# Research Progress (2017-2018)
# VARIETAL DEVELOPMENT PROGRAM PROGRAM AREA

## PLANT BREEDING DIVISION
### Research Progress 2017-2018

| Research Progress | Expected Output |
|---|---|
| **1. Rice Breeding** | |
| **1.1 Development of Upland Rice (B. Aus):** Forty eight crosses were made using 32 parents and 39 crosses were confirmed as true hybrid and 315 superior individual plants were selected from 16 $F_2$ population based on phenotypic performance of each cross. A total of 1079 progenies and 101 fixed lines were selected from pedigree nurseries. Seven entries were selected from 28 observational yield trial based on growth duration, yield, homogeneity and other morpho-agronomic traits. Seven advanced lines were selected from preliminary yield trial for further evaluation. A proposed variety trial was conducted with BR6848-3B-12. | Promising lines/varieties will be developed with short duration: 90-95 days, yield potential: 4.0 – 4.5 t/ha, with early vigor. |
| **1.2 Development of T Aus Rice:** A total of 13 crosses were done using 17 parents and 1893 $F_1$ seeds obtained; 11 crosses were confirmed as true hybrid; 28,170 progenies from 29 crosses were advanced from $F_2$ generations through field RGA; 816 progenies from 9 crosses were advanced from $F_3$ generations through field RGA, 113 progenies were selected from $F_4$ and $F_6$ generations in pedigree nurseries. Twelve genotypes were selected from 30 entries in observational yield trial and 11 advanced lines selected from 16 entries in preliminary yield trial on the basis of homogeneity with respect to plant height, phenotypic acceptability at vegetative and maturity stages and physicochemical properties. In regional yield trial, seven genotypes were selected based on growth duration, PAcp, grain quality and grain yield compared to popular variety BR26 and BRRI dhan48. Proposed variety trial was conducted with NERICA10-7-PL2-B for T Aus season. | Promising lines/varieties will be developed with better yield potential (5.0 – 5.5 t/ha) and shorter growth duration (105 – 110 days) comparison to existing varieties |
| **1.3 Development of Shallow Flooded Rice varieties:** A total of 31 crosses were made using 22 parents and 266 $F_1$ seeds produced from single cross and 410 $F_1$ seeds from multiple cross. Ten crosses were confirmed out of 15 as true hybrid and 2,850 progenies were advanced through RGA. Seed of the local cultivars and parental genotypes were increased and genetic purity maintained. | High yielding (4.0-5.0 t/ha) rice varieties for shallow flooded area (up to 1.0 m depth), shallow deep area (30 cm water) and medium deep area (50-60 cm water) along with submergence, facultative elongation and hypoxia tolerance will be developed. |
| **1.4 Development of Rainfed Lowland Rice (RLR):** In T. Aman season, 08 crosses were made; 14 crosses were confirmed as true hybrid; 784 | Short duration varieties (105-115 days) with 4.5- |

| | |
|---|---|
| progenies were selected from 36 $F_2$ populations; 704 progenies and 58 fixed lines were selected from pedigree nurseries. Fifty four genotypes were selected from observational yield trial. Three genotypes from IRLON, 46 from preliminary yield trial, 12 from secondary yield trial, 3 from regional yield trial were selected and 2 genotypes performed better in from ALART. | 5.0 t/ha yield potential and medium duration (116-130 days) varieties with 6.0-7.0 t/ha yield potential will be developed. |
| **1.5 Development of Salt Tolerant Rice (STR):** In T. Aman Season, 20 crosses were made using 26 parents. A total of 18 $F_1$'s for T. Aman season were confirmed and selected. Thirty six $F_2$ populations comprising 240 progenies were selected and crosswise bulked. From pedigree nursery, 185 progenies were selected from 14 $F_3$ and 216 progenies of 19 $F_4$ populations selected. Seventy eight fixed lines were derived from $F_5$ population.<br>The Field Rapid Generation Advance (FRGA) was done at BRRI Farm, Gazipur and pedigree nursery, yield trials were conducted in Khulna and Satkhira during both T. Aman and Boro Season. Eleven $F_2$ population comprising 32,800 progenies were grown in hotspot (Satkhira) in RGA method and 20,622 progenies harvested as $F_3$. Segregating populations were grown followed by RGA method comprising both T. Aman and Boro season.<br>Twelve crosses from $F_2$ yielded 25,250 progenies of $F_3$ and 14,750 $F_3$ produced 13,500 $F_4$. In total 10,150 and 2062 progenies of $F_4$ and $F_5$ were also grown to generate 9,900 and 2,050 progenies for the subsequent next generations, respectively.<br>Nineteen genotypes out of 87 from BR lines and 13 out of 45 were selected from IRSSTN in OYT. Seventeen entries out of 26 were selected from two PYTs. Eight entries out of 14 were selected from SYT.<br>In PVS preference analysis BR9536-B-10-1-26 and BR8727-B-2-1-1 were the most preferred genotypes.<br>In Boro Season, 54 crosses were made. A total of 91 $F_1$'s was confirmed and registered in the BRRI cross list. Twenty five $F_2$ populations were selected and crosswise bulked. 269 progenies were selected from 7 $F_3$ and 14 $F_4$ populations. As well as 67 fixed lines were obtained from 26 $F_5$ generation. Thirty one entries out of 87 were selected from OYT. Thirty three entries out of 127 were selected from STBN, OYT. Fourteen entries of 34 were selected from PYT. Three entries out of 07 were selected from advanced yield trial. In PVS preference analysis, IR 87870-6-1-1-1-1-B was the most preferred genotype out of 10 entries over the locations. | Salt tolerant varieties for farmers and consumers preference will be developed with seedling stage (14 dS/m) & reproductive stage tolerance (EC = 8-10 dS/m) and better yield potential (5.0-5.5 t/h for T. Aman and 6.0-7.0 for Boro season) |
| **1.6 Development of Premium Quality Rice (PQR) for T. Aman Season:** In T. Aman, 44 crosses (15 PQR, 12 Anti-oxidant enriched rice and 17 photosensitive rice) were made, two crosses confirmed and 173 plants selected from 15 $F_2$ populations. From Pedigree nurseries, 163 progenies with 16 fixed lines were selected from 223 progenies of 39 crosses in $F_3$- $F_7$ populations. Thirty two genotypes were selected from 108 observational yield trial based on growth duration, yield, and homogeneity with other morpho-agronomic traits. In PYT, 26 genotypes were selected from 32. In secondary yield trial 21 genotypes were selected from 26 with 0.6-1.1 t/ha yield advantage over check varieties; Kalizira, Chinigura, Kataribhog, BRRI | National and international grade (Kalizira, Chinigura, Kataribhog, Basmati, Jasmine, Banglamoti and BRRI dhan34 type) high yielding aromatic varieties with earliness and good plant type will be developed. |

| | |
|---|---|
| dhan34 and BRRI dhan37. Six materials were promoted to ALART from RYT, which had 1.0-1.5 t/ha yield advantage over check varieties Kalizira, Chinigura, Kataribhog, BRRI dhan34 and BRRI dhan37. Promising advanced breeding line; BR8538-2-1-2 was promoted with 3.72-4.55 t/ha grain yield to proposed variety trial from ALART.<br>In Boro season, 13 single crosses were made, 7 confirmed as true hybrid; 161 progenies selected from 13 $F_2$ populations; 193 progenies and 48 fixed lines selected from pedigree nurseries. Thirty six genotypes from OYT, 8 from PYT, 6 from SYT, 5 from RYT were selected. | |
| **1.7. Development of Zinc Enriched Rice (ZER):** In T. Aman season, 15 single and 30 pre-breeding materials crosses were made. Eleven crosses were selected and confirmed as true $F_1$ comparing with their parents and registered in the BR Cross resister. In total 15510 individual progenies and 99 fixed lines were isolated from pedigree nurseries. From OYT, 25 genotypes were selected based on yield and growth duration considering significant difference in growth duration from the check. Ten genotypes from PYT, 25 from SYT, 03 from RYT, 01 from ALART were selected. The selected genotypes were better than checks in terms of grain yield and other agronomic performances. Nucleus seed of BRRI dhban62 and BRRI dhan72 were produced 150 kg, 700 kg kg respectively.<br>In Boro season, 29 single crosses were made and 4044 individual progenies and 4 fixed lines isolated from pedigree nurseries. From OYT, 20 uniform genotypes were selected based on yield and growth duration considering significant difference in growth duration from the check. Five genotypes from PYT, 2 from SYT and 6 from RYT were selected. Nucleus seed of BRRI dhan64, BRRI dhan74, and BRRI dhan84 were produced 40 kg, 700 kg and 600 kg respectively. | High iron and zinc content with resistance to major insect pests and diseases with acceptable grain quality rice will be developed. |
| **1.8 Development of Insect Resistant Rice (IRR):** In T. Aman season, 34 crosses were made using 32 parents. Fifty eight crosses were confirmed as true hybrid. A total of 275 superior individual plants were selected from 12 $F_2$ population based on phenotypic performance of each cross. In total 675 progenies and 78 fixed lines for BPH and GM were selected from pedigree nursery. Thirty lines from OYT and 16 lines from PYT, four lines from SYT and two genotypes from RYT were selected and will be promoted for ALART for further evaluation.<br>In Boro season, 35 crosses were made and 26 crosses were confirmed. From $F_2$ populations 353 progenies as well as 570 progenies for BPH were selected from pedigree nursery. Twelve genotypes moderately resistant (MR) to resistant (R) for BPH from PYT were selected in Boro season. Two lines from RYT were selected for further trial. Besides this, eight $F_3$ population comprising 2200 progenies were grown followed by RGA method and 2000 progenies harvested as $F_4$. | BPH and Gall midge resistant variety will be developed with better yield potential (5.0-5.5 t/ha for T. Aman and 6.0-7.0 t/ha for irrigated Boro season). |
| **1.9 Development of Disease Resistant Rice (DRR):** Seven crosses for bacterial blight and two for blast in T. Aman and 12 crosses for bacterial blight and nine for blast were made in Boro season. Eight crosses for bacterial blight and six for blast during T. Aman and nine crosses for | BB, Blast and RTV resistant varieties will be developed with better yield potential (5.5 – 6.0 t/ha). |

| | |
|---|---|
| bacterial blight and six for blast in Boro were confirmed as true $F_1$. In total 5720 progenies for bacterial blight were advanced in T. Aman season and 29,988 progenies for bacterial blight and 16,170 progenies for blast were advanced from RGA nursery ($F_2$ populations) in Boro season. In T Aman, 6,481 progenies and in Boro season 8,325 progenies for bacterial blight and 2,002 for blast were advanced from $F_3$ generations of RGA nursery. A total of 4292 resistant progenies for bacterial blight and 1,113 progenies for blast were advanced from $F_4$ generations of RGA nursery in Boro season, 173 superior progenies for bacterial blight were selected from pedigree nursery ($F_4$-$F_5$ generations) in T. Aman whereas, 805 progenies were selected for bacterial blight from $F_3$ generations and 166 superior progenies for bacterial blight were selected from $F_4$ generation during Boro season. Six genotypes for bacterial blight, eight for blast and three for rice tungro virus were selected from observational yield trial in T. Aman season while 8 entries for bacterial blight during Boro season showed better yield potential and agronomic performance over the check varieties with tolerance to bacterial blight. The advanced line; BR10388-24-3-5 was selected based on growth duration, grain yield and bacterial blight score and two genotypes selected for Blast in T. Aman season and four genotypes for bacterial blight selected in Boro season. From RYT trial three genotypes in T. Aman season and two genotypes in Boro season were selected with good yield, growth duration, bacterial blight tolerance and better grain quality. The BB resistance genotype, BR8938-19-4-3-1-1 was recommended for proposed variety in Boro season. | |
| **1.10 Development of Favorable Boro Rice (FBR):** Thirty one crosses were made from RGA nurseries, In total, 65,979 individual plants were selected from $F_2$-$F_5$ populations of 47 crosses. Seven of 43 genotypes were selected from OYT. Seventeen genotypes from PYT-1, 15 genotypes from PYT-2 and three genotypes from AYT were selected. In RYT, four genotypes viz. IR99061-B-B-7, IR09A235, IR14N126 and IR99056-B-B-15 had 0.7-1.3 t/ha yield advantage over check varieties BRRI dhan28 and BRRI dhan58. | Rice varieties for favorable irrigated ecosystem will be developed with high yield potential (7.0-8.5 t/ha), earliness and acceptable grain quality. |
| **1.11 Development of Cold Tolerance Rice (CTR):** Forty five crosses were made and 8 confirmed as true $F_1$. In total 60,795 individual plants were selected from 65 crosses of $F_2$-$F_6$ population by RGA system. Sixty eight genotypes were selected from Line Stage Testing (LST) based on phenotypic acceptability and disease infestation. Twenty seven genotypes were selected from OYT. In PYT, seven genotypes had 0.7-0.9 t/ha yield advantage over check; BRRI dhan28, BRRI dhan69 and BRRI dhan36. In AYT, two genotypes; BR8562-11-2-6-1-1-2 and BR8564-32-1-1-6-1-1 had 0.5-0.7 t/ha yield advantage over checks; BRRI dhan28, BRRI dhan69 and BRRI dhan36. In Haor areas, 58 genotypes were selected based on growth duration, yield, and homogeneity with other morpho-agronomic traits. | Cold tolerance rice varieties will be developed for cold affected northern, western and Haor region with high yield potential (6.5-7.5 t/ha). |
| **1.12 Development Submergence and Water Stagnation Tolerant Rice varieties:** In total 1416 $F_1$ seeds were obtained from single cross and 768 $F_1$ seeds from multiple cross. Panicles of 13,326 from $F_3$, 4992 from $F_4$, 10238 | Short duration and high yielding rice varieties with three weeks submergence, |

| | |
|---|---|
| from $F_5$, 6753 from $F_6$ individuals were harvested at the time of maturity, preserved and processed with proper labels. The ranges of mortality percentage of different RGA generations are $F_3$ – 6-71%, $F_4$ – 32-53%, F5 – 30-68% and $F_6$ – 8-26%. In yield trial, 221 genotypes were tested out of which 77 genotypes selected. PYT conducted under controlled and natural flash flooding condition, IR 13F450-5 showed highest survival. PVS trials at Kulaghat, Mogholerhat, Darshona were submerged for 12, 8 and 11 days. Under flooded condition, average data over three locations (Mogholerhat, Kulaghat and Darshona) showed that IR13F441 produced the highest pooled grain yield 3.56 t/ha with 79% pooled survival. The pooled heritability obtained from grain yield of PVS trial conducted under flooding condition was 90%, indicating acceptable level of precision. | stagnant flood and anaerobic germination tolerances with yield target 6.0-6.5 t/ha in normal condition and 5.0 t/ha in stress condition. |
| 1.13 **Development of Water Saving and Aerobic Rice varieties:** A total of 3887 individuals of $F_5$ generation were advanced following single seed descent based field RGA technique. In OYT, 25 genotypes were selected out of 128 based on grain yield. Among them the highest grain yield was produced by IR16L1484 (7.38 t/ha) with growth duration 152 days. Whereas in AYT, the highest grain yield was produced by IR98814-11-1-3-1 (5.99 t/ha with growth duration 154 days) which was around 1.0 ton higher than BRRI dhan58 with 3 days shorter growth duration. | Water saving (20-30% water) rice varieties will be developed for boro season giving significantly similar yield compared to standard checks. |
| **1.14: Development of Drought Tolerant Rice: (DTR):** Ten crosses were made; 17 crosses were confirmed as true hybrid; 170 progenies selected from 28 $F_2$ populations; 624 progenies and 58 fixed lines selected from pedigree nurseries. Thirty two genotypes were selected from OYT and 16 selected from PYT. | Drought Tolerant Varieties for T. Aman season will be developed with potential yield target (5.0 – 6.0 t/ha). |
| **1.15: Development of Green Super Rice (GSR):** In T. Aman season, a total of 7718 $BC_1F_1$ seeds were produced from three backcrosses (BRRI dhan28*1/IR112062GR2E, BRRI dhan49*1/IR112062GR2E and BRRI dhan62*1/IR112062GR2E). About 385 kg seeds of transgenic line; IR112060 GR2-E:2-7-63-2-96 was produced as a seed multiplication activity for conducting MLT in next Boro season. In Boro season, 2126 $BC_2F_1$ seeds were produced from three backcrosses (BRRI dhan28*2/IR112062GR2E, BRRI dhan49*2/IR112062GR2E and BRRI dhan62*2/IR112062GR2E) and two plants bulked. GR2E line; IR112060 GR2-E:2-7-63-2-96 was evaluated with standard check BRRI dhan29 in a confined field trial condition at five locations (Gazipur, Cumilla, Habiganj, Rajshahi, Barishal) under government approval. The line showed similar phenotypic appearance in almost all traits to non-transgenic BRRI dhan29. The entry was very uniform in phenotype particularly in flowering, plant height, and grain size and shape, with the majority of lines were quite similar to the recipient parent. Genotyping using event specific STS marker showed that all the transgenic plants were homozygous for transgene locus. The transgenic line yielded 7.08 t/ha to 9.11 t/ha with average of 8.0 ± 0.34 t/ha, while the non-transgenic BRRI dhan29 yielded 8.68 t/ha ranging from 7.33 to 9.56 t/ha. The total carotenoid content in milled rice after harvesting ranged from 13.7 – 17.4 μg/g with an average value of 16.0 ± 0.12 μg/g. | Development of less input but high yield potential (7.00 t/ha) genotypes with tolerance to different stresses (abiotic and biotic). |

