual webmail (e-mail id) & group mail into BRRI domain for all scientists and class 1 officers.	1. Bandwidth connectivity increase from 12 Mbps to 16 Mbps or more and distributes the bandwidth among client PC. 2. Manage and maintain BRRI internet connectivity.
	6.4. Activity: Antivirus Security Protection of BRRI ***Research Progress:*** • Already some initiatives have been taken to implement this protection system.	1. Setup antivirus security system to BRRI server. 2. Virus cleaned through server using Antivirus security system.

	6 .5. Activity: e-Tender system of BRRI ***Research Progress****:* • BRRI e-Tender system software is developed under Bangladesh Bank. • BRRI e-Tender system software is hosted to Bangladesh Bank test server.	1. Start e-Tendering system in BRRI. 2. Hosted e-tender software to real server, after completing the test period.
	6 .6. Activity: Video Conference System of BRRI ***Research Progress****:* • ICT cell of Agricultural Statistics division will provide Video conference system related support services such as setup Skype software, installation webcam and headphone etc.	1. Create Skype account for all scientists.
	6 .7. Activity: Digital Signature System of BRRI ***Research Progress****:* • BRRI has already implemented Digital Signature Certificate processing by CCA under Information & Communication technology (ICT) division of govt. of Bangladesh. Also, ICT Cell of Agricultural Statistics division distributed *53 (Fifty Three)* digital signature certificate of scientists and officers of BRRI. • It has arranged a workshop by ICT Cell for distributing digital signature certificate for scientists and officers of BRRI, where officials of CCA have staged.	1. Setup digital signature system to BRRI. 2. Develop digital signature system for all scientists and class 1 officers of BRRI.
	6 .8. Activity: Personal Data Sheet (PDS) Database of BRRI ***Research Progress****:* • The Personal Data Sheet (PDS) Software is developed under BARC. • We have created Personal Data Sheet (PDS) database for all scientists, officers, clerks as per requirement of the Ministry of Agriculture (MoA). • Personal Data Sheet (PDS) database is updated regularly with latest information. It is a routine work.	1. Setup personal data sheet database system to BRRI. 2. Send PDS data to BARC server through PDS software.

	6 .9. Activity: Heritage of BRRI ***Research Progress:*** • We have created Heritage for all retired scientists, officers, staffs and all labours of BRRI as per requirement of the BRRI authority. • Heritage is updated regularly as per availability of information. It is a routine work.	1. Manage and maintain BRRI heritage. 2. Add all ex. Scientists, ex. officers and ex. Stuffs in BRRI heritage.

Farm Management Division

Research Progress 2014-2015

Sl. No.	Research Progress	Expected output
Program area: Socio-economic and Policy		
03.	Farm Management Division	
	3.1. Project: Rice Production Management	
	• Expt.1. **The influence of seedling age on tiller production, yield and yield components of rice.** **The data are being processed**	Tiller number, yield and yield components may increase with decreasing seedling age.
	• Expt.2. **Seed quality of different T. aman rice as affected by rainfed condition in ripening phase** **The data are being processed.**	Seed quality *i.e.* germination percentage, grain weight and seedling vigor may be affected due to rainfed or unavailable moisture during ripening stage.
	• Expt.3. **Effect of quality seed and farmer's seed for seed production and; yield gap between quality seed used plot and farmers' seed used plots.** **The experiment is in the field.**	Yield of farmers seed used plot may be lower than TLS and breeder seed used plots.
	• Expt.4**. Effect of foliar spray of MOP and elemental S for spot free seed production** **The data are being processed**	Recommended fertilizer and MOP spray at heading stage and 15 days after heading may be useful for spot free seed production.
	3.2. Project: **Cost of production**	
	• Expt. 1. **Cost and return of HYV rice cultivation at BRRI Gazipur Farm.** **Data are being processed**	The cost of production per kg of rice highest in aus season followed by aman season and may be lowest in boro season.
	3.3. Project: Survey and development of **data base for labor management**	

	• Expt. 1. **Monitoring the laborers' wages rate for rice cultivation around BRRI Farms.** Data are being collected	The average wage rate through out the year may higher than last year
	3.4. Project: Management and utilization of land and other resources. • Ten activities were done on seed production, irrigation, drainage, beautification etc. These are the continuous routine activities	These are for the better outcome from farm land and researches.

Farm Machinery and Postharvest Technology Division

Research Progress 2014-2015

Sl. No.	Research Progress	Expected output
1.	**Project: Development of Agricultural Machineries**	
1.1	*Effect of settling period of soil on performance of Rice Transplanter*	The experiment was conducted in the divisional research field at FMPHT division in BRRI head quarter, Gazipur. Three transplanters such as riding type six rows OUAT transplanter (T1), walking type four rows CRRI transplanter (T2) and walking type two rows Yanji transplanters (T3) were used for the evaluation. Four settling periods 24, 32, 48 and 56 hr. were considered for this study. The performance data of three Rice transplanters at four specified settling period was collected. Data analysis is under process.
1.2	*Design and development of power operated hand reaper*	A prototype of power hand reaper has fabricated in research workshop and preliminary field evaluation was done in Aman 2013 and 2014 season. The result has presented in 2013-14 annual research review workshop. Further modification and multiplication of 5 power hand reaper is going on and it will be tested.

Sl. No.	Research Progress	Expected output
1.3	*Modification and evaluation of mechanical rice transplanter for different tillage condition*	A strip tillage mechanism was attached in front of and in line with the rotary picker for transplanting rice seedlings in minimum tillage condition. Engine power available at a 3600 rpm speed was conveyed to the strip tillage rotary shaft with the arrangement of a belt-pulley, worm gearing, shaft-universal joint, involutes spline shaft and bevel gear resulting in a 450 rpm rotary blade speed. A lever-operated tensioning pulley was included into the belt drive to engage and disengage the power to the strip tillage shaft. The modified rice transplanter was evaluated for transplanting seedlings in moisture-saturated and unpuddled soils produced under minimum tillage. During test, average strip size was 2.0 x 2.10 cm. Seedlings were placed uniformly in the strip without damage. The detail results will be presented in annual review research workshop.
1.4	*Study on seedling strength and soil bonding capacity with different filler and base materials for mechanical transplanting*	This experiment was conducted in the Farm Machinery and Post-harvest Technology Division, BRRI, Gazipur during Aman 2014 and Boro 2014-15 with the following treatments. Seedling raised on plastic tray using two types of soil incorporation with different organic fertilizer at different rate of mixture. Soil textural classes, P^H and organic matter content were identified in the BARI soil science laboratory. Sandy loam soil and clay loam soil was used as factor A. Cow dung, mustard cake, rice straw organic fertilizer, rice bran. Poultry litter and vermin compost mixed with both types of soil at the rate of 0.0% (Control), 10%, 20%, 30% and 40% organic fertilizer. Organic matter mixed weight basis with soil sample at the designed rate. Agronomic and other parameters of the raised seedling were measured after 25 and 18 days of sowing during irrigated dry and non-irrigated wet season representing the cold and hot condition respectively. Data analysis is under process.
1.5	*Design and development of a head feed power thresher*	A new head feed thresher was fabricated at the FMPHT research workshop and tested during Aman'14. Some mechanical faults were observed during the field test. Addressing these faults another prototype will be fabricated in Janata Engineering Workshop.