# Hybrid Rice Division
## Research Progress 2017-2018

| SN | Research Progress | Expected Output |
|---|---|---|
| **01: Development of Parental Lines and Hybrids (T. Aman)** | | |
| 1 | Source Nursery | Forty eight **(**48) test crosses and 215 (A x R) crosses were made |
| 2 | Testcross Nursery | Nine entries have been found heterotic over check varieties on the basis of yield and growth duration. Twelve entries were found completely sterile and their corresponding male parents were regarded as suspected maintainer lines. |
| 3 | Backcross Nursery | Nineteen backcross generations were advanced as new CMS lines. |
| 4 | CMS Maintenance and Evaluation Nursery | 59 CMS lines were maintained by hand crossing for their genetic purity |
| 5 | Improvement of parental lines through B×B and R×R crosses | 31$F_4$ generations of B×B crosses from 18 crosses and 40$F_4$ generations of R×R from 25 cross combinations |
| **02: Development of Disease Resistant Hybrid Rice Parental Lines (T. Aman)** | | |
| 1 | Confirmation of $F_1$s | Twelve $F_1$ plants out of sixteen, were found heterozygous having three BB resistance genes (*Xa4*, *xa13* and *Xa21*) from the cross between BRRI10R/ IRBB60 through molecular marker technique |
| 2 | Growing on $BC_1F_1$ population (B line) | Fifteen plants out of thirty five and twenty one plants out of forty were found against BB resistance genes of *xa13* and *Xa21* from the crosses of IR75608B and IR79156B with IRBB60 through molecular marker technique. $BC_1F_1$ plants were selected for crossing between recurrent parent and $BC_1F_1$ plants. Mature $BC_2F_1$ seeds were properly collected and preserved and growing in next season. |
| 3 | Growing on $BC_2F_1$ population (R line) | Sixteen plants out of 45 were found BB resistance genes against *Xa4*, *xa5*, *xa13* and *Xa21* from the cross of BRRI20R with IRBB60 through molecular marker technique. Selected $BC_2F_1$ plants were crossed between recurrent parent and $BC_2F_1$ plants. Mature $BC_3F_1$ seeds were properly collected and preserved for growing in next season. |
| 4 | Growing on $BC_3F_1$ population | Ten plants out of 20 were found two BB resistance genes *xa5*and *xa13* from the cross of BRRI31R with IRBB60 through molecular marker technique. Selected $BC_3F_2$ seeds were harvested at maturity stage and preserved properly for growing in next season |
| **03: Evaluation of Parental lines and Hybrids (T. Aman)** | | |
| 1 | Observational Trial (OT) of experimental hybrids | Out of 261 entries, ten (10) hybrid combinations were selected based on yield, duration and grain type and produced more than 19-33% yield advantage over check variety BRRI dhan49, 10-22% over BRRI hybrid dhan4 and 2-13 % over BRRI hybrid dhan6 but growth duration 2 to 4 weeks earlier than check variety BRRI dhan49 |
| 2 | Preliminary Yield Trials (PYT) | Under preliminary yield trials three hybrids out of twelve gave more than one ton yield advantage over BRRI dhan49 and exhibited yield advantage over BRRI hybrid dhan4 by 15-24% and 6-15% over |

| | | |
|---|---|---|
| | | BRRI hybrid dhan6 |
| 3 | National Hybrid Rice Yield Trials (NHRYT) | Seven hybrids along with one check variety were evaluated. Data were compiled by SCA |
| 4 | Demonstration trials of promising and BRRI released hybrids | Performance of the newly selected hybrids were satisfactory |
| **04: Seed Production of Parental Lines and Hybrids (T. Aman)** | | |
| 1 | CMS line multiplication of released hybrids | Seed yield of 476 kg/plot (1.4 t/ha), 364 kg/plot (1.3 t/ha), 456 kg/plot (1.2 t/ha), 192 kg/plot (1.2 t/ha) and 180 kg/plot (1.5 t/ha) were obtained from BRRI10A, BRRI11A, IR58025A, BRRI7A and IR79156A respectively in T. Aman season 2017 |
| 2 | $F_1$ Hybrid seed production of BRRI hybrid dhan5 and BRRI hybrid dhan6 in T. Aman 2017 | A total of 230 kg (1.3 t/ha) and 130 kg (1.3 t/ha) hybrid seeds were produced from BRRI hybrid dhan5 (BRRI7A/BRRI31R) and BRRI hybrid dhan6 (IR79156A/BRRI20R) respectively during T. Aman 2017 |
| 3 | Multiplication of promising CMS lines | Seed yield 7.8 kg/plot (1.5 t/ha), 8.0 kg/plot (1.1 t/ha), 3.6 kg/plot (1.2 t/ha), 2.3 kg/plot (1.8 t/ha), 3.5 kg/plot (0.9 t/ha), 17.0 kg/plot (1.1 t/ha). 16.0 kg/plot (1.06 t/ha), 13.0 kg/plot (0.87 t/ha), 14.5 kg/plot (0.97 t/ha) and 11.5 kg/plot (1.6 t/ha) were obtained from BRRI13A, BRRI25A, BRRI32A, BRRI35A, BRRI48A, BRRI50A, BRRI53A, BRRI72A, BRRI85A and IR78355A during T. Aman 2017 |
| **01: Development of Parental Lines and Hybrids (Boro)** | | |
| 1 | Source Nursery | Sixty test crosses and 417 (A × R) crosses were made |
| 2 | Testcross Nursery | Out of 140 test crosses ($F_1$s), five tested entries showed complete sterility and they were immediately backcrossed with their corresponding male parents for conversion. On the other hand, six entries have been selected for their high yielding ability compared with the check variety. |
| 3 | Backcross Nursery | Four $BC_6$ generations were advanced as new CMS lines and shifted to CMS nursery. Other entries were advanced to the next generations except for four $BC_1$ generations due to unstable in pollen fertility. |
| 4 | CMS Maintenance and Evaluation Nursery | 86 CMS lines were maintained through hand crossing for seed increase and genetic purity. |
| 5 | Improvement of parental lines through B×B and R×R crosses | 177$F_5$ populations from 36 B×B crosses and 170$F_5$ populations from 31 R×R crosses |
| **02: Development of Disease Resistant Hybrid Rice Parental Lines (Boro)** | | |
| 1 | Growing on $BC_1F_1$ population | Fifteen (15) $BC_1F_1$ plants out of 25 were found heterozygous having three BB resistance genes (*Xa4, xa13* and *Xa21*) through molecular marker technique from the cross between BRRI10R/ IRBB60 for the resistant gene linked markers. Selected $BC_1F_1$ plants were crossed with recurrent parent and $BC_1F_1$ plants. Mature $BC_2F_1$ seeds were properly collected and preserved for and growing in next season. |
| 2 | Growing on $BC_2F_1$ population. | Twenty (20) plants 30)and twenty-six (26) plants out of 38 were found two BB resistance genes *xa13* and *Xa21* from the crosses of IR75608B and IR79156B with IRBB60 through molecular marker technique for the resistant gene linked markers. Selected $BC_2F_1$ plants were crossed between recurrent parent and $BC_2F_1$ plants. Mature $BC_3F_1$ seeds were properly collected and preserved for growing in next season |

| | | |
|---|---|---|
| 3 | Growing on $BC_3F_1$ population (R line) | Ten (10) plants out of 18 were found four BB resistance genes *Xa4, xa13* and *Xa21* from the cross of BRRI20R with IRBB60 through molecular marker technique for the resistant gene linked markers. Selected $BC_3F_2$ seeds were harvested at maturity stage and preserved properly for growing in next season. |
| 4 | Growing on $BC_3F_2$ population (R line) | Eighty-five (85) $BC_3F_3$ progenies out of 213 were found two BB resistance genes *xa5* and *xa13* from the cross of BRRI31R with IRBB60 through molecular marker technique for the resistant gene linked markers. Selected $BC_3F_3$ seeds were harvested at maturity stage and preserved properly for growing in next season. |
| **03: Evaluation of Parental lines and Hybrids (Boro)** | | |
| 1 | Observational Trial (OT) of experimental hybrids | Out of 303 test hybrids 16 hybrid combinations were selected based on yield, duration and grain type and showed yield advantage 4-20% over BRRI hybrid dhan5 with growth duration similar to BRRI dhan28 but one to two weeks earlier than BRRI dhan29 |
| 2 | Preliminary Yield Trials (PYT) | Eighteen hybrids were evaluated along with two hybrid and two inbred checks and all the selected hybrids showed yield advantage ranging from 32-59% over BRRI dhan28 and 18-41% over BRRI dhan29. Three hybrid combinations had out yielded BRRI hybrid dhan3 and BRRI hybrid dhan5 by more than 1 tons. |
| 3 | Demonstration trials of promising and BRRI released hybrids | Performance of the newly selected hybrids were satisfactory |
| 4 | National Hybrid Rice Yield Trials (NHRYT) | 34 hybrids along with two inbred and one hybrid check were evaluated. Data were compiled by SCA |
| **04: Seed Production of Parental Lines and Hybrids (Boro)** | | |
| 1 | CMS line multiplication of BRRI released hybrids | Seed yield of 480 kg (2.2 t/ha), 370 kg (2.2 t/ha), 433 kg (2.3 t/ha), 240 kg (1.6 t/ha), 575 kg (2.4 t/ha) and 80 kg (2.4 t/ha) were obtained from BRRI7A, BRRI10A, BRRI11A, IR58025A, IR79156A and BRRI32A respectively |
| 2 | $F_1$ seed production of released hybrid | A total of 975 kg (2.6 t/ha) from BRRI hybrid dhan2, 1250 kg (2.5 t/ha) from BRRI hybrid dhan3, 938 kg (1.65 t/ha) from BRRI hybrid dhan4, 510 kg (1.8) t/ha) from BRRI hybrid dhan5 and 450 kg (1.9 t/ha) from BRRI hybrid dhan6 were obtained |
| 3 | Seed production of promising CMS lines | Seed yield 3.2 kg/plot (1.0 t/ha), 14.6 kg/plot (1.2 t/ha), 13.3 kg/plot (1.0 t/ha), 8.4 kg/plot (1.0 t/ha), 27.8 kg/plot (1.2 t/ha) and 3.9 kg/plot (0.8 t/ha) were obtained from promising CMS lines BRRI25A, BRRI50A, BRRI53A, BRRI72A, IR75608A and IR8355A respectively |
| 4 | Maintainer and restorer lines multiplication of selected lines | Considerable amount of maintainer and restorer lines were multiplied for further use |
| 5 | 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 |
| 6 | 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 |

# Genetic Resources and Seed Division (GRSD)

## Research Progress 2017-2018

| Sl. No. | Research Progress | Expected Output |
|---|---|---|
| **3** | **Rice Germplasm and Seed** | |
| **3.1** | **Rice germplasm conservation and management**<br>• Collection of 161 germplasm.<br>• Rejuvenation of 2040 germplasm and characterization of 158 germplasm with 53 morpho-agronomic characters. Thirty-six new germplasm were registered as new accessions (from acc. 8201 to 8236) in Genebank.<br>• Morphological characterization of 158 germplasm with 53 morpho-agronomic characters were conducted.<br>• Supply of 1137 accessions of germplasm of which 378 samples of BRRI varieties for research and demonstration. | Long term conservation of the rice germplasm and utilization for future research and breeding.<br><br>Characterized and as well as conserved germplasm would be utilized in trait specific breeding program. |
| **3.2** | **Seed production and variety maintenance**<br>• All BRRI developed (81) and recommended (14) rice varieties were maintained as nucleus stock.<br>• In total, 151.93 tons of breeder seed of which 37.20 tons from 42 varieties in T. Aman and 114.73 tons from 21 varieties in Boro seasons were produced.<br>• At the same time, 125.37 tons of breeder seed of which 93.47 tons from 21 varieties in Boro, 5.19 tons from 12 varieties in Aus and 26.71 tons from 35 varieties in T. Aman 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** | **Exploratory and genetic studies**<br>• Genetic diversity of 61 local Binni varieties in T. Aman season were studied and were grouped into five clusters.<br>• Two Balam (acc. 1011, 516), three Jesso-Balam (2473, 2464, 2472), one Sada Mota (7888) and one Lal Mota (7889) were selected for Preliminary Yield Trial (PYT) for the next T. Aman 2018 season. | 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. |
| **3.4** | **Documentation of technology**<br>During the reporting year, 200 accessions were documented in computer through *Microsoft Office Excel* program with collected available information. | Characterized information of the germplasm could be utilized for selecting parent(s) in breeding program. |

# Grain Quality and Nutrition Division

## Research Progress 2017-2018

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| | Programme area / Project with duration | |
| 1. | Determination of physicochemical and cooking properties of rice grain. | Newly developed breeding lines were identified to help to develop data base on physicochemical cooking and eating qualities of grain. |
| 2. | Evaluation of Physicochemical properties of newly released BRRI varieties. | Physicochemical and cooking qualities of recently released BRRI developed rice varieties were identified for updating the data base. |
| 3. | Determination of physicochemical properties of Black rice. | Physicochemical and cooking qualities of Black rice cultivars were determined from different sources in Bangladesh. |
| 4. | Evaluation of commercial rice bran oil, soybean oil and mustard oil available in the local market. | Peroxide value, Saponification value, Iodine number and Fatty Acid composition present in the oil were determined. |
| 5. | Effect of different degree of milling on the retention of micronutrient of BRRI released high Zinc varieties. | Optimum milling time and percent degree of milling which retains most micronutrient were found out. |
| 6. | Determine an appropriate processing method to increase the concentration of resistant starch (RS) of cooked rice. | Conversion of rice starch to resistant starch using different cooking and cooling method was maximized. |
| 7. | Identification of rice genotypes having low heavy metal uptake ability at seedling stage. | • Heavy metal uptake in rice plant by different rice cultivars was assessed.<br>• Dose response uptake of heavy metals on different rice genotype was assessed.<br>• Low heavy metal uptake rice genotype was identified. |
| 8. | Study on the effect of protein content on the basis of varietal difference, regional variation and different doses of nitrogen application at Boro season as well as seasonal variation at Boro, Aus and Aman season, 2017-18. | Reasons of variation for rice protein content based on varietal difference, regional variation, seasonal variation and different doses of nitrogen application for BRRI released varieties were identified. |
| 9. | Study on antioxidative and anticancer properties of black rice in Bangladesh. | Anticancer effect of black rice on experim ental animal model was evaluated. |
| 10. | Physicochemical, cooking and sensory properties related to quality of rice noodles. | • Laboratory-scale method for making flat rice noodles was standardized.<br>• Genotype variation in physicochemical, cooking and sensory properties of rice |

| | | |
|---|---|---|
| | | flour in relation to noodle quality was standardized and<br>• Specific characteristics responsible for producing superior quality of rice noodles were identified. |
| 11. | Determination of physicochemical properties and quality of puffed, popped and flattened rice from newly released BRRI varieties. | • Physical quality of puffed, popped and flattened rice was identified.<br>• Nutritional value of puffed, popped and flattened rice was determined. |
| 12 | Postharvest loss minimization of rice bran for quality bran oil | Heat treatment at 130-135$^0$C for 2 hrs, found suitable for stabilizing rice bran from increasing FFA% and lowering oil% for at least 28 days and it is expected that lipase activity might possibly inhibited or at least show down their activity by heat treatment |

# CROP SOIL WATER MANAGEMENT PROGRAM AREA

## Agronomy Division

### Research Progress, 2017-2018

| Sl. No. | Research Program | Progress/Output |
|---|---|---|
| **01. Seeds and Seedlings** | | |
| 1.1 | Effect of salicylic acid (SA) on quality seedling production of Boro rice under natural cold stress condition | Salicylic acid @ 250 µM, 500 µM and 750 µM had no significant effect on shoot length, number of seedling per unit area and seedling strength when sprayed at 15 and 30 day after seeding (from November-January seeding). |
| **02. Planting Practices** | | |
| 2.1 | Effect of time of planting on growth and yield of advanced lines in Aus, Aman and Boro seasons (on going) | In T. Aus, NERICA10-7-PL2-B had lower growth duration and lower yield than the check variety BRRI dhan48. Both NERICA10-7-PL2-B and BRRI dhan48 gave higher yield at late planting situation.<br>In T. Aman, RLR-2 lines- BR8204-5-3-2-5-2, IR11F190 and IR70213-10-CPA-4-2-2-2 gave higher yield than check varieties BRRI dhan39 and BRRI dhan49 up to 2 August planting with similar growth duration.<br>Salt tolerant lines, HHZ5-SAL12-DT3-Y2 and HHZ8- |

| | | |
|---|---|---|
| | | SAL12-Y2-DT1 gave higher grain yield than check variety BRRI dhan73 up to 17 August planting with similar growth duration.<br><br>In Boro, (2017-18) favorable Boro line- BRRI dhan29-SC3-28-16-10-8-HR1 (com) produced higher grain yield than check variety, BRRI dhan28 up to 05 February planting with similar growth duration.<br><br>Bacterial Blight Resistant entries- BR(Bio)8333-BC5-1-20, BR(Bio)8333-BC5-2-16 and BR(Bio)8333-BC5-2-22 gave significantly the highest grain yield (0.47 t $ha^{-1}$) than both check IRBB60 and Purbachi up to 17 August. |
| 2.2 | Effect of plant spacing on growth and yield of mechanically transplanted rice | Wider row spacing of manual transplanting (30 × 13) cm use of tender seedlings showed positive effect on the grain yield but that was not significant with other spacing (30 x 13 cm, 30 x 15 cm, 30 x 17 cm) by mechanical transplanter and hand transplanting compared with recommended transplanting. |
| 2.3 | Effect of planting date on growth and yield of BRRI released varieties in Aman and Boro seasons in different regions of Bangladesh | In Rajshahi region, T. Aman variety BRRI dhan66, and BRRI dhan71 gave higher yield at 25th July transplanting.<br>In Barisal region, T. Aman variety BRRI dhan78 and BRRI dhan79 gave higher yield at 5$^{th}$ August transplanting whereas BRRI dhan76, BRRI dhan77 gave higher yield at 21th August transplanting. |
| 2.4 | Effect of seedling age on tillering dynamics of BRRI released varieties and its impact on yield | Fifteen days old seedling produced the highest tillers in all varieties and BRRI dhan52 had the highest tiller number irrespective of seedling age and was statistically similar with BRRI dhan49.<br><br>25-30 days old seedling produced higher productive tiller for BRRI dhan49 (236-241) and BRRI dhan52 (255-258), 20-25 days for BRRI dhan70 (213-224), BRRI dhan72 (199-215) and BRRI dhan73 (194-214) and 15-20 days for BRRI dhan66 (215-218), BRRI dhan71 (208-213), BRRI dhan75 (214-237) and BRRI hybrid dhan6 (234-241).<br><br>The experiment was completely lodged due to depression on 3$^{rd}$ week of October and the lower yield of the varieties could not be related to productive tiller. |

| | | |
|---|---|---|
| **03. Fertilizer Management** | | |
| 3.1 | Influence of N and K management options on growth and yield of Swarna5 cultivar at variable time of planting | Integrated crop management approach ($N_0$ $P_7$ $K_{28.5}$ $S_9$ kg $ha^{-1}$ as basal with 1st top dress N at 10 DAT @ 27.5 kg, 2nd top dress N at 30 DAT @ 16.5 kg and 3rd top dress N @ 11.0 + K @ 13.3 at 45 DAT) might be a good option to produce about 0.5 t $ha^{-1}$ higher yield in Boro season than existing researcher practice. |
| 3.2 | Effect of nitrogen and potassium management on growth and yield of short duration T. Aman rice at varying time of planting | In BRRI dhan56, BRRI dhan62 and BRRI dhan71 all aged seedlings with $M_1$ (N-P-K-S: 70-11-41-11 kg $ha^{-1}$ and N: 1/3rd as basal + 1/3rd at 10 DAT + 1/3rd at 25 DAT) gave comparatively higher yield (3.39-4.31 t $ha^{-1}$) than with $M_2$ (N-P-K-S: 120-11-41-11 kg $ha^{-1}$ and N: 2/3rd as basal + 1/3rd at 25 DAT). In BRRI dhan75 the 20, 25 and 30 days old seedlings with $M_1$ gave higher yield compared to $M_2$ but 35 and 40 days old seedlings with $M_1$ gave lower yield compared to $M_2$. |
| 3.3 | Effect of N management at the reproductive phase of rice (on going) | Among N management treatments $N_4$ (23 kg as basal + 40 kg at 20 DAT+ 40 kg at 40 DAT+ 17 kg $ha^{-1}$ at Heading) and $N_1$ (40 kg at 15 DAT + 40 kg at 40 DAT + 40 kg at BPI) produced the highest grain yield (6.03 and 6.0 t $ha^{-1}$).<br><br>The lowest grain yield was observed from $N_2$ (23 kg as basal + 40 kg at 20 DAT + 40 kg at 40 DAT + 17 kg $ha^{-1}$ at 10days after PI) and $N_3$ (23 kg as basal + 40 kg at 20 DAT + 40 kg at 40 DAT + 17 kg $ha^{-1}$ at Booting) treatment (5.13 and 4.90 t $ha^{-1}$).<br><br>Higher sterility was observed with $N_2$ followed by $N_3$ and lower with $N_4$ followed by $N_1$. |
| **04. Weed Management** | | |
| 4.1 | Weed persistence, crop resistance and phytotonic effects of new molecule herbicides in transplanted rice | Herbicide Mefeneset + bensulfuron methyl (Pre emergence) followed by bispyribac sodium (post emergence) produced the lowest weed number and biomass and higher weed control efficiency (93%).<br><br>The highest grain yield was achieved in the treatment Mefeneset + bensulfuron methyl (Pre emergence) fb bispyribac sodium (post emergence) followed by Bensulfuron methyl + acetachlor (Pre emergence) fb |

| | | |
|---|---|---|
| | | ethoxysulfuron (post emergence) treatment.<br>Application of three hand weeding did not compete with herbicide treated plots in terms of grain yield may be phytotonic effect of herbicides on crop growth and development for sustainable rice production. |
| 4.2 | Effect of continuous application of herbicide on weed species shifting and resistance | Mixed herbicide like, pretilachlor + pyrazosulfuran ethyl treatment reduced the weed species *Cynodon dactylon* and *Scirpus maritimus* compared to single molecule herbicide. |
| 4.3 | Mixed weed flora management by new molecule herbicides in transplanted and direct seeded rice | Pretilachlor + Trisulfuron and Bensulfuran methyl + Bispyribac sodium effectively controlled most of the sedges and grasses in direct wet seeded rice in Aman season. |
| 4.4 | Effect of crop residues for weed control efficiency in rice | Higher weed control efficiency (90%) was obtained from weed free plot followed by rice straw (75%) and sorghum (74%). |
| **05. Yield Maximization** | | |
| 5.1 | Study on nutrient management for yield maximization of fine rice | BRRI dhan50 produced about 0.5 t $ha^{-1}$ higher grain yield than BRRI dhan63 with integrated nutrient management (BRRI recommended fertilizer dose + 1.5 t $ha^{-1}$ organic manure) and soil test based nutrient management (115-19-66-0-1.5 kg $ha^{-1}$ N, P, K, S & Zn). |
| 5.2 | Study on nutrient management for yield maximization of hybrid rice | Higher grain yield was found in BRRI recom. Dose ($N_1$; N-P-K-S-Zn = 115-20-60-12-2.6 kg $ha^{-1}$) and 20% over $N_1$. Poor yield performance of hybrid varieties (BRRI hybrid dhan4 and 6) was due to high sterility that resulted from lodging (due to depression and heavy rain during grain filling stage). |
| 5.3 | Effect of organic and inorganic fertilizer management on growth and yield of BRRI dhan58 | Fertilizer management with 30% N at 15DAT+35% N at AT + 35% N at PI+ PZnS (Basal) + K 50% basal+50% K at PI could be used for yield maximization in Boro rice. |
| 5.4 | Yield maximization of aromatic rice through integrated nutrient management | Higher grain yield of 4.68 and 4.24 t $ha^{-1}$ was observed in BRRI dhan75 and BRRI dhan70 respectively with 75% BRRI recommended fertilizer dose +25% N from PM. |

# Irrigation and Water Management Division

## Research Progress 2017-2018

| Sl. No. | Research Progress | Expected Output |
|---|---|---|
| **I: Water Use Efficiency Improvement in Irrigated Agriculture** | | |
| **01** | **Water Requirement Experiments** | |
| | **1.1 Optimization of irrigation water use for Boro cultivation under different establishment methods:** Considering the crop yield and irrigation water saving, AWD irrigation with transplanting method was found best for irrigated boro production. But it is expected that higher yield could be achieved from the direct seeded plots by improved crop management for ensuring homogeneity in crop establishment and weeds control. Proper land preparation, precision land leveling, maintaining proper seeding depth and adequate soil moisture are important for achieving a homogeneous crop stand establishment. Steps will be taken to ensure proper land leveling, timely application of herbicides, timely weeding and proper water management in the direct seeding treatments. | Suitable cultivation and water management practice for Boro rice under water and labour scarce condition. |
| | **1.2 Optimization of irrigation water for maximum year-round production:** In Aman season BRRI dhan49 gave the highest yield (5.41 t/ha) followed by BRRI dhan75 (5.16 t/ha). The growth duration of BRRI dhan49 and BRRI dhan75 were 136 days and 117 days, respectively. It indicates that BRRI dhan75 gives satisfactory yield with less amount of supplementary irrigation as well as optimum time for Rabi crop cultivation. The mean yield of Maize, Potato, Lentil and BRRI dhan28 were 11.2 t/ha, 29.9 t/ha, 0.79 t/ha and 6.35 t/ha, respectively. The amount of irrigation applied for Maize, Potato, Lentil and BRRI dhan28 were 200 mm, 150 mm, 0 mm and 650 mm, respectively. Table 5 also indicated that cultivation of BRAUS is possible only after harvest of Potato. Farmers can go for early Aus after harvest of Lentil. Normal Aus cultivation is possible after harvest of Maize. A complete analysis will be possible after harvest of Braus and Aus crop. The above result indicates that Aman-Potato-Braus and Aman-Maize-Aus could give higher yield with less amount irrigation. | Selection of cropping patterns for higher productivity, higher economic benefit and lower irrigation requirement |
| | **1.3 Study on water stress tolerance for different advanced rice genotype of BRRI:** ALART BR8192-10-1-2-3-4 under RLR, ALART-1, ALART IR70213-10-CPA-4-2-2-2 under RLR, ALART-2 and ALART BR8492-9-5-3-2 under RLR, ALART-3 gave better performance in water stress treatments up to -30 kPa and may expected for a variety. ALART BR7959-14-2-1 under disease resistant gave better performance and may be recommended for variety. ALART BR7959-14-2-1 under drought resistant variety gave better performance with water stress treatment and | Scaling of water stress tolerance capacity (WSTC) and proper irrigation schedule of a particular variety; |

| | | |
|---|---|---|
| | recommended for a variety. ALART HHZ23-DT16-DT1-DT1 and ALART HHZ5-DT20-DT3-Y2 under GSR gave better performance with water stress of -10 kPa and -30 kPa, respectively and may be expected for variety. ALART BR8938-19-4-3-1-1 gave higher yield with -10 kPa water stress and remaining better performance up to -30 kPa water stress. ALART HHZ12-SAL2-Y3-Y2 and HHZ5-DT20-DT2-DT1 gave better performance with -10 kPa water stress. ALART BR(Bio)9785-BC2-6-2-2 gave better performance with -30kPa water stress and ALART BR(Bio)9785-BC2-20-1-3 gave better performance with -10 kPa water stress. | |
| | **1.4. Effect of perched water table depletion on growth and yield of BRRI dhan49:** During the growing period of BRRI dhan49, total 683 mm rainfall occurred. Rainfall received in vegetative, reproductive and ripening phase was 402, 274 and 7.4 mm, respectively for all the treatments. About 180 mm irrigation was applied in $I_1$, whereas 95 mm water was applied in $I_2$ and only 48 mm in $I_3$. Yield and water used data is shown in Table 9. Result shows that all the treatment gave statistically similar yield since rainfall was sufficient in vegetative and reproductive phases. The highest 4.31 t $ha^{-1}$ yield was found in $I_2$ followed by 4.13 and 4.10 t $ha^{-1}$ in $I_1$ and $I_3$, respectively. The lowest yield (3.97 t $ha^{-1}$) was found in $I_4$. Distribution of rainfall was found good during T.Aman 2017 in Gazipur. All the treatment received sufficient rainfall in vegetative phase and reproductive phase. But rainfall was scarce in ripening phase. Yield of BRRI dhan49 was comparatively lower than its potential yield. This is possibly the effect of late transplanting. During T.Aman 2017, a good rainfall distribution was observed over the crop growing period. Statistically similar yield was observed for all the treatments. This is first year experiment and more trialsare needed to draw a conclusion. | Suitable water management options for BRRI dhan49 |
| | **1.5 Study on the operation status of Ganges-Kobadak (G-K) irrigation project after six decades of its initialization:** A major problem in the area is water logging of the low lands due to inadequate drainage systems and a consequent difficulty in getting “jho” condition of the soil in some lands. So, by repairing the canal systems, proper gate control, proper inspection, employing adequate manpower, increasing project authority's cooperation and increasing farmers' consciousness in irrigation management, it is possible to reduce water loss and provide adequate water supply in the project area and avoiding waterlogging condition. More decentralization and more coordinated intersectoral linkages of various water management institutions, will not only reduce the income gap, but will also address poverty alleviation. Irrigation coverage can be expanded in both Rabi and Kharif seasons by improving system efficiency. Application of precision technology through organized | Recommend measures necessary for improving the performance of the irrigation project |

| | | |
|---|---|---|
| | extension system for the irrigated agriculture and providing on-farm water management training to the water users groups and association. Cropping intensity can be increased by growing a wide variety of crops in the different growing seasons. In G-K, the successful performance of the tertiary canal can be determined largely by the active participation of water users through WMGs and WMAs and the efficiency of the BWDB officials. To improve the beneficial impact of irrigation on the poor following effective steps can be needed to bring the entire potential command area under irrigation and to ensure equitable distribution of water to all areas and to all categories of households in order to need for diversification towards high value crops according to the agronomic and agro ecological settings. | |
| **II: Utilization of Water Resources in Rainfed Environment** | | |
| **02** | **Water Management for rice cultivation in climate change environment Experiments** | |
| | **2.1 Agricultural drought forecasting for mitigating drought in T. Aman rice: Progress:** Forecasted rainfall and evapotranspiration give satisfactory results with low prediction error -4.5% and -8.4%, respectively. So, web-based medium range weather forecasting gave good forecasting. Drought prediction by drought model found quite satisfactory (average 75% prediction accuracy) with little bit higher underestimation. There was no effect on drought in yield and yield contributing parameters due to higher rainfall during the growing season. | Drought forecasting, drought quantification in terms of amount and days and also severity, amount and number of supplemental irrigations for mitigating drought, Impact of drought on yield and validation of WRF model as well as drought model (Towfiq) with Markov-Chain Model |
| **III: Land and Water Resources Use for Sustainable Crop Production** | | |
| **03** | **Land and Water Resources Use for Sustainable Crop Production Experiments** | |
| | **3.1 Assessment of suitable water resources availability for irrigation to increase crop production in tidal areas of Barisal region:** A considerable part of the upstream Tentulia, Buriswar, Biskhali and Boleswar river was suitable for irrigation throughout the dry season. The adjacent area of the rivers could be used for irrigated crop production. | Assessment availability of suitable surface water resources in the coastal area for improvement of agricultural productivity through irrigation |
| | **3.2 Water resources assessment for dry season crop cultivation in selected polders of coastal region:** There is a large possibility of dry season crop cultivation using canal water in polder 43/1. Large volume of water stored in the canal and water salinity remains in permissible limit. But proper operation of sluice gate is needed. | Availability of suitable water in rivers and canals and productivity improvement through assessment of available suitable water resources |

| | | |
|---|---|---|
| | **3.3. Use of Less Saline Water Resources for increasing Cropping intensity in Barishal Region:** Sufficient amount of water is available round the year in primary, secondary and tertiary canals in Barishal region. Salinity of these water remains in permissible limit for irrigation. Neverthless vast land remains fallow during Boro season. There is a large scope of crop intensification through boro rice cultivation. But to get desirable yield of boro rice massive demonstration work and farmers' training is needed. Because, farmers of this area don't have sufficient knowledge on pest management, fertilizer management and other agronomic management. | Increase of cropping intensity of the area |
| **IV: Sustainable Management of Groundwater** | | |
| **04** | **Surface and Ground Water Assessment Experiments** | |
| | **4.1 Assessment of Groundwater Resources and Safe Utilization in Different Geo-Hydrological Regions:** Maximum groundwater level at BRRI farm Gazipur is declining day by day and it was not fully recharged after the monsoon. Declination of groundwater in Gazipur is very alarming. During dry period, STW irrigation would not be functional in Rajshahi region, because ground water level would go down below suction limit. Howerver, in last four years (2014-2017), the minimum groundwater level increased prositively, which indicates more recharge in groundwater storge in that location. | Determination of declination rate of groundwater level in different regions of Bangladesh |
| **V: RENEWABLE ENERGY** | | |
| **05** | **RENEWABLE ENERGY Experiments** | |
| | **5.1 Evaluation of smallholder surface water solar irrigation system for crop production:** The portable solar system can operate an irrigation pump and a paddy thresher successfully. There is no technical problem found during operation. But some structural problems observed. The wheels of the portable panel will have to change due to less friction with soil during moving and folding mechanism can be developed due to overweight when two farmers folded manually. | Minimum solar panel will be obtained for smallholder irrigation, easily movable trolley or portable type PV panel structure will be obtained, found maximum discharge in terms of suction head, maximum command area will be determined by using the solar water pump for rice irrigation and feasibility of the solar pump for rice cultivation will be obtained. |
| **VI: Water Management Technologies Demonstration and Dissemination at Farmers' Field** | | |
| **06** | **Water Management Technologies Demonstration and Dissemination at Farmers' Field** | |