Sl. No.	Research Progress	Expected output
1.6	*Design and development of a hill dispensing seeder*	The Korean direct seeding machine has modified for paddy seeding in dry land. However, this seeder machine was found suitable only in fine tilted dry soil. Further modification is going on for moist and wet land.
1.7	Development of seedling raising techniques to combat cold temperature	The experiment was conducted at BRRI regional station Bhanga, Rangpur and BRRI H/Q in Boro 2014-2015 season. The experiment need to be continued to find better result to the next season.
1.8	Design and development of BRRI panicle thresher	BRRI panicle thresher was designed, developed and fabricated in Farida Engg. workshop, Bogra. The manufacturing workshop provided technical support to fabricate the machine. Modification works were done in FMPHT divisional research workshop. Preliminary performance test was done using rice and wheat. Through performance test will be carried out after harvesting boro rice.
1.9	*Design and development of Single and double row conical weeder*	Fabrications of two prototypes were completed in the FMPHT divisional workshop, BRRI. Some problem was found in the first prototype during field test. Those problems were minimized in the second prototype. For making easier and adjustable of the conical weeder, third prototype fabrication is continuing in the research workshop.
2	***Project Title: Milling and Processing Technology***	
2.1	Comparative performance of different types of mechanical dryer	A new burner was developed and tested in FMPHT division for parboiled and un-parboiled rice. The burner can generate sufficient heat which is suitable for dried paddy. BRRI seed dryer was modified as separated electric motor and blower. This dryer will be tested in Boro,2015 season.
2.2	*Study on milling recovery of BRRI varieties under different drying rate and degree of polishing*	In this experiment, minimum 8 hours effective sun-shine is needed for drying treatments. Therefore, drying will be done in effective sun-shine day (mid-March, 2015) maintaining 4 cm grain layer thickness at 12% moisture content. Milling treatments will be done after effective sun drying of paddy.
2.3	*Design and development of solar dryer*	Design and drawing of the thin layer solar dryer is going on.
3	***Project Title:Development of stores and storage technology***	

Sl. No.	Research Progress	Expected output
3.1	Study the storage quality under different degree of milled rice	Improvement of air-blow rice mill is almost complete. Rice will be dehulled by rubber roll huller and brown rice will be polished at different degree of polishing by air-blow rice mill. Storage drum were purchased. The experiment will be set up within May 2015.
4	***Project Title: Renewable Energy Technology***	
4.1	*Physical and thermo-chemical characterization of rice husk*	Physical and thermo-chemical properties of four BRRI rice varieties have already done under MS programme in IUT. Recently FMPHT division collected a BOM calorimeter and programme will again start with BRRI rice varieties.
5	***Project: Popularization of BRRI developed farm machinery and Postharvest technology***	
5.1	*Industrial and farm level extension of BRRI machinery and Postharvest technology*	In the year of 2014-2015, a total 50 day-long demonstration cum informal training programs were conducted at different places of FMTD project areas. About 2000 participants including farmers, machine operators and Sub Assistant Agricultural Officer (SAAO) were attended the demonstration cum informal training programmes.
5.2	*Training on operation, repair and maintenance of BRRI farm machinery*	Total 55 numbers two day long training programmes were conducted during Aus and Aman seasons, 2014-15 in different location within the project areas. Altogether 1100 participants mostly farm machinery operators were attended in formal training programmes as trainee. Trained operator was able to repair minor defects of the machine themselves. After training, the operators operated all machinery successfully.

Sl. No.	Research Progress	Expected output
5.3	*Field Trial and Demonstration of Promising Farm Machinery and Technology to the LFS Farmers*	Field demonstration of seedling raising technique, mechanical rice transplanter, BRRI USG applicator, BRRI prilled urea applicator, BRRI power weeder BRRI weeder and reaper was conducted in 22, 19 and 27 locations of Barisal, Jhalkhathi, Potuakhali, Nilphamari, Lalmonirhat, Kurigram and Rangpur district during Boro/2014, Aus/2014 and Aman/2014 season respectively. The farmers were satisfied about the performance of farm machines. They were informed that the seedling raising technique for mechanical transplanter. It was proven that USG saved urea. BRRI USG applicator made easy placement of USG in the rice field which reduced the drudgery of the farmers. Field activity of farm machines were published in daily newspapers. BRRI weeder was provided to the LFS farmers for long-term use of the machine.
5.4	*Mid-term evaluation of FMTD project machinery*	A study was conducted at selected 24 upazilas of 12 districts during the Aman 2014 season to assess the present conditions, extent of use and repair and maintenance status of the machines supplied by the project with 60% subsidized price. Data analysis is under process and result will be presented in next year.