| | | |
|---|---|---|
| | **6.1 Modelling Climate Change Impact on Agriculture and Developing Mitigation and Adaptation Strategies for Sustaining Agricultural Production in Bangladesh (CRP-II)**<br><br>**6.1.1 Irrigation water requirement of major cropping systems in Bangladesh, A model study:** Water requirement of key crops in the prevalent cropping systems of north-west and south-west regions of Bangladesh was simulated by using CROPWAT model, to ultimately decide the optimized irrigation schedule. The present study was carried out by using normal weather data of the seven test locations in the study region. Input files, in terms of normal weather on daily time step, soil data for texture, moisture retention and moisture transmission and bulk density, general agronomic management practices for the test regions, were prepared for running of the model. The outputs of the model run were reference evapo-transpiration, actual crop evapo-transpiration and irrigation water requirements. The test regions in north-west and south-west regions receive normal rainfall of 1467 to 2290 mm, which is spatially variant. More than 75% of annual rainfall normally occurs during monsoon period. However, spatio-temporal changes in the rainfall event as well amounts have been reported in the last few decades, as well the extreme events occurrence has increased in the recent years. The highest reference evapotranspiration rate was found in April and the lowest in January, which matched well with the atmospheric evaporativity demand based on the prevailing weather conditions. Jute and T.Aus rice showed the highest crop water requirement although they have less growing duration than other test crops. Rabi season (i.e. winter) crops, viz. wheat, mustard, lentil, potato required less water due to lower reference evapo-transpiration and henceforth crop evapotranspiration, primarily due to relatively cooler environment during the growing period. Maize, Boro and T.Aman rice required more water because of their higher growth duration. Boro rice-based cropping pattern required more irrigation, due to longer duration and the period during which the amount of rainfall received is almost negligible. CROPWAT model estimated 1251 mm net irrigation water for Boro-T.Aus-T.Aman cropping pattern whereas the lowest 369 mm water was required for Wheat-Jute-T.Aman. It was concluded that farmers in the test region generally apply 66% more water than the irrigation water requirements (897 mm) of the crops in the major cropping systems, and there is a need to evolve a procedure for judicious use of irrigation water for maximization of the agricultural productivity by also safeguarding the environment. | Figuring out the best cropping systems requiring less water based on model predictions |
| | **6.1.2 Impact of extreme temperatures on rice production in Bangladesh:** We used 11 extreme temperature indices of magnitude, intensity, and persistence to quantify the extreme climate | Prediction trend of climatic parameters and assessment of their |

| | | |
|---|---|---|
| | changes in Bangladesh. The regionally averaged trends and the spatial changes in these indices were analyzed at 26 meteorological stations during 1971–2015. All of the warm extreme temperature-based indices showed consistent warming trends and all of the cold extreme indices except very cold days were significantly decreased in Bangladesh during the study period. Over the same period, the warm indices, including summer days, warm days and nights and diurnal temperature range were significantly increased. Whereas, the cold days and cold nights were significantly decreased. Furthermore, the magnitudes of the trends in the warm extremes were larger than those in the cold extremes. Extreme warm events in most regions tended to increase, while extreme cold events tended to decrease in Bangladesh. All warm extremes showed the positive correlation and all cold extremes were negatively correlated with the mean annual temperature. Beside these, warm extremes and cold extremes were also correlated with each other during the study period. Warm extremes showed the positive effects on different season rice yield whereas cold extremes negatively influenced the rice yield. However, the combined effects of all temperature extremes influenced the different season rice yield and it was in increasing trends. | impact on agriculture |
| | **6.1.3 Delineation of soil fertility status in Bangladesh:** Geometric mean and weighted mean scoring methods showed better relationships with dry season irrigated rice yields in Bangladesh indicating that this technique can be employed for soil fertility assessment and its subsequent use for crop zoning and for determination of fertilizer rates. | Find out an efficient way to determine the soil fertility |
| | **6.1.4 Measurement of GHG emission from rice field under different fertilizer and water management:** The AWD irrigation was very effective to reduce seasonal CH4 flux about 23-36% than continuous flooding. There was no significant difference in terms of rice yield with either continuous flooding or AWD irrigation. Our results suggest that the AWD drainage practice during rice cultivation could be very effective soil management practice to reduce GHG emission impact from rice fields, while not impacting rice productivity. | Selecting appropriate fertilizer and water management options for less GHG emission |
| | **6.2 Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India (LWR/2014/73)**<br><br>**6.2.1 Selection of suitable T. Aman rice varieties for facilitating Rabi crops intensification:** Most of the farmers in both study locations cultivated low-yielding local rice varieties during T. Aman season due to high field water depth and sometime because of tidal water pressure. Latest modern varieties were tested to facilitate timely sowing of Rabi/Boro crops and for improving land and water productivity in coastal region. Our chosen project sites are | Selection of suitable T. Aman varieties for coastal zones |

| | | |
|---|---|---|
| | comparatively in higher elevation and for that reason, most of the farmers 'adopted modern varieties in Dacope and local varieties in Amtali areas. BRRI dha76 was he most preferred variety to farmers in Dacope followed by check variety BR23. BRRI dhan73 was least preferred among the potential one in the current year. On the other hand, BRRI dhan77 was the most preferred variety at Amtali followed by BRRI dhan53. Similarly, BBRI dhan73 ranked as least preferred variety in Amtali. Modern wet-season rice variety is a profitable farm enterprise at typical seasonal yield and current price even under farmers' practice. Returns to labour indicates that WS rice farming is a better livelihood option than off-farm wage work to farmers. Gross income of rainfed wet season rice is largely varied to due to seasonal fluctuation of yield and market uncertainty. It is also the case that under farmer's practice, chance of giving negative net income of MV WS rice is significant. However, economic viability (profitable and less risky) of the rainfed WS rice under research management is largely higher than farmer's practice. The key insight of the finding is that adoption of modern technologies (variety and agronomic management) not only likely to increase food grain production and farm income but also to reduce risk of the rainfed crop cultivation largely. | |
| | **6.2.2. Growing vegetables crops with rice under waterlogged lowland condition:** Generally, farmers cultivate low-yielding local varieties during T. Aman season in study areas because of tidal pressure having limited scope for growing vegetables. This study has created avenues to grow varied kinds of vegetables for home consumption and for commercial purposes and thus improved total land productivity. Neighboring farmers showed their interest to grow vegetables with rice in coming wet season. Farmers got the additional crops of vegetables with rice in wet season, which gave the opportunity for extra income. However, farmers expected that double storied vegetables and T. Aman will be a profitable system and a good source of fresh vegetables for family subsistence, and they are interest to grow vegetables with rice in coming wet season. | Crop intensification in the coastal zone with better nutrition for people |
| | **6.2 3. Study on salinity dynamics of water in coastal areas of Bangladesh:** Fresh water resources development is one of the crucial issues for sustainable crop and soil salinity management in coastal areas. In both of the study locations, river water became saline (> 4.0 dS/m) after December and as high as 20-25 dS/m in April. Therefore, surface fresh water was trapped in local canals within December. Groundwater salinity was monitored from observation well. In Dacope, groundwater level varied from 0.75-0.95 m and salinity from 2.3-3.52 dS/m. In Amtali, groundwater level varied from 1.02-1.40 m and its salinity from 3.25-11.7 dS/m, which is beyond the permissible limit of irrigation. | Selection of suitable salinity management options for agriculture |

| | | |
|---|---|---|
| | **6.2.4. Planting time for Boro rice cultivation in saline areas (APSIM model):** Production of Boro rice in the coastal area is an option for cropping intensification in the comparatively low land areas where water receding delayed after T. Aman harvest. But Boro rice needed more water compare to other crops. Boro rice may be grown where the fresh water resources are available during crop growing season. Boro rice can be successfully grown in both of the tested locations. The saline tolerant variety produced successfully in both of the saline prone Dacope and Amtali region. But in Barisal, the non-saline area, non-saline tolerant BRRI dhan28 produced highest yield compare to other locations. The enterprise budget indicates that dry season rice cultivation under research management at current price is profitable based on gross margin and return. | Suitable planting time for sustainable Boro cultivation with available canal water |
| | **6.2.5. Integrated approach of crop intensification through excavation of mini-pond for storing fresh water in coastal region:** Integrated approach for increasing dry season high value crop production can improve the cropping intensity of the coastal zones. It also increases the total land productivity and income and also met-up the need of vegetables and fish requirement of any family. | Increasing crop production in coastal areas by extending water management practices |
| | **6.2.6 Block demonstration of Boro rice by using canal water:** Salt tolerant BRRI dhan67 performed well in both the sites. But fresh water availability is the main constraints for cultivation of Boro rice. However, farmers are highly interested to grow Boro rice by conserving fresh water by trapped canal. In this regard, a canal was excavated in Sekandarkhali, Amtali area and the farmers are interested to grow more rice in the next season. | Increasing crop production in coastal areas by extending water management practices |
| | **6.2.7 Performance of Aus rice for crop intensification in coastal zones:** Rice is comparatively low risk crop. Aus rice cultivation is the good option for increasing cropping intensification in the coastal zones. Seedling raising is the main constraints for Aus rice production. Framers showed their interest to grow more Aus rice for increasing land productivity of the coastal zones and also increasing food security of that locations. | Increasing crop production in coastal areas by extending water management practices |
| | **6.3 Improving water use for dry season agriculture by marginal and tenant farmers in the Eastern Gangetic Plains**<br>**6.3.1 Irrigated agriculture in the northwest region of Bangladesh:** The research results of the demonstrations indicate that the mentioned technologies are effective for irrigation water saving and water productivity improvement in the study areas. Steps for mass adoption of these technologies in the northern region of Bangladesh will be helpful to cope with the water scarcity and sustainable agriculture. | Extension of water management technologies and practices in North-West region to minimize water availability problem |

# PLANT PHYSIOLOGY DIVISION

## Research progress 2017-2018

| Sl. No. | Research progress | Expected output |
|---|---|---|
| | Programme area/ Project with duration | |
| | **1: SALINITY TOLERANCE** | |
| 1.1 | **Exploring new sources of salinity tolerance from BRRI Genebank germplasm at seedling stage:** Four-hundred-five germplasm along with standard tolerant Nona Bokra, Pokkali, IR58443 and sensitive check IRRI154 were screened at 12 dS/m salinity. Out of the tested germplasm, 25 were found tolerant to moderately tolerant (SES score and survivability ranged from 3.33-5.50 and 83.33- 100.0% respectively). | New sources of salinity tolerance from Bangladeshi landraces |
| 1.2 | **Screening of advanced breeding lines for salinity tolerance at seedling stage**<br>**IRSSTN materials**: Among eighty genotypes thirty genotypes were found tolerant to moderately tolerant (SES 3-5, survivability percentage 77.8- 100%).<br>**STR materials**: Among the tested genotypes 87870-6-1-1-1-1-B-3 was found tolerant (SES 3, survivability 100%) and 8384-3-B-7-1-1-1 was found moderately tolerant (SES 5, survivability 100%).<br>**Somaclonal line**: Among sixteen lines none of the genotypes was found tolerant to salinity (SES 6-9, survivability 22.2-72.2%).<br>**Indian genotypes:** Among seven genotypes tested none was found tolerant (SES 6-7, survivability 50-77.8%). | Identification of salt tolerant advanced rice genotypes at seedling stage. |
| **1.3** | **Identification of novel sources of salt tolerance through physiological and biochemical characterization of diverse rice germplasms:** Among 117 genotypes, only 21 showed visual score 3 to 5 that was tolerant to moderately tolerant. The survivality percentage of these genotypes varied from 57 to 100%. Moreover, these tolerant and moderately tolerant genotypes showed minimum reduction on shoot length, root length, shoot dry weight and root dry weight over control condition. All the genotypes were divided into four sub clusters both at control and stress conditions. However, most of the tolerant genotypes belonged to the same sub group as cluster IV. Considering SES score, survivability percentage and reduction percentage of shoot length, root length and seedling dry weight over control, 21 genotypes were selected for further physiological and biochemical studies. | New sources of salt tolerant rice genotypes at seedling stage. |
| 1.4 | **Investigations of antioxidant systems of high yielding salt tolerant rice varieties:** Salt tolerant cultivars exhibited much | Antioxidant capacities available in the high |

| | | |
|---|---|---|
| | higher Malondialdehyde (MDA) concentration and low in proline concentration after 72 hours under varying salinity stress. Chlorophyll and carotenoids did not show significant variation within a brief period of stress. Up-regulation of the antioxidant system specifically MDA and proline content after 72 hours of stress varied differently possibly due to possessing different mechanism having different responding time. | yielding background for use in the developing of new salt tolerant varieties. |
| | **2: SUBMERGENCE TOLERANCE** | |
| 2.1 | **Screening of rice germplasm for flash flood submergence tolerance:** None of the germplasm survived under complete submerged condition. | Search in new sources of submergence tolerant donor from Bangladeshi landraces. |
| 2.2 | **Screening of advanced breeding lines for flash flood submergence tolerance:** Among the advanced breeding lines, 21 lines (BR9175-2-1-1-11-2, BR9167-1-1-2-11-1, IR 108541:6-36-3-8-B-B, IR 108541:6-36-1-30- B-B, IR 108541:6-29-3-3-B-B, IR 108541:1-23- 1-14-B-B, IR16D1059, IR16D1056, IR16D1048, IR16D1047, IR16D1040, IR15D1038, IR15D1024, IR15D1031, IR15D1048, IR15D1080, IR16D1026, IR16F1035, IR16F1033, IR16F1039, IR16F1036) were found tolerant compared with the tolerant check. | Identify better tolerant breeding lines. |
| 2.3 | **Effect of complete submergence at different growth stages of submergence tolerant BRRI varieties:** Both the tolerant varieties showed 100% tolerance at seedling stage but in case of BRRI dhan52, none of the plant survived at tillering stage where as BRRI dhan79 showed moderately tolerant, which had slight elongating capacity under submergence condition. At PI and booting stage BRRI dhan52 recovered poorly without new tiller appearance compared with BRRI dhan79. The grain formation after PI and booting stage submergence was not satisfactory. Majority spikelets of the panicle were sterile. BRRI dhan79 showed better tolerance level compared to BRRI dhan52. | Identification of critical growth stage of submergence damage. |
| 2.4 | **Screening for stagnant flooding tolerance of advanced breeding lines for whole growth period:** Among the genotypes seven were found moderately tolerant (Survivability percentage 65-100%, yield reduction 49-18%). | Identify genotype tolerant to water stagnation. |
| | **3: DROUGHT TOLERANCE** | |
| 3.1 | **Expt. Screening of rice germplasm for drought tolerance at reproductive phase, T. Aman 2017:** Out of 276 germplasm, 19 genotypes showed the best performance in relation to yield under drought stress at reproductive phase. | The best tolerant germplasm to be further used as donor parent for developing future drought tolerant Aman varieties. |
| 3.2 | **Evaluation of advanced breeding lines under drought stress at reproductive phase in the rainout shelter:** Out of 18 OYT three genotypes namely IR118194-B-21-3, IR118194- | Drought tolerant advanced genotypes will be identified |

| | | |
|---|---|---|
| | B-6-2 and IR118194-B-6-4 performed better having score 3 under drought condition. On the other hand, out of eight PYT IR94391-131-358-19-B-6-1-4 performed better followed by IR11N313. | |
| 3.3 | **Characterization of advanced breeding lines under control drought condition at reproductive phase:** Out of nine RYT genotypes IR95817-14-1-1-2 performed better followed by IR95815-4-1-1-3 and out of eight OYT genotypes IR96321-558-563-B-2-1-1 performed better. Among the eight IRRI genotypes CAMPONI SML showed better performance. | Drought tolerant genotypes will be identified |
| 3.4 | **Evaluation of advanced breeding line for screening against drought stress at vegetative stage:** The advanced breeding lines BR6848-3B-12 showed better performance under drought condition. | Performance of the advanced breeding lines BR6848-3B-12 will be observed |
| 3.5 | **Screening germplasm under drought stress in the rain-out shelter:** Out of 160 germplasms 27 genotypes could flower and produce seed of which seven genotypes did not lodge. | Drought tolerant germplasm will be identified for Aus season. |
| | **4: HEAT TOLERANCE** | |
| 4.1 | **Evaluation of advanced breeding lines and germplasm for heat tolerance:** Among the 14 breeding lines, one entry showed 40.5% fertility under heat stress treatment and got SES score 5. Following the same procedure 41 BRRI germplasm were rescreened against high temperature. Among the 41 germplasm 23 scored 5. | New sources of heat tolerant donor for high temperature stress (35-38 $^0$C) during flowering. |
| 4.2 | **Introgression of heat tolerant QTL (*qHTSF4.1*) into Bangladeshi mega rice varieties through marker-assisted breeding:** Out of 75 F1's, 28 (18 and 10 on the background of BRRI dhan58 and BRRI dhan48 respectively) from both cross combinations were confirmed and 1st backcrossing was carried out in the confirmed progenies. A total of 1534 BC1F1 seeds were produced for both cross combinations by backcrossing with respective recipient parents. | Heat tolerant BRRI dhan58 and BRRI dhan48, which can tolerate high temperature (>35$^0$C) during flowering. |
| 4.3 | **Expt. Marker assisted introgression of spikelet fertility QTL from N22 into two Bangladeshi mega rice varieties BRRI dhan28 and BRRI dhan29:** From second backcross population, 88 fixed lines were selected from 20 lines at BC2F5 stage and confirmed to have fixed QTL through genotyping of R4M30 marker. From third backcross population, 264 segregating lines at BC3F2 were selected through genotypically by using an InDel marker (R4M30) and during harvesting of the selected lines, phenotypic similarity with reference to the respective recurrent parents (BRRI dhan28 and BRRI dhan29) were also compared. | Heat tolerant BRRI dhan28 and BRRI dhan29, which can tolerate high temperature (>35$^0$C) during flowering. |
| | **Project 5: COLD TOLERANCE** | |
| 5.1 | **Screening of rice genotypes for seedling stage cold tolerance:** Among the tested rice genotypes, one exotic rice | Identification of new sources of cold tolerant |

| | | |
|---|---|---|
| | genotype Mineasahi showed cold tolerance at seedling stage, while 33 germplasm, three BRRI varieties (BR6, BRRI dhan43 and BRRI dhan67) and a local variety Kainihati-1, showed moderately tolerant at seedling stage. Other genotypes were susceptible to highly susceptible. | germplasm |
| 5.2 | **Screening of advanced breeding lines for reproductive phase cold tolerance:** Among the tested genotypes, none was found tolerant, while only one genotype BR(Bio) 9777-124-1-1-2 was found as moderately tolerant at reproductive phase. Its growth duration, plant height, last internode length, sterility and grain yield, were less affected than the other tested genotypes in stress condition except HbjB-VI. | Identification of cold tolerant advanced lines |
| 5.3 | **Evaluation of some rice varieties for reproductive phase cold tolerance:** Mineasahi and HbjB-VI were less affected due to cold stress. Rice genotypes- Mineasahi showed significantly less reduction of plant height, last internode and panicle lengths than other genotypes after cold treatment. Mineasahi and HbjB-VI had significantly better panicle exertion and lower panicle degeneration at cold conditions. Furthermore, higher number of filled grains per panicle and lower percentage of sterility were recorded from Mineasahi and HbjB-VI after cold treatment. Rice genotypes Mineasahi was found the best cold tolerant genotype at reproductive phase in all the trials (GC, CWT and natural cold condition). After cold stress, rice varieties BRRI dhan67 and BRRI dhan69 had lower spikelet sterility than BRRI dhan28 and BRRI dhan36, but higher than HbjB-VI. | Identification of cold tolerant rice varieties for reproductive phase |
| 5.4 | **Expt. Growth duration and yield of some local rice varieties under direct seeding condition:** All the tested local varieties of Kanihati had longer growth duration than check varieties Bhutan and BRRI dhan28. Check variety Bhutan had the lowest growth duration and it was only 130 days. Growth duration of Kanihati-6 and Kanihati-12 were similar to BRRI dhan36, but not other genotypes. None of the varieties of Kanihati could out yielded BRRI dhan28 and BRRI dhan36. | Identification of growth duration and yield of some local rice varieties under direct seeding condition |
| 5.5 | **Evaluation of international temperate rice observational nursery (IRTON, 2017):** Considering phenotypic acceptance, sterility, grain size, yield and cold tolerance ability five genotypes (TP7594, TP20692, TP25175, 26717 and 24361) were selected. | Identification of cold tolerant lines from IRTON. |
| 5.6 | **Evaluation of Nepalese rice varieties for cold tolerance at seedling stage:** Among the tested 13 Nepalese rice varieties, Lekali dhan-1, Lekali dhan-3, Chandan Nath-3 and Khumal-13 showed tolerant to moderately tolerant at seedling stage having SES ranged from 3.55 to 4.69 with survivability 92-100%. These four varieties could be regarded as good source of cold | Identification of cold tolerant Nepalese rice varieties for seedling stage |

| | | |
|---|---|---|
| | tolerance at seedling stage. | |
| | **6: GROWTH STUDIES** | |
| 6.1 | **Determination of photo-period induction cycle of photosensitive rice varieties:** Number of photoinduction cycle varied for all the entries for different photoperiod. | Photo-period induction cycle of photosensitive rice varieties will be identified. |
| | **7: YIELD POTENTIAL** | |
| 7.1 | **Trait discovery for improving yield potential of current high-yielding ideotype:** None of the tested entries qualify or close to the optimized traits for targeted yield potential 10-12 t/ha. The highest amount of total dry matter and HI was found as 18.69 t/ha and 0.49 respectively. | Targeted ideotype should be GD = 100-130 days; LAI = 5-6; higher conversion rate HI > 0.50 with total biomass 20-22 $tha^{-1}$. |
| | **8: CROP WEATHER INFORMATION** | |
| 8.1 | **Manual weather station:** Collected data on weather parameters *viz*. maximum and minimum temperature ($^0$C), rainfall (mm), sunshine hours (hours/day) and solar radiation (Cal/$cm^2$/day) during the experimental year (July 2017 - June 18) as recorded from BRRI headquarter and seven regional stations Rangpur, Barisal, Habiganj, Bhanga, Rajshahi, Sonagazi and Kumilla by Plant Physiology Division. | Recording and storage of prevailing weather condition. |
| 8.2 | **Automatic weather station:** Collected data on weather parameters *viz*. maximum and minimum temperature ($^0$C), rainfall (mm), sunshine hours (hours/day) and solar radiation (Cal/$cm^2$/day) during the experimental year as recorded from BRRI headquarter (July 2017 - June 18) and four regional stations Rangpur (December 2017 – July 18), Habiganj(March 2018 - July 18), and Rajshahi (February 2018 - July 18) by Plant Physiology Division. | Recording and storage of prevailing weather condition. |

# Soil Science Division

## Research Progress 2017-18

| Research Progress | Expected output |
|---|---|
| **1. Fertility Assessment of Rice Soils and Nutrient use efficiency in rice** | |
| **1.1. Determination of N dose for ALART materials:** Field t Field trials were conducted at BRRI farm, Gazipur (AEZ 28) during T. Aus 2017 T. Aman 2017 seasons. In Aus season one Narica genotype was tested against BRRI dhan48 while in T. Aman 2017 season five advance (BR8204-5-3-2-5-2, BR7528-2R-HR16-12-23-P1, BR7954-14-2-1, BR840-10-3-1-2 and HHZ23-DT16-DT1-DT1) were tested for only N rates with five different N rates (0, 35, 70, 105 and 140 kg/ha). Four fertilizer treatments viz. $T_1$= NPK (AEZ-basis), $T_2$ = N omission (-N), $T_3$ = P omission (-P) and $T_4$ = K omission (-K) were imposed in the main plots and rice genotypes in the subplots with three replications in T. Aus season. In T.Aus season, recommended fertilizer dose for Narica line was NPK @ 59-10-47 kg/ha .In T.Aman season the calculated optimum nitrogen dose that maximized the grain yield of different advance lines were 69,55,68,30 and56kg/ha. | Determination of appropriate N rates for some newly released BRRI varieties/ lines for optimum yield. |
| **1.2. Determination of N dose for modern rice varieties:** An experiment was conducted in Boro season using BRRI dhan58 as tested variety with eight N fertilizers doses- 0, 25, 50, 75, 100, 125, 150 and 175 kg/ha. The calculated economically optimum N dose for BRRI dhan58 in Boro season was 144 kg/ha. | Determination of appropriate N rates for newly released BRRI varieties for optimum yield. |

| | |
|---|---|
| **1.3. Nutrient management for growing four crops in a year:** The experiment was initiated with three fertilizer treatments e.g. AEZ based fertilizer, crop residues (CR) + AEZ based fertilizer and native nutrients were tested with two cropping patterns like Mustard-Boro-T. Aus-T. Aman (CP1) and Mustard-Green gram-T. Aus-T. Aman (CP2). In the first and second crop cycle, AEZ based fertilizer seems to be enough for obtaining potential yield of each crop. In terms of REY as well as economic point of view CP1 performed better than CP2. However, long-term evaluation needs to see the yield trends and soil fertility status. | Appropriate integrated nutrient management packages will be developed for triple and four crops based cropping patterns. |
| **2: Nutritional Problems in Soils** | |
| **2. 1. Influence of nitrogen and potassium rates on performance of modern rice:** The experiments were conducted at BRRI farm, Gazipur (AEZ 28) during T. Aman 2014 to Boro 2018. 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 for three years with BRRI dhan49 in T. Aman and BRRI dhan29 in Boro season. A combination of 100 kg K and 120 kg N for Boro rice (BRRI dhan74) cultivation seems to be suitable for desired yield. | Suitable ratio of N and K for MV rice cultivation will be developed with N and K dynamics in soil and plant. |
| **2. 2. Performance of rice varieties under phosphorus deficit condition:** An experiment was conducted at BRRI farm, Gazipur during 2017-18 in wet season (T. Aman 2017) and dry season (Boro 2018) seasons having different levels of soil available P. Soil available P were grouped into four where each level had three plots considered as three replications. The soil available P levels were considered as main plots in both seasons. Soil available P groups were 1.80-2.50, 2.51-3.20, 3.21-3.90 and 3.91-4.60 mg $kg^{-1}$ in wet season while 1.70-2.30, 2.31-2.90, 2.91-3.50 and 3.51-4.10 mg $kg^{-1}$ in dry season. In sub-plots, 0 and 12 kg $ha^{-1}$ P fertilizer doses were arranged in wet season and 0 and 20 kg $ha^{-1}$ in dry season. Imbalanced nutrient concentrations in grains and straw were observed due to P | The more P efficient varieties will be identified by investigating the performance of MV rice under different soil P levels. |

| | |
|---|---|
| deficiency in soil. Soil P affected rice yield and plant nutrition more in dry season than wet season. | |
| **2. 3. Long-term missing element trial at BRRI regional station farm in Habiganj:** The experiment was initiated in a permanent layout at the BRRI regional station Habiganj farm in 2007-08 Boro season viewing missing element approach using 8 treatments in RCB design with 3 replications. The treatments were- $T_1$= NPKS (Complete), $T_2$ = PKS (-N), $T_3$= NKS (-P), $T_4$= NPS (-K), $T_5$= NPK(-S), $T_6$= KS (-NP), $T_7$ = PS (-NK) and $T_8$= all missing (-NPKS). Boro 2017-18 was the 11th year continuation of this experiment. From the experiment it may be concluded that, besides NP, K are the most yield limiting nutrient element in BRRI Habiganj farm. | From long term missing element trial the yield limiting nutrients of BRRI farm Habiganj will be identified. |
| **2. 4. Long-term missing element trial at BRRI regional station farm in Rangpur:** The experiment was initiated in a permanent layout at BRRI farm Rangpur in Boro, 2015 combining 7 treatments in RCB design with 3 replications. Fertilizer rate was 97-7-39-15-0.3 kg $ha^{-1}$ and 145-10-57-15-0.6 kg $ha^{-1}$ in T. Aman and Boro seasons, respectively. Among the major nutrient elements omission, N appeared as the most nutrient limiting factor for rice in both T. Aman and Boro seasons. | Identification of yield limiting nutrients of BRRI farm Rangpur by missing element trial |
| **2. 5**. **Long-term effect of organic and inorganic nutrients on yield and yield trend of low land rice:** The experiment was initiated on a permanent layout at the BRRI farm, Gazipur since 1985 Boro season. Twelve treatments in RCB design with 4 replications were imposed. From Boro 2000, each plot was sub-divided to include a reverse treatment .Treatments were modified four times adding different organic manure with IPNS systems and splitting K doses. Long-term omission of N, P, K, S adversely affected rice yield though S and Zn omission had no negative effect on rice yield in Grey Terrace soil of BRRI farm, Gazipur. Long-term application of IPNS based fertilizers showed increasing trend of rice yield, while inorganic fertilizer alone showed yield plateau. | Increased yield and soil health maintenance through balanced fertilization. |
| **2. 6. Effect of intensive rice cropping on rice yield under continuous wetland condition:** This experiment was initiated in 1971 in a permanent layout with an objective to grow three rice crops (Boro, T. Aus and T. Aman) annually with NPK fertilizer application. Since Boro 2000, the experiment was modified to accommodate six treatments viz. control (native nutrient), reverse control (NPKSZnCu), NPK, NPKS, NPKSZn and NPKSZnCu. The varieties tested in T. Aus, T. Aman and Boro seasons were BRRI dhan48, BRRIdhan46 and BRRI dhan50, respectively. The NPK doses used were 140-25-80, 60-15-80 and 60-10-60 kg $ha^{-1}$ for Boro, T. Aman and T. Aus, respectively. Sulfur, Zn and Cu were applied at 10, 4 and 1 kg $ha^{-1}$ in Boro season only. Intensive rice cropping without fertilizer showed decreasing trend and lower nutrient status of the soil. However, complete fertilization in this situation can recuperate soil productivity even after a long period of rice cultivation. | Increased annual rice production in wet land condition and soil health maintenance through balanced fertilization. |
| **Project 3: Integrated nutrient management for intensive rice cropping** | |

| | |
|---|---|
| **3.1. Integrated nutrient management for double and triple rice cropping for maximizing productivity:** The experiment was initiated in Boro 2008-0 at BRRI farm Gazipur AEZ 28). Boro–Fallow-T. Aman and Boro-T. Aus-T. Aman cropping patters are used as double and triple cropping pattern. Four treatment combinations were tested viz. $T_1$= control, $T_2$= STB dose (NPKS @ 160-25-60-20 kg $ha^{-1}$ for Boro, 70-12-48-10 kg $ha^{-1}$ for T. Aus and 84-15-54 14 kg $ha^{-1}$ for T. Aman), $T_3$= STB (50%) + Mixed manure (MM) (cow dung t $ha^{-1}$ + ash 1 t $ha^{-1}$ as oven dry basis), $T_4$ = Farmers' practice (FP) (NPKS @ 80-10-20-10 kg $ha^{-1}$ for Boro, 70-10-15-0 kg $ha^{-1}$ for T. Aus and 70-10-15-0 kg/ha for T. Aman). In double rice cropping pattern, STB dose gave 9.17 t ha $yr^{-1}$ grain yields but 50% STB + MM resulted in 13.01 t $ha^{-1}$ $yr^{-1}$ under triple rice cropping. | Sustainable soil health and productivity ensured by nutrient and cropping pattern management. |
| **3.2. Performance of vermicompost and poultry manure on rice yield and soil health:** The experiment was conducted at BRRI Farm, since Boro, 2015. Poultry manure and VC were used full doses of chemical fertilizer with @ 0.5, 1.0, 1.5, 2.0 and 2+IPNS fertilizer t $ha^{-1}$ and compared with control. The recommendation rates of chemical fertilizers (N-P-K-S-Zn = 138-10-80-5-5kg $ha^{-1}$). Vermicompost (VC) or Poultry litter at 0.5 t $ha^{-1}$ with full doses of chemical fertilizer could be suitable for sustaining rice productivity and rice soil health. | Sustainable soil health and productivity through nutrient management. |
| **4:Greenhouse Gas Emission from Rice Field** | |
| **4.1**. **Effects of fertilizer and water management on greenhouse gas emissions, rice yield and nitrogen use efficiency:** The field experiment was conducted in BRRI farm, Gazipur during T. Aman 2017 and Boro 2018 under two water regimes like CSW and AWD. Eight treatments with different sources and rates of N fertilizer were tested for both seasons. Integrated plant nutrient system (IPNS) based organic fertilizers, i.e., poultry litter (PL), vermicompost (VC) was applied before transplanting. For deep placed treatments, urea briquettes (UB) were applied as a single application during first top dressing (TD) of PU (7-10 days after rice transplantation). UB were placed at 7-10 cm below the soil surface between four hills at alternate rows. For Bhaluka, Mymensingh site, conventional farmers practice and AWD conditions under farmer's field were tested for quantifying $CH_4$ emissions.A closed chamber technique was used to collect gas samples to measure $CH_4$ emissions. Deep placement of UB significantly increased rice yield and NUE compared to PU under AWD and CSW practices in Boro season. Deep placement of UB significantly reduced floodwater $NH_4^+$-N and $NH_3$ volatilization compared to broadcast PU. | Quantification of $CH_4$ emissions and nitrogen use efficiency through fertilizer and water management. |
| **4.2. Climate smart agricultural practices for crop production and greenhouse gas emission in Bangladesh:** Two villages from each of | Climate smart agricultural |

| | |
|---|---|
| Pakundia and Kotiadi Upazilla of Kishoreganj district were selected. In both season, rice crop manager (RCM) and farmer's practices based fertilizer managements were investigated. After T. Aman harvest, mustard was grown in Kotiadi with recommended fertilizer doses of Urea-TSP-MoP-Gypusm-Boric acid @ 197-145-66-132-7 kg $ha^{-1}$. Mustard plots were divided into two parts to accommodate full doses of RCM fertilizer ($T_1$) and 50% reduction of RCM dose except Urea ($T_2$). Finally, greenhouse gas emission was estimated through Cool Farm Tools Beta-3. Shorter duration rice variety is one of the important key factors to reduce greenhouse gas emission and increase rice yield during wet rice growing season in study area.<br>The INM practice was superior over balanced chemical fertilization to maintain soil carbon stock. Mean weight diameter of water stable (MWDw) aggregates and crop yields were positively correlated with SOC. | practices will developed |
| **4.3. Greenhouse gas emissions on wetland rice soils in Bangladesh:** In order to investigate the effect of different organic and inorganic fertilization on GHGs emission characteristics during wet rice season in rice soil were installed at Bangladesh Rice Research Institute (BRRI) farm, Gazipur,in July 2017. Treatments imposed were: chemical fertilizers (NPKSZn), cow dung (CD), poultry manure (PM) and vermicompost (VC) with integrated plant nutrient system (IPNS) based inorganic fertilizations and control. This can be concluded that the different organic manure practice during wet rice cultivation could be an effective soil management practice to increase net ecosystem carbon balance (NECB) in soil and $CO_2$ capturing capacity from the atmosphere, while not impacting rice productivity. | Determination of net ecosystem carbon balance in wetland rice soil. |
| **5: Soil Microbiology and Biofertilizer** | |
| **5.1. Isolation and characterization of potential PGPB strain from rice soil:** A number of 30 plant growth promoting bacteria were isolated from acid, saline and Gazipur soil following dilution and plate count method in different media. The PGPB were isolated using a nitrogen-free (Nfb) semi-solid malate medium. For phosphate solubilizing bacteria NBRIP media was used. Identified bacterial strains (PGPB) were capable of fixing $N_2$, phosphate solubilizing and produce indoleacetic acid. Some of the isolates were capable to produce exopolysaccharides and induced system resistance for disease control. | Identification of Potential PGPB strain from rice soil |

| | |
|---|---|
| **5.2. Evaluation of bio-organic fertilizer in soil plant system:** Field experiments (BRRI Gazipur, BRRI R/S Barisal and BRRI R/S Rajshahi) and 12 farmer's field demonstrations were conducted in T.Aman season. In the Boro 2017-18 season, three field experiments were conducted at BRRI Gazipur, BRRI R/S Barisal and BRRI R/S Cumilla. Bio-organic fertilizers were used at 2 t $ha^{-1}$ for both Aman and Boro season. The treatment combinations for BRRI Gazipur was $T_1$ = Control, $T_2$= NPKS, $T_3$= 100% NKS, $T_4$ = Bio- organic fertilizer @ 2 t $ha^{-1}$ + 100% NKS, $T_5$= 75% NPKS, $T_6$= Bio- organic fertilizer @ 2 t $ha^{-1}$ + 75% NKS, $T_7$= Bio- organic fertilizer @ 2 t $ha^{-1}$ + 75% NKS, $T_8$= Bio- organic fertilizer @ 2 t $ha^{-1}$and for other regional stations; $T_1$= Bio- organic fertilizer @ 2 t $ha^{-1}$ $T_2$= NPKS, $T_3$= Bio- organic fertilizer @ 2 t $ha^{-1}$ + 75% NKS, $T_4$= Control. Application of bio-organic fertilizer (1-2 t $ha^{-1}$) can supplement 25-30% chemical N and 100% TSP fertilizer requirement rice production. Bio-organic fertilizer improved rice yield in saline soil. | Bio-organic fertilizer as a nutrient source in soil plant system. |