Workshop Machinery and Maintenance

Research Progress 2014-15

Sl. No.	Research Progress	Expected output
	Programme Area: Farm Mechanization and Post-harvest Technology	
1	**Design and development of power transmission system of a self-propelled power unit for multiple use** **Progress:** Design of power transmission system of a self-propelled power unit has been done with the help of AutoCAD tool. Its fabrication will be done at BRRI research workshop.	A self-propelled power unit for multiple use will be developed.
2	**Design, development, and modification of self-propelled reaper** **Progress:** The complete design of self-propelled reaper has been done with the help of AutoCAD tools. Fabrication of the reaper will be completed at BRRI Research Workshop. Test and evaluation of self-propelled reaper will be done at field level.	Self-propelled reaper will be developed and tested. Harvesting time, cost, human drudgery and yield loss will be minimized.
3	**Design and development of a power tiller operated grain cleaner** **Progress:** All drawings of the PT operated grain cleaner have been done with the help of AutoCAD tools and it will be fabricated at BRRI Research Workshop as per specification.	Power tiller operated grain cleaner will be developed.
4	**Modification of reaper travelling wheel for wet-land condition** **Progress:** Complete design and drawing of self-propelled reaper wheel have been done with the help of AutoCAD and its fabrication has also been done at BRRI research workshop. It will be tested in next season	Wet land suited travelling wheel of reaper will be developed.
5	**Determination of tilling efficiency of power tiller at selected areas of Bangladesh** **Progress:** Experiments are being conducted in Boro and Aman seasons to determine paddy yield as influenced by different tillage depths (4-5 inch, 5-6 inch, 6-7 inch and 7-8 inch). It will also be tested in different places.	Optimum tillage depth for maximum paddy yield will be determined.

6	**Feasibility study of solar energy use in agricultural machinery** **Progress:** Stored solar energy was used in winnowing paddy at BRRI threshing yard. In other time this energy used as illumination of four bulbs of each 15 W at BRRI automobile workshop. It will also be used in winnowing paddy with other agricultural machinery.	Possibility of solar energy use in agricultural machinery will be assessed.
7	**Modification of hydro tiller for better maneuverability** **Progress:** The complete design of hydro tiller has been done with the help of AutoCAD tools and its fabrication will be done at BRRI research workshop next year.	Longevity of hydro tiller will be increased.

Adaptive Research Division

Research Progress: 2014-2015

3. Adaptive trial of modern rice varieties under IAPP

Sl. No.	Expt. Title	Output		
		Grain yield (t ha^{-1})	Growth duration (days)	Suitable variety
3.1	**Adaptive trials, T. Aus 2014 in Barisal region:** Four Adaptive trials were conducted in 4 upazilas of 4 districts (Barisal, Jhalokathi, Patuakhali and Borguna). RCB design with three replications were followed in the trial using the varieties below:			
	BR24	3.28	106	BRRI dhan48
	BRRI dhan27	3.69	116	
	BRRI dhan48	4.72	111	
	BRRI dhan55	4.25	107	
	Local Ck (Mala, Gota IRRI, Surmamoni)	2.90-3.88	120-126	
3.2	**Adaptive trials, T. Aman 2014 in Barisal region:** Four Adaptive trials were conducted in 4 upazilas of 4 districts (Barisal, Jhalokathi, Patuakhali and Borguna). RCB design with three replications were followed in the trial using the varieties below:			
	BRRI dhan41	4.50	147	BRRI dhan41
	BRRI dhan44	4.45	145	
	BRRI dhan49	4.39	133	
	BRRI dhan52	4.31	146	
	Local Ck (Dudkalam, Jafor IRRI,	3.55-4.02	138-163	

	Sadamota)			
3.3	**Adaptive trials, T. Aman 2014 in Rangpur region:** Four Adaptive trials were conducted in 4 upazilas of 4 districts (Rangpur, Nilphamari, Lalmolnirhat and Kurigram). RCB design with three replications were followed in the trial using the varieties below:			
	BRRI dhan49	4.88	134	BRRI dhan49 & BRRI dhan57
	BRRI dhan56	4.53	110	
	BRRI dhan57	4.21	106	
	BRRI dhan62	4.15	103	
	Local Ck (Swarna, BINA-7)	3.92-4.92	116-146	
3.4	**Adaptive trials, Boro 2015 in Barisal region:** Eight Adaptive trials were conducted in 8 upazilas of 4 districts (Barisal, Patuakhali, and Jhalokathi and Borguna). RCB design with three replications were followed in the trial using the varieties below:			
	BRRI dhan47	5.78	151	BRRI dhan47 & BRRI dhan58
	BRRI dhan55	5.57	148	
	BRRI dhan58	7.00	154	
	BRRI dhan59	5.41	150	
	BRRI dhan61	5.28	149	
	Llocal Ck(BR8, Bhajan, BRRI dhan28 and 29)	5.02-7.30	140-165	
3.5	**Adaptive trials, Boro 2015 in Rangpur region:** Eight Adaptive trials were conducted in 8 upazilas of 4 districts ((Rangpur, Nilphamari, Lalmolnirhat and Kurigram). RCB design with three replications were followed in the trial using the varieties below:			BRRI dhan58
	BRRI dhan29	6.53	163	
	BRRI dhan50	5.41	153	
	BRRI dhan55	5.38	146	
	BRRI dhan58	6.57	155	
	BRRI dhan59	5.12	150	
	Llocal Ck (BRRI dhan28)	5.10	143	