# PEST MANAGEMNT PROGRAM AREA

## Entomology Division

### Research Progress 2017- 2018

| Research Progress | Expected Output |
|---|---|
| **I:** Survey and Monitoring of Rice Arthropods<br>**1.1. Pest and natural enemy monitoring at BRRI farm:** Rice insect pests, their natural enemies and crop damage intensities in six habitats were monitored weekly by 100 complete sweeps from each habitat at BRRI research farm, Gazipur. The overall insect pest incidence was low in all season. Higher incidences of insect pests were found in T. Aman than the Aus season. Highest insect pest and natural enemies were found in rice bund during Aus season. Short-horned grasshopper (SHG), rice bug (RB), spider (SPD) and damselfly were dominant in all habitats of Aus season. In T. Aman season highest insect population and natural enemies were found in seed bed and irrigated rice habitat respectively. Short horned grasshopper was dominant insect in all habitats of T. Aman season. Spider, damselfly and ladybird beetle were the dominant predators in all the habitats of these season. Visual counting from 20 hills showed that the population and the damage of insect pests were below the economic threshold level (ETL). | Insect pests and natural enemies will be monitored from different rice habitats and will be developed some models or forecast method in a long term. |

| Research Progress | Expected Output |
|---|---|
| **1.2 Insect pests and natural enemies in light trap:** Rice insect pests and their natural enemies were monitored throughout the year by Pennsylvanian light trap from dusk to dawn throughout the year at BRRI headquarter, Gazipur and BRRI regional stations. Cumilla, Sonagazi, Barishal, Rangpur, Habiganj and Rajshahi. The total number of insect pests was the highest at Habiganj and followed by Gazipur, Barishal, Rajshahi, Sonagazi, Rangpur and Cumilla. The abundance of GLH, RLF, BPH, WBPH and YSB was observed almost all the seven locations. The highest number of BPH was observed during the month of November at Habiganj and Gazipur. BPH had an additional peak in April 2018 at Gazipur. The highest peak of YSB was observed at Habiganj in the month of September. In the month of June at Habiganj and October-November in Barisal there was a peak of GLH. The highest number of natural enemies in light trap was recorded at Habiganj, followed by observed Gazipur, Barisal, Sonagazi, Rajshahi and Cumilla. No Natural Enemy was in Rangpur station during July, 2017 to June, 2018. Green mirid bug (GMB) population of Gazipur was noticeably higher than those of the 6 stations (Cumilla, Rajshahi, Barishal, Habiganj, Rangpur and Sonagazi). In the month of November & April two different peaks of GMB were observed in both Gazipur & Barishal. The highest peak of SPD was observed at Sonagazi in the month of November and April. Number of insect pests and natural enemies will be monitored throughout the year and update the existent databank. Also, incidence and peak abundance will be estimated. | Number of insect pests and natural enemies will be monitored throughout the year and update the existent databank. Also, incidence and peak abundance will be estimated. |

| Research Progress | Expected Output |
|---|---|
| **1.3 Insect pests survey in different AEZs of Bangladesh:** Insect pests were below the ETL level both Aus and T. Aman 2017 in Sylhet region except rice hispa in T. Aman season. The population of short horned grass hopper (SHG) was found highest in sweep net collection (23.67/20 sweep) during Aus season followed by green leafhopper (GLH), rice leaf roller (RLR) and rice hispa (9.87, 5.0 and 3.67/20 sweep) respectively in Sylhet region. But in T. Aman season rice hispa (RH) population was found highest (144/20 sweep) followed by GLH and SHG (11.87 and 9.73/20 sweep respectively. Rice hispa outbreaks occurred in South Surma and Gopalganj upazila of Sylhet during T. Aman 2017. During visual counting it was observed that T. Aman seed bed in all the locations were highly infested by thrips. Entire lengths of leaves of seedlings are rolling. Plants are completely wilting followed by severe yellowing and scorching. During Aus season damsel fly population found highest, 13.00/20 sweep followed by Spider, Lady bird beetle (LBB) and carabid beetle (CDB) (5.11, 2.11and 1.22/20 sweep respectively). Brown plant hopper (BPH), white backed plant hopper (WBPH), grasshopper (GH), green leaf hopper (GLH) and yellow stem borer (YSB) were the major insect pests prevailed in all the four regions of Rajshahi, Rangpur, Sylhet and Barisal during Boro 2017-18 season. But the incidence was below the ETL. Incidence of insect pests in different AEZ of Bangladesh during Boro 2017-18. Highest BPH was observed in one location of Moulvibazar district which ultimately increases the average BPH population in Sylhet region. Brown planthopper, WBPH, GH and GLH infestations were higher in Sylhet region than Rajshahi, Rangpur and Barisal. In Rajshahi region, higher incidence of dark headed borer (DHB) other than yellow stem borer (YSB) occurred at the early and mid tillering stages of rice plant. Among the natural enemies, spider (SPD) was higher in number followed by lady bird beetle (LBB), damsel fly, carabid beetle (CDB) and dragon fly during Boro 2017-2018 season. Green mirid bug (GMB) and tiger beetle (TB) were found highest (13.0 and 12.0/20 sweep respectively) in Sylhet than other regions. Prevalence of parasitoid and staphylinid beetle was observed in Rajshahi and Barisal. | Arthropods (pests and natural enemy) distribution pattern and incidence in different AEZ will be monitored. |
| **1.4 Use of solar light trap for insect pests management in crop field:** Rice insect pests including yellow stem borer (YSB), green leafhopper (GLH), white leafhopper (WLH), leaffolder (LF), caseworm (CW), brown planthopper, mole cricket, field cricket, grasshoppers, rice bug (RB) and vegetable insect pests such as brinjal shoot and fruit borer (BSFB), cabbage butterfly, cutworm catches were found in solar light trap in each location. Highest numbers of insect pests were trapped in May than that of April. Highest number of YSB was observed in May followed by GLH. More than 900 YSB were caught in each light trap per month. This result indicated that solar light trap would be a promising pest control tool in rice field as well vegetable crops in Bangladesh. We also recorded damaged symptoms both from solar light trap installed plot and farmers plot (without solar light trap). Significantly lower damaged was found in solar light trap installed plot than control one (farmers plot). This result indicated that use of solar light traps both in rice and vegetable crops showed effective tool for controlling and monitoring insect pests and providing an effective tool for sustainable pest | Efficacy of BRRI solar light trap for insect pest management in rice and vegetable fields will be identified. |

| Research Progress | Expected Output |
|---|---|
| management system. Using this solar light trap reduces chemical insecticide use and save environment from insecticidal pollution. The farmers showed high interest to use this solar light trap in their crop field. | |
| **1.5 Impact of climate change on rice arthropods:** A hierarchical structure of 22 years 14 migratory insect species, with three orders of diversity ($q$ = 0, 1, 2) accounted by temporal diversity decomposition framework based on hill numbers. Species diversity showed significant quadratic correlations with short period (month). Species richness increased with monthly average temperature and rainfall, but both the species and heterozygosity decreased with increased temperature showing a linear relationship. While correlations didn't exhibit annually at constant pattern due to climate variation and sensitivity of species to temperature, thus leading to a historical hierarchical structure. Only half of ten equivalent species appeared during 10 years increased, indicating that the composition of migratory pool kept relative constant within 22 years. However, based on historical data, model predicts that species diversity will be reduced by 2050. This study highlights the importance of temporal diversity decomposition to dissect the impact of climate change on the species-environment interactions and may provide guidelines for historical biodiversity research. | Abundance of rice arthropods due to climate change can be indicated under different climatic condition. |
| **II: Studies on Rice Insect Pest and Natural Enemy Bio-ecology**<br>**2.1 Impact of salinity on insect population development:** The population of brown planthopper (pest) and green mirid bug (pest control agent) developed at five levels of salinity i.e., 2.0 ds/m, 4.0 ds/m, 6.0 ds/m and 8.0 ds/m including control (0 ds/m) were determined. The salinity has significant impact on the development of both pest and pest control agent (P = 0.05). Total number of BPH increased from control (0.0 ds/m) to 4.0 dS/m) salinity and thereafter declined with increasing salinity level. The highest population of BPH (361.33) developed at 4.0 dS/m and the lowest population (144.33) was found at 8.0 dS/m salinity. The reason behind the highest population was found at 4.0 ds/m is unknown at this stage. Similarly, salinity has significant impact on pest control agent, green mirid bug (GMB) (P = 0.05). GMB is a potential predator for BPH pest in rice field. The number of GMB population developed at different level of salinity decreased with increased salinity level. The highest population of GMB (96.67) was found at 0.0 dS/m and lowest (35.33) at 8.0 dS/m. These results indicated that salinity influence the pest control service in coastal area. The population developmental trend of BPH and GMB was different. In control treatment showed that the population number of BPH and mirid bug were 298.33 and 96.67 respectively. BPH showed highest population at 4.0 ds/m salinity and thereafter decreased significantly. It indicated that BPH loves slight salty environment as well salty food. However, GMB showed clear decline trend with increasing salinity level. The population of GMB is highly correlated to the population of planthopper in the field. In this study, GMB population did not follow the population of BPH at 4.0 ds/m. It can be explained that GMB does not like salty environment/host that developed in salty environment. This | Incidence of rice insect pests and its damage potential could be understood under saline condition. Proper management strategy can be designed. |

| Research Progress | Expected Output |
|---|---|
| result indicated that mildly elevated salinity zone harbor higher BPH pest in crop field and GMB does not like salinity. The results of this study revealed that salinity has significant impact on rice growth (P = 0.05, N = 3). The plant height ranged from 105.11 to 116.78 cm. The highest plant height was observed in control treatment and lowest was in 8.0 dS/m. The plant height decreased with increasing salinity. Salinity has also significant impact on grain filling of rice crop (P = 0.05). Number of unfilled grain per panicle ranges from 20 to 35. The highest number of unfilled grain (35) per panicle was found at 8.0 dS/m and the lowest (20) found at 0.0 dS/m. The number of unfilled grain per panicle increased with increased salinity level. The weight of 1000 grains also varied with different salinity levels and it ranged from 23 to 28g. The weights of 1000 grains gradually decreased with increasing salinity. The highest 1000 grains weight (28g) obtained at 0.0 dS/m and the lowest 1000 grains weight (23g) observed at 8.0 dS/m. Further studies are required to get precise information from this experiment. | |
| **III: Integrated Pest Management**<br>**3.1 Conservation of natural enemies in rice ecosystem:** Natural enemies of rice insect pests can be conserved in rice ecosystem through ecological engineering approach. Eco-engineering treated plot showed highest parasitism activity to the exposed BPH and rice hispa egg in rice field. Rice hispa and BPH egg were parasitized by *Trichogramma zahiri* and *Anagrus spp* respectively. Severe pest outbreak was not observed in the experimental plot. Moreover, eco-engineering plot reduced 50% key pest population and 75% chemical insecticides from rice field. In addition, no significant yield difference was observed among three times insecticide treated plot (6.58 t/ha) and eco-engineering (6.73 t/ha), control (6.48t/ha) plot in BRRI dhan58 during Boro season. Moreover, lowest damaged symptom (white head) was observed in eco-engineering plot. This result indicated that rice can be produced without insecticide using ecological engineering technique. | The use of insecticide will be reduced at the early crop stages by enhancing the buildup of different natural enemies in rice agro-ecosystem. |
| **IV: Crop Loss Assessment**<br>**4.1. Effect of rice leaf folder damage on rice grain yield of variety BRRI dhan46:** The experiment was conducted in BRRI farm, Gazipur. Yield loss due to rice leaf folder was estimated 34.15% in variety BRRI dhan46, at 35.67% folded leaf condition. | Damage, yield loss and its relation to infestation severity in gall midge prone areas will be assessed. |
| **V: Evaluation of Chemicals and Botanicals against Rice Insect Pests**<br>**5.1 Test of different candidate insecticides against major insect pests of rice:** A total of 115 commercial formulations of insecticides were evaluated against brown planthopper (BPH) and 6 against rice hispa. One hundred seven out of 115 insecticides were found effective against BPH and all 6 were found effective against rice hispa. | Effective insecticide (s) will be determined and recommended to Sub-PTAC and PATC |
| **5.2 Fumigation action of botanical oils against stored grain insect pests:**The experiment was conducted in the field lab of Entomology Division and found that first (24 hrs) and 2$^{nd}$ exposure (48 hrs) period of rice stored grain insects to mahogany oil fume caused significant mortality to rice weevil and Angoumois grain moth compared to the control. Mortality ranges from 51 to 95.67% and 87.14 to 96.82% in rice weevil and Angoumois grain | The specific methods of selected insecticide will be identified on the development of resurgence. |

| Research Progress | Expected Output |
|---|---|
| moth respectively. The result of this study indicated that mahogany oil would be an effective product to control stored grain insect pests. After fumigation exposure of grains, panel test was conducted to determine that bitter taste residue remains in the grain or not. Randomly more than 10 people were selected and approached to eat the grain after 48 hrs exposure of fumigation and feel no bitter taste by mahogany oil exposure rice grain. However, more research is required for large scale control. | |
| **6.1 Screening of INGER IRBPHN 2017 rice varieties:** A total of 68 INGER IRBPHN 2017 materials were screened against BPH at green house condition to identify resistance sources against major insect pests of rice. A total of nineteen breeding lines showed moderately resistant score (3-5) reaction. | Resistant sources against major insect pests could be found. |

# Plant Pathology Division

## Research Progress 2017-18

| Sl. No. | Research Progress | Expected Output |
|---|---|---|
| 1. | **Survey and monitoring of rice diseases in selected areas** | Surveys were conducted in both T. Aman 2017 and Boro 2017-18 at different locations including Gazipur, Cumilla, Rangpur, Rajshahi, Kushtia, Satkhira, Barisal and Habiganj districts of Bangladesh. In the surveyed areas, bacterial blight, blast, sheath blight, false smut, brown spot, tungro and leaf scald were recorded. Among the diseases, blast disease was observed severe in different upazilla of Cumilla and Rangpur districts, in addition Tungro severity was observed in Habiganj district during Boro season whereas, bacterial blight, brown spot and sheath blight diseases were found as predominant in T. Aman season in other regions. |
| 2. | **Improvement of differential systems for rice blast disease in Bangladesh** | To improve the existing differential system for rice blast disease resistance, 210 blast infected samples were collected from 73 hot spots of 10 districts of Bangladesh. We emphasized specially on BRRI dhan28 infected plot, because now a days recurrent blast infection reported in BRRI dhan28. The specific objective of this study was to identify the new races of blast pathogen that may responsible for the present blast outbreak in Bangladesh. Isolation and preservation of the pathogen is going on. Data will be analyzed after pathogenicity tests of all selected isolates. |

| | | |
|---|---|---|
| **3.** | **Identification of existing races/ pathotypes of *Xanthomonas oryzae* pv. *oryzae* and study on its diversity during T. Aman 2017** | Seeds of 13 NILs (Near Isogenic Lines) and 14 Pyramid lines were obtained from IRRI, Philipines fior testing and From 300 leaf samples 110 isolates were tested for pathogenicity test. The isolates of *Xoo* were polymorphic for virulence on 13 NILs. The results showed that a total of 12*Xoo* pathotypes/races were existed in Bangladesh. The *R* genes *xa5, Xa8,xa13, Xa21* and *Xa23* showed9 to 95 % resistance frequency among the isolates. Only *Xa21* gene showed resistant reactions (95 %) to maximum isolates. |
| **4.** | **Collection, isolation and preservation of blast isolates** | About 20 blast infected rice leaves or panicles were collected from different locations such as Gazipur, Rangpur and Dinajpur. Isolation and preservation of blast fungus was done according to standard protocol. These isolates will be used for the screening of germplasms, NILs etc to find out resistant materials of blast disease. |
| **5.** | **Screening of rice germplasms against bakanae disease** | Eighty germplasms were screened out. Three (ACC 562, 621, 652) were found resistant. These resistant materials will be released as resistant materials or can be used as donar parent to develop bakanae resistant variety. |
| **6.** | **Screening of advanced breeding lines against sheath blight disease of rice** | Among all of test materials 12 lines such as BR9124-3-3-1-3, BR9124-75-3-4-2, BR9123-23-2-2-5, BR8824-68-3-2-4, BR8826-38-3-2-2, BR8822-48-1-1-5, BR7833-19-2-3-5-P8-4, BR(Bio)9785-BC2-19-3-5, BR(Bio)8333-BC5-2-22, BR8609-2-B-9-1-B5, BR7671-37-2-2-3-7-3-P10, BR7671-37-2-2-3-7-3-P11 were found moderately susceptible (Table10). However, other materials were found susceptible to highly susceptible to sheath blight disease. |
| **7.** | **Evaluation of advanced breeding lines against blast disease** | In T. Aman season 136 advanced breeding lines along with check materials were screened to identify the resistance sources against blast disease (*Pyricularia oryzae*). Three entries such as IR10F102, BR9043-11-3-2-2 and IR95817-51-1-1 showed moderate resistance to blast. Again, in Boro season, out of 84 materials five materials such as IR99056-B-B-15,IR101762-1-1-1, IR83484-3B-7-1-1-1, IR87870-6-1-1-1-1-B, and BR8339-6-2-5-2 showed moderate resistance to blast disease. Resistant materials will be used as resistant variety or donor parents to develop |

| | | |
|---|---|---|
| | | blast materials materials. |
| **8.** | **Screening of upland rice germplasms against blast disease** | Among 45 upland rice germplasms, only six namely IR9559-3-1-1, IR9559-4-1-1, IR9559-5-3-2, IR9559-PP871-1, IR9669-PP836-1 and Ja No Naq showed resistant reaction. We will further reconfirm the reaction pattern in next season. |
| **9.** | **Multiplication of exotic upland rice germplasm** | Seeds were produced from 30 upland rice germplasms among 45 genotypes and the remaining entries did not flower. |
| **10.** | **Screening of zhoom rice germplasms against blast disease** | Out of 50 zhoom rice germplasm 21 were found resistant. Susceptible check US2 and LTH showed highly sensitive reaction and scored 5. The resistant germplasm showed 0-1 score. Genotyping of phenotypically resistant zhom rice germplasms was done through marker assisted selection (MAS). Resistant materials will be used as resistant variety or donor parents to develop blast resistant materials . |
| **11.** | **Screening of Rain-fed low land rice germplasms against blast disease under field condition.** | All the susceptible checks in the border lines and separate rows inside the testing materials showed highly susceptible reaction and scored 4-5. Data was taken at 15 days after inoculation. Among the tested materials 4 materials were detected as resistant (score 0-1) which will be tested further and to be confirmed. |
| **12.** | **Evaluation of blast resistance *Pi9* derived line in hot spot of Bangladesh** | There was no blast infection in *Pi9* gene derived line whereas adjacent plot of BRRI dhan28 was affected severely by neck blast disease. The growth duration and yield performance of *Pi9* derived line and BRRI dhan28 were more or less same (142-145 days and 5.8 to 6.1 t/ha). Farmers preferred this line by seeing its good phenotypic appearance and yield performance. The physic-chemical properties of this line are tested to analyze chemical composition. |
| **13.** | **Screening of INGER materials against blast disease** | A total of 150 INGER materials were screened against three differential blast isolates. Among them 5 materials (2017IRBN-022, 2017IRBN-005, 2017IRBN-015, 2017IRBN-002 & 2017IRBN-009) were found resistant. These materials are needed to confirm again in blast nursery where natural blast infection occurs regularly. |

| | | |
|---|---|---|
| **14.** | **Screening advanced breeding materials against blast disease** | A total of 30 advanced breeding materials were screened against three differential blast isolates blast isolates (BD576p, BD642p and Ba196a) by artificial inoculation. Among them 3 materials (BR10395-22-3-4, BR10395-22-3-5 and BR7959-14-2-1) were found resistant. These materials are needed to confirm again in blast nursery where natural blast infection occurs regularly. |
| **15.** | **Screening of rice germplasms and breeding lines against bacterial blight (BB) disease during T. Aman 2017** | Among the 150 test germplasms, none of the materials were found resistant to BB. However, 4 resistant (BR9138-4-4-5-5-P2, BR9138-4-4-5-5-P3, BR7959-10-1-1, BR8545-5-5-2-7-2), 23 moderately resistant materials were obtained from 161 breeding materials against BB. The resistant checks were also showed resistant to BB. The highly resistant to resistant materials further need to confirm in the next season by artificial inoculation. It is suggested that highly resistant to resistant materials are recommended for further breeding program. |
| **16.** | **Evaluation of pre-breeding materials against bacterial blight (BB) disease of rice during Aus and Aman 2017** | During Aus 2017 season total 28 genotypes showed highly resistant and 67 genotypes exhibited resistant reaction against the virulent *Xoo* isolates among the 102 tested rice genotypes (Table 17). In T. Aman 2017 season, 102 rice genotypes were again evaluated using 2 major virulent *Xoo* isolates. Total 12 genotypes showed highly resistant and 48 showed resistant reaction against the *Xoo* isolates. This variation in disease reaction might be due to seasonal variation of the isolates. Because the isolates used in this study during both seasons were collected from the BB diseased samples of T. Aman season. The resistant checks were also showed resistant to BB and susceptible checks were also showed highly susceptible reaction. It is suggested that highly resistant to resistant materials showed in the T. Aman season are recommended for further breeding program. |
| **17.** | **Gene pyramiding for bacterial blight (BB) resistance (BAS project)** | Pathogenicity test results showed that a number of progenies having Xa21 and xa13 of $BC_2F_1$ and $BC_1F_1$ developed from the crosses were resistant to the most virulent BB isolate BXO9. |

| | | |
|---|---|---|
| **18.** | **Introgression of blast resistant gene into BRRI dhan47 (PhD work)** | A total of thirty (30) homozygous and thirty-seven (37) heterozygous $BC_3F_2$ plants having *Pi40* gene were found through marker assisted selection. |
| **19.** | **Gene Pyramiding of Bacterial Blight and Blast Resistance Genes into the Genetic Background of BRRI dhan29** | In Aman 2017 four crosses were made to obtain F1 seeds whereas in Boro season four backcrosses were made among the parents. Heterozygosity of the populations was confirmed through using respective marker. After confirmation crossing was done to make next generation. |
| **20.** | **Introgression of blast resistant genes into boro rice** | Seeds produced in different crossing, and backcrossing generations are mentioned in the following table 22 during T Aman 2017. A total of 13 BC3F3 plants with *Pi9* allele were selected from the cross between BRRI dhan28 and IRBL-9W in T. Aman, 2017 season. These materials have grown again in Boro, 2017-18 and BC3F4 materials selected. BC3F3 plants were selected from a cross/backcross between BRRI dhan63 and IRBLta2-Re in the last T. Aman season. The selected plants will be grown in T. Aman 2018. |
| **21.** | **Development of blast resistant varieties using differential system and molecular markers** | To improve the genetic background of popular rice varieties BRRI dhan28, BRRI dhan29, BRRI dhan63 and BRRI dhan64 against blast disease, a maker assisted backcross breeding followed by pathogenicity tests were started with the collaboration of JIRCAS, Japan in 2014. Different sources of *Pi9*, *Piz-t*, *Pish*, *pi21* and *Pb1* were used as donor. Around 200 plants of BC2F2 population of each cross, were cultivated in Boro 2017-18 season at BRRI farm Gazipur. Plant selections using linked marker (foreground selection) have already completed at the Laboratory of Plant Pathology Division, BRRI, Gazipur. The selected materials will be advanced up to BC2F5 by modified field RGA system. |
| **22.** | **Development of blast resistance, early and cold tolerant pre-breeding materials for haor region of Bangladesh** | To improve the genetic background of popular rice varieties BRRI dhan28 and BRRI dhan29 for blast resistance, early and cold tolerance, crosses were made with Mineasahi. Twenty two F1 seeds were harvested. F1 confirmation have already done by marker. Forward breeding followed by Marker Assisted Selection and Differential System will be applied to advance the generation. The materials will |

| | | |
|---|---|---|
| | | be advanced by modified RGA up to F5 generation. |
| **23.** | **Improvement of BRRI varieties for resistance to blast and bacterial blight diseases using marker assisted backcross breeding** | A total of 142 F1 seeds as well as 191 BC1F1 seeds were obtained from different crosses(crosses of BRRI dhan28, BRRI dhan58, IRBB58, Pi9 (US), Pi9 (IR64), PB1) and further crossing will be carried out to make next generation. |
| **24.** | **Development of pre-breeding materials of tungro resistance** | In Aman'17, six crosses were made whereas in Boro,17/18 season six crosses were made among the parents. Heterozygosity of the populations was confirmed through using respective marker. After confirmation crossing was done to develop next generation. |
| **25.** | **Linkage and QTL mapping of tungro resistance in rice (KGF Project)** | Successfully F1 and BC1F1 seeds were produced from the hybridization of BRRI dhan48 and Kumragoir. Out of 250 SSR primers 84 primers were found polymorphic between two parents. Tungro virus particles (RTBV and RTSV) were detected through using molecular marker. |
| **26.** | **Molecular detection of rice tungro virus (KGF)** | Rice tungro bacilliform virus (RTBV, a DNA virus) and Rice tungro spherical virus (RTSV, a RNA Virus) were successfully detected through molecular markers. In addition, the presence of both virus particles were confirmed in the virus infected plant samples of Comilla, Habiganj, Gazipur and Jhenaidah. |
| **27.** | **Purification of JIRA by pure line selection** | Three Jira cultivars were collected from three regions Jessore, Rajshahi and Bogura. In BRRI, Gazipur seeds were produced by following head to row method for pure line selection. The purified seeds named HR (Path)-7, HR (Path)-8 and HR (Path)-9 were handed over to the GRS Division for necessary actions. |
| **28.** | **Diagnoses of physical environment and pathogen biology responsible for rice blast disease outbreak in Bangladesh and build up awareness to the stakeholders.** | Last 20 years weather data of blast hot spot areas (Kishorganj and Jaldhaka, Kurigram; Dumuria, Khulna; Jessore) have already been collected. Disease reaction data of blast and others information on cultural practices for Boro 2016-17 are also collected. Blast infected samples have also been collected for pathogen isolation and pathogenicity test. Data analyses are going on. |

| | | |
|---|---|---|
| **29.** | **Rice false smut disease symptom** | Two distinct types of smut balls were identified - orange and olivaceous-greenish-black. After one week of panicle emergence early symptom is seen on the infected panicle. . After initiation of the symptom, it tooks 12 days to become fully developed smut balls. Predominantly, smut balls formed in the lower half of the infected panicles. On an average, 1 to 2 smut balls formed on the infected panicles. Orange smut balls were appeared in all the three rice growing seasons- 'Boro', 'Aus' and early 'T. Aman' (during October and early November). Olivaceous greenish-black smut balls were observed only in late 'T. Aman' (mid-November onwards). |
| **30.** | **Effects of rice false smut (RFSm) contaminated seeds on grain quality** | Three year's study provided strong indication of inferior milling outturn and head rice yield in RFSm contaminated seeds. Results further revealed reduced amylose content and increased protein content in such seeds. It was further observed a tendency in reduced cooking time requirement from RFSm contamination. |
| **31.** | **Newly Developed Rice False Smut Disease Rating Scale** | Through consulting seven published disease resistant scoring system for RFSm (FS-Rating), a new system has been developed to score false smut disease. |
| **32.** | **Field reaction of genotypes to rice false smut resistance** | Among the 23 tested genotypes, 'BRRI dhan49' was in the category of 'HS', 'BR11', and 'Gutiswarna' in 'S', 'BR25', 'BRRI dhan32' and 'BRRI dhan52' in 'MS' and 'BRRI dhan39' in 'MR'. |
| **33.** | **Development of inoculation technique for rice false smut disease** | Successful artificial inoculation of rice false smut disease was done and inoculated rice plant showed symptom after 21 days of inoculation. |
| **34.** | **Development of novel bio-pesticides against Sheath blight and bacterial blight diseases of rice in Bangladesh** | The radial growth of *R. solani* was significantly inhibited by 12 *Trichoderma* and 4 *Bacillus* strains including Recharge and chemical control compared to $H_2O$ control treatment.<br><br>In pot experiment, sheath blight disease was significantly reduced (about 40-70%) compared to diseased control by 1*Bacillus* and 2 *Trichoderma* isolates**.** Bacterial Blight disease was reduced about 30-40% over diseased control by 2*Trichoderma* isolates**.** |
| **35.** | **Identification of potential bio-control agents and formulations of bio-pesticides against bakanae disease** | Forty (40) biocontrolling bacteria, 6 *Trichoderma spp.*, and five plant active ingredients (neem seed extraction in ethanol, neem leaf extraction in ethanol, |

| | | |
|---|---|---|
| | **(NATP-2 project)** | mehogoni extraction in ethanol, kata mehedi extraction in ethanol and dodder plant extraction in ethanol) have been identified to inhibit mycelial growth of bakanae causing pathogen (Fig. 18 & 19). Among the tested plant products, neem extraction in ethanol, mehogoni extraction in ethanol, kata mehedi leaf extraction in ethanol and dodder plant extraction in ethanol completely (100%) inhibited the mycelia growth of the pathogen. |
| **36.** | **Effect of drought tolerant microbes (*Pseudomonas* spp. and *Trichoderma* spp.) on drought response of rice** | Five *Trichoderma* isolates (T1, T2, T3, T4 and T5) were isolated from different soil samples of Gazipur district. These *Trichoderma spp.* were tested on the tested varieties to find out their effectiveness against drought tolerant activity in rice. From this trial, it was observed that T3 and T5 are the unique *Trichoderma spp*. for both the tested varieties for performing good drought tolerant activity. For conclusive the result this trial will be evaluated further. |
| **37.** | **Evaluation of fungicides against rice seedling blight during boro** | Twelve fungicides were tested as seed treating fungicides. Amister Top was used as standard fungicide as found effective to control the disease reported earlier. Alix, Azonil, Limostar Top, M-zole and Tramp along with Amister Top (Standard check) were found effective and produce no disease. Seedling growth was also found better in those fungicides. |
| **38.** | **Application of nanotechnology in rice disease management in Bangladesh** | To evaluate the silver nano particle against Bacterial Blight (BB) disease, commercial formulation (MONOSI Harbal) was applied for both preventive and curative on BRRI dhan28. Due to low disease pressure in both control and inoculated plots, effects of silver nano particle on BB disease management was not able to determined. Moreover, in *in vitro* condition, we did not find any growth suppressive effect of commercial formulation of Ag nano particle (MONOSI Harbal) up to 1000 ppm concentration. Pure nano particles of Si, Ag, Zn and Cu extracted from different organic sources have already collected and *in vitro* study against fungal/bacterial growth inhibition were also evaluated. Ag nano particle was found most effective in fungal growth inhibition of rice blast pathogen. |
| **39.** | **Evaluation of new chemicals against blast disease** | Among the 15 fungicides, only three fungicides i.e Royal 175 WDG, Tebuplus 75, and Mcvo 75 were successfully controlled rice blast disease (above 80%) in the year 2017. |

| | | |
|---|---|---|
| **40.** | **Judicial application of selected fungicides for neck blast disease management efficiently** | Results suggested that application of Trooper at the initial stage of flowering is the best way of neck blast disease management (95.8% disease reduction) followed by Nativo application at booting stage (89.6% disease reduction). Application of Trooper in booting stage also inhibited neck blast disease, but at later stage disease was appeared at the base of panicle that did not affected on grain yield significantly. |
| **41.** | **Evaluation of new chemicals against Sheath blight of rice** | A total of 21 chemicals including one standard (Nativo) were tested against ShB at BRRI, Gazipur and BRRI, Rajshahi in T. Aman 2017. Test chemicals reduced sheath blight ranging from 40.40% to 88.01% at Gazipur and 8.24% to 65.13% at Rajshahi. At Gazipur, six chemicals along with standard check reduced disease over 80 %. Highest reduction was observed in Nativo (88.00%) treated plot followed by Wintop (83.17%), Dlink (82.80%), Sega Star (82.08%), Success (81.68%),Active (80.69%)and Troy (80.65%). The lowest reduction was at Prodifen (40.40%) treated plot. |
| **42.** | **Integrated management of blast disease for enhancing rice production in relation to climate change** | A total of 37 field demonstrations were conducted in blast prone areas of Gazipur, Rangpur, Dinajpur, Mymensingh, Cumilla and Khulna regions in Boro 2017-18, where BRRI recommended integrated blast management practice reduced approximately 76.13% blast disease compared to farmer's practice which resulted around 22.72% yield increased. A total of 15 batches of training were successfully completed in 6 different regions of Bangladesh where 308 farmers, 77 pesticide dealers and 105 SAAO acquired knowledge on rice blast disease and it's management at field level. Five field-days on rice blast disease and its management were conducted at five different regions of Bangladesh in Boro 2017-18where 500 farmers as well as SAAO of the respective upazila, Agricultural Extension Officer, Upazila Agriculture Officer, Deputy Director of the District and scientists were present in the occasion. A regional workshop on rice blast disease in aromatic rice and its management was held in BRRI Regional Station, Rajshahi. Around 100 participants including farmers, SAAO, Agricultural Extension Officer, Upazila Agriculture Officer and Deputy Directors of the Rajshahi region were attended in the workshop. Moreover, 10000 copies leaflet on |

| | | |
|---|---|---|
| | | "Rice blast disease and its integrated management" were published with the financial assistance of the project which were circulated among farmers with the help of DAE personnel which played a significant role to create awareness on rice blast disease and its successful management. |
| **43.** | **Management of Sheath blight disease utilizing *Trichoderma harzianum*** | A total of six treatments – T1 (RDF with Trichocompost), T2 (75% RDF + 25% vermicompost), T3 (RDF), T4 (75% RDF+ 25% poultry manure), T5 (RDF with DAP) and T6 (Control without fertilizer) were set up. Disease severity Index (DSI) of sheath blight disease was significantly lower in T1 (7.2) (RDF with Trichocompost) and T2 (9.8) (75% RDF + 25% vermicompost) compared to other treatments. Although there was no significant difference was observed between T1 and T2 in terms of DSI and yield but 12% yield was increased when T1 was applied. It was also observed that disease incidence and % RLH were significantly lower in T1 compared to other treatments. |