4. Promotional activities:

Sl. No.	**Activities**	**Output**
4.1 Farmers training		
	Farmers' training on modern rice production technologies during 2014-15: 27 farmers'	About 895 farmers and DAE field staffs were trained about

	trainings were arranged under different projects (MIADP, EQSS) and GOB.	modern rice production technologies.
4.2	**Field day:** About 60 Field days were conducted during 2014-2015 in different seasons under different projects (IAPP, MIADP, EQSS) and GOB.	About 10,000 farmers and DAE personnel and local elite people participated and gained knowledge about BRRI technologies.
Enrichment of own seed stock		
4.3	**Seed production at BRRI farm under ARD:** For conducting adaptive research trials in different locations of Bangladesh, ARD produced quality rice seeds at BRRI farm during Aus 2014, Aman 2014 and Boro 2015.	A total of 11 tons quality seeds of different BRRI varieties were produced which were used for follow up adaptive research trials.

Training Division

Research Progress 2014 - 2015

Sl. No.	Research Progress	Expected Output
I	**Program Area : Technology Transfer** **Program Performing Unit : Training Division**	
	1. Technology Transfer Through Training	Knowledge and skill of the trained personnel of the subject matter will be increased.
	1.1. Training on Modern Rice Production Technologies for SAAO (Regular) Participant : SAAO (DAE) No. of participants: 120 Duration: 1 week Batch: Total 30 Completed :06	Trained SAAO will be able to identify and solve field problems of rice cultivation and help the farmers to increase productivity.
	1.2. Integrated Rice Production Training (Mujibnagar) Participant : SAAO (DAE) and NGO Officers No. of participants: 162 (SAAO 43, NGO 80, SA/SSA 39) Duration: 1 week Batch: 8 (Completed)	Trained personnels will be able to identify field problems of rice cultivation and solve the problem. Rice production in the project area will be increased.
	1.3. Training on Modern Rice Production Technologies (EQSSP) Participant : SAAO (DAE) No. of participants: 222 Duration: 1week Batch: 12 (Completed)	Knowledge and skill of the participants on modern rice production technologies will be inreased. Total rice production of the country will be increased
	1.4. Three days Training on Quality Rice Seed Production (IAPP) Participants: CF and SAAO of DAE from project area	Knowledge of the participants about quality seed production will be enreased. Supply and use of quality rice seed will be increased in the project area.

	No. of participants: 159 Duration: 3 days Batch: 8 (Completed)	
	1.5. Three days Training on Quality Rice Seed Production (EQSSP) Participants: DAE, BADC and NGO officers No. of participants: 320 Duration: 3 days Batch: Total 24 Completed:19	Knowledge and skill of the participants about quality rice seed production and storage will be increased. Supply and use of quality rice seed will be increased.
	1.6. Experimental design and data analysis Participants: IAPP and BRRI scientists Duration: 5 days 1.7. Training on Rice production and Data collection Participants: SA (IAPP and BRRI) Duration: 1 week	The participants will be able to use appropreated experimental design in planning and executing research program and analyse data. Trained personnels will be able to identify field problems of rice cultivation and solve the problem. Collected experimental data properly and effectively
II	**Evaluation of imparted training program**	
	2.1. Performance of long and short term training programs. Participant :1-week trainees (On going)	This will help improvement of training course and method of training.
III	**BRKB and its improvement.**	
	3.1. Bangladesh Rice Knowledge Bank Updated: On going.	Updated information on rice production technologies will be available.