# FARM MACHINERY AND MECHNIZATION PROGRAM AREA

## Farm Machinery and Postharvest Technology Division

### Research Progress 2017-2018

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| **1.** | **Programme area /Project title: Development of Agricultural Machineries** | |
| 1.1 | **Design and development of whole feed type mini combine harvester:** A second prototype of whole feed mini combine harvester was fabricated using locally available materials in Janata Engineering workshop, Chuadanga under Private Public Partnership (PPP). BRRI provides design, drawing, technical and financial support to develop and fabricate the machine. The faults of first prototype were taken into consideration to fabricate the second prototype. The preliminary performance of the 1$^{st}$version was tested in wheat and Aus 2016 season to find out the capacity, efficiency, operation fault etc. The harvesting capacity and fuel consumption were found 0.15~0.20ha/h, 2.75~3.00 l/h respectively. The success of this machine may create a new era in Bangladesh agriculture for harvesting and also mitigate the labour shortage. | Prototype of whole feed mini combine harvester will be available for Bangladesh condition. |

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| 1.2 | **Design and development of USG fertilizer deep placement (FDP) technology for existing walking type rice transplanter:** A study was conducted to incorporate the USG deep placement (UDP) technology with the existing rice transplanter (DP 480) to avoid the present problems of USG placement and accelerate the adoption of mechanized rice transplanting and UDP technologies to the end users. Walking type 4-rows Rice Transplanter was selected for UDP technology based on power transmission facility and available space for necessary attachment. Push-pull type (Injector) UDP technology was designed for incorporation. Mechanism was developed for both the USG briquette of 1.8 and 2.7 g size. Engine power available at high rpm (more than 1800 rpm) was conveyed to the applicator with the arrangement of belt-pulley, worm gearing, shaft-bearing, rotary cam and bevel gear with an engage-disengage facility resulting in about 23 rpm of the UDP injector. From gear pulley, power transmitted to the worm gear to reduce the power at a ratio of 1:35. Bevel gear also used in the gear box to change the direction of power at 90 degree intersecting shaft. From output shaft of the gear box, power transmitted to the cam operating shaft with the same velocity ratio. Cam system was connected to operate the push-pull handle of the applicator vertically. The interval of push-pull handle is synchronized with the driving speed of the transplanter.The developed FDP technology with rice transplanter performed well in preliminary tests by transmitting power from engine to the applicator, receiving and placing granules properly. | Seedlings transplanting and deep placement of fertilizer will be done simultaneously. Fertilizer deep placement difficulties will be solved.<br>Farmers can apply prilled urea fertilizer or mixing of Urea, TSP, MoP and Gypsum fertilizer along with seedlings transplanting using the same machine.<br>Losses of fertilizer in different form (Leaching, ammonia volatilization, de-nitrification and surface runoff) will be reduced.<br>Farmers can save time and costs for simultaneous transplanting and fertilizer deep placement. However, the difficulties to maintain rice transplanter and fertilizer application will be solved. |

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| 1.3 | **Performance evaluation of BRRI prilled urea applicator (BPUA) for long duration Boro rice variety:** An experiment was conducted during the Boro season of 2016-2017 at Rajpat, Kashiyani, to evaluate the performance of BRRI Prilled urea applicator (BPUA) and urea (N) fertilizer deep placement for long duration rice variety of BRRI dhan29. The treatments were $T_1$ = Urea deep placement by BPUA (70% urea fertilizer of recommended dose), $T_2$ = Urea deep placement by BPUA (80% urea fertilizer of recommended dose), $T_3$ = Hand broadcasting (Recommended dose of urea @ 270 kg $ha^{-1}$) and $T_4$ = Control (-N). Both actual and theoretical field capacity was found less for operation of the machine at 20% saving of fertilizer due to frequent feeding of fertilizer in the hopper of the applicator. Field efficiency of the applicator was 59 and 53% for operation at 30 and 20% saving, respectively. Actual saving percentage of urea fertilizer was noted 34 and 24% in the field against the calibration of 30 and 20% of saving. There was no significance difference of plant height and number of tillers between 70 and 80% of recommended dose of urea fertilizer application in the non-oxidize zone by the BPUA. Deep placement of the urea fertilizer (70 and 80% of recommended dose) gave significantly higher yield (6.7-6.8 t/ha) compared to hand broadcasting of urea (6.1 t/ha). Straw yield and harvest index did not vary with the mode and rate of fertilizer. The agronomic efficiency and partial factor productivity for N observed higher in urea fertilizer deep placement field compared to broadcasting whereas both the parameters did not varied for 30 and 20% saving rate. BPUA accounted the highest BCR (1.72 and 1.67) for 80 and 70% of the recommended urea fertilizer application in non-oxidized zone compared to the hand broadcasting of urea fertilizer (1.56). Farmer can apply 80% of urea fertilizer in non-oxidized zone by the BPUA for long duration rice variety. | Prilled urea applicator will be developed for mechanical transplanted rice field<br>Efficacy of prilled urea deep placement will be asset in mechanical transplanted ricefield. |
| 1.4 | **Design and development of a double row weeder:** A push-pull type manually operated double row rotary weeder was designed and fabricated in the FMPHT divisional research workshop. It consists of four rotors. The weight of the double row weeder is 7.5 kg. Effective width of operation is 35-37 cm. An observation trial was done and the fabricated weeder was primarily tested in the BRRI research field, Gazipur. It was observed that about 70-80% weeds were uprooted and buried successfully by the rotors during push-pull operation of the weeder. The performance of the double row weeder was primarily found satisfactory and suitable to control weeds in the line transplanted field. Fine-tuning and modification of the rotors and blade is under process and it will be tested thoroughly in the next season. | Double row will be introduced to the farmer. Field capacity will be increased rather than single row weeder. |

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| 1.5 | **Design and development of a head feed mini combine harvester:** This study was aimed to design, fabrication and testing the performance of the developed prototype of head feed combine harvester. It was designed and fabricated using locally available materials in Janata Engineering workshop, Chuadanga under Private Public Partnership (PPP). BRRI provide engineering design, fabricated drawing, technical and financial support to develop and fabricate the machine. The preliminary performance of the 1st version was conducted in Aman 2017 season to find out the field capacity, working efficiency, operation fault etc. Functional problems in gear system and cleaning mechanism were identified during the study. The harvesting capacity and fuel consumption were found 0.2~0.25 ha/h and 2.45~3.5 l/h respectively. A second prototype of head feed mini combine harvester was re-designed and fabricated to overcome the identified problems of the 1st version. The 2nd version will be tested in the upcoming Boro season. | Prototype of head feed mini combine harvester will be available for Bangladesh condition |
| 1.6 | **Performance evaluation of power operated automatic seed sower machine:** Uniform seedling density 2-3 seedling per square centimeter is prerequisite condition for smooth operation of mechanical rice transplanter. Seed sowing in uniform density by hand broadcasting is difficult, time consuming and laborious work. Thereby a mechanical seed sower machine was collected and calibrated to perform seed sowing mechanically. The uniformity of seed dispensing rate and different depth of soil in tray was measured in different position of lever. The recommended depth of bed soil and depth of cover-up soil were found in the middle position of 3-4 and 2-3 of the adjusting lever, respectively. The desired seed rate was found in the middle position of 4-5 of the adjusting lever for medium grain size130~140 gm germinated seeds per tray. About 440 trays per hour were prepared at desired condition using two persons. Therefore, it is an appropriate and time saving technology to prepare seedling tray for mechanical rice transplanter. | Performance of power operated seed sower machine will be evaluated |
| **2** | **Milling and Processing Technology** | |

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| 2.1 | **Test, evaluation and modification of rubber roll de-husker:** A de-husking machine was developed to improve the milling performance of rice processing. The developed de-husker was connected in series with the existing auto rice mill. The capacity of the developed de-husker was 647 kg/h. The husking efficiency was found more than 90% for BRRI dhan70 and milling recovery was 63% when it was polished in friction type polisher. The average head rice recovery based on input paddy was 54.6%, which was found promising for processing of premiere quality rice. Old steel engelberg huller can be replaced with the combination of de-husker and polisher. Besides, this combination gives similar milling recovery of the semi and automatic rice mill. In addition, separately collected husk and bran can be used for making briquette and extracting edible oil, respectively. | A suitable rubber roll de-husker will be introduced for Bangladesh condition |
| 2.2 | **Study on milling recovery at different moisture content:** Parboiled BRRI dhan29 was processed in the air blow type engelberg huller with six different moisture levels (9.2%, 10.3%, 11.2%, 12.3%, 13.2% and 14.1%) to find out the optimum moisture content for milling. Under parboiled condition, around 10-11% moisture content (wb) was found suitable for milling of parboiled paddy processed in the air blow type engelberg huller and around 10% moisture content (wb) was found best in terms of head rice recovery (63.5%). | Premium quality rice milling data base will be developed. |
| 2.3 | **Improvement of air-blow type engelberg huller:** FMPHT division developed air blowing type (one-pass) engelberg huller used for processing parboiled paddy. Processing of un-parboiled paddy with this huller, FMPHT division took initiative to reduce rotor rpm by using different sizes of pulley. Among the five size of pulley, 254 mm size with 734 rotor rpm produced 45.40% head rice (based on input paddy supply) which found promising. Normally, engelberg huller operates more than 1200 rpm that's speed suitable for parboiled rice processing and at that rpm produces more breakage for un-parboiled paddy. In this experiment, 1200 rpm for processing un-parboiled paddy gives lowest head rice recovery (34%) and the highest broken rice (28%) percentage. Farmers and millers both will be benefitted by using modified huller mill for both parboiled and un-parboiled paddy in single pass operation. | Improved rice milling system will be developed within 3 years |
| **3** | **Renewable Energy Technology** | |

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| 3.1 | **Design and development of BRRI solar powered light trap:** Solar light trap was designed and fabricated for controlling insects in rice field. The fabricated solar light trap was installed in BRRI HQ research field of west and east byed. The developed light traps functioning well technically. However, some technical faults (battery and bulb wetted by rain, insufficient backup, low light intensity) were observed during field test of 1st prototype of solar light trap. The different types of bulbs (yellowish, bluish, reddish, florescence, neon) were tested to find out suitable light colour to attract more insects. Considering technical faults of 1st version of solar light trap, 2nd prototype was designed and fabricated. The performance of second prototype will be evaluated in upcoming Boro 2018 season. | Solar operated light trap will be developed |
| **4** | **Industrial And Farm Level Extension Of Agricultural Machinery** | |
| 4.1 | **Enhancement of crop productivity and reduction of production cost using farm machinery:** Adaptive trial and field demonstration of farm machinery and technology was conducted in Rajpat, Kasiyani of Gopalganj district during Boro 2017 season. The technologies were seedling raising technique, mechanical rice transplanter, BRRI prilled urea applicator, BRRI weeder and reaper. BRRI dhan58, BRRI dhan50, BRRI dhan29 and BRRI dhan28 were cultivated in the trial plots. In total 101 field trials were conducted during Boro 2017 season. Four (4) trainings, four field days and one motivational tour programs were conducted during this season. About 40 plots covering 20 bighas of land in 12 different farmer's field were harvested by the BRRI reaper as promotional activity. Prilled urea application by the BRRI prilled urea applicator gave the highest grain yield than hand broadcasting of urea due to uniform placement of urea in subsurface soil. | Mitigate labour shortage, reduced human drudgery and production cost |

# Workshop Machinery and Maintenance Division

## Research Progress 2017-18

| Sl. No. | Research Progress | Expected Output |
|---|---|---|
| 1. | **Design and development of power transmission system of a self-propelled power unit for multiple use:** Fabrication of the power transmission system of the reaper is going on. It will be tested. | A self-propelled power unit for multiple use will be developed. |
| 2. | **Design and development of a power tiller operated grain cleaner:** It has been done and tested at BRRI threshing yard. It will be continued. | Self-propelled reaper will be developed and tested. Harvesting time, cost, human drudgery and yield loss will be minimized. |
| 3. | **Design and development of manually/power operated mini reaper:** Design and drawing of manually operated reaper has been done. Its fabrication will be going on. | Harvesting time, cost, human drudgery and yield loss will be minimized. |
| 4. | **Modification of reaper travelling wheel for wet-land condition:** It has been tested in the semi-wet land and it performed well. A problem of tail wheel to operate it in wet land. It has been modified to overcome this problem. Its fabrication has been done. It will be tested. | Wet land suited travelling wheel of reaper will be developed. |
| 5. | **Determination of tilling efficiency of power tiller at selected areas in Bangladesh:** Experiment was conducted in Aman 2017 and Boro 2018 seasons in R/S Rajshahi. It will be continued in other satations. | Optimum tillage depth for maximum paddy yield will be determined. |
| 6. | **Modification of hydro tiller for better maneuverability:** Problem has been identified and its sketch has been done. Rest of the work will be done. | Longevity of hydro tiller will be increased. |
| 7. | **Potentiality of engineering workshop for enhancing farm mechanization in selected areas of Bangladesh:** Data was collected from Bhai-Bhai Engineering Workshop, Kamal Machine Tools, Uttaran Engineering Woprkshop and Alim Engineering Workshop. It will be continued. | A pretested questionnaire will be used for collecting data from different districts. Purposive sampling technique will be used in this survey. |
| 8. | **Survey on status and constraint of farm machinery used in farmer's field at selected areas:** Data was collected from the farmers' field of Handrakona, Sherpur; Hatinakanda, Netrokona and Sheikepara, Jessore district. It will be continued. | Problems and demands of the machinery in the farmers' field will be identified. |
| 9. | **Feasibility study of solar energy use in Agricultural Machinery:** 850 Watt solar panels were installed on the roof of BRRI automobile workshop. Solar energy was used winnowing paddy at BRRI threshing yard. It will be evaluated for different machinery. | Possibility of solar energy use in agricultural machinery will be assessed. |

| Sl. No. | Research Progress | Expected Output |
|---|---|---|
| 10 | **Solar energy use in threshing operation:** 850 watt solar panels were installed on the roof of BRRI automobile. Modified pedal thresher was run using solar energy to thresh paddy and its performance was evaluated in Boro 2018 for threshing paddy at BRRI threshing yard. The solar energy will also be used in open drum thresher. | Solar energy used modified padel drum thresher will be developed. |

# RICE FARMING SYSTEMS PROGRAM AREA

## Rice Farming Systems Division

### Research Progress 2017-2018

| S1.No. | Research Progress | Expected Output |
|---|---|---|
| 01 | Identification of rice variety in Boro-Fallow-T. Aman cropping system for sustainable productivity | In Aman season there was a statistically significant difference found among the variety where BRRI dhan71 gave the highest yield (5.83 t/ha) while the lowest yield was given by BRRI dhan49 (3.43 t/ha). In Boro season there is no statistical difference between BRRI dhan58 and BRRI dhan63 while both varieties gave almost similar yield. From that point of view, it can be said that farmers can choose BRRI dhan71 in Aman season with any of the Boro variety for maximum production. But more precision this experiment should continue for couple of years. |
| 02 | Development of vegetables, fish and fruit system in shallow mini pond | The results showed that the aroid stem yield was 1200, 1125 and 1012 t/ha . The stolon yield ranged from 92 to 106 kg/105m$^2$ and the highest stolon was obtained 106 kg. Highest fish yield was obtained 45 kg. Economic analysis of different treatment showed gross margin of 0,500/-, 17800/- and 15,500 Tk/105m$^2$, where only fish gave 2950/-Tk from the same unit plot.<br>However, mixed farming near the homestead was found to be an effective combination accommodating vegetable, fruit and fish in a system. There is scope of substantial improvement of the productivity of the system with the inclusion of diversified vegetables and fruit. Year round Papaya gave 350Tk/ 0.06ha. and different vegetables like Snake gourd, Bitter gourd, Ash gourd, Ridge gourd, Bottle gourd, Sweet gourd, Country bean and Yard long bean gave 350/-,1250/-,825/- and 3150/-, 275/-, 275/-, 4625/-, 975/-, 375/- |

| | | |
|---|---|---|
| | | Tk/0.06 ha. respectively . Among the vegetables highest gross margin was found from Sweet gourd followed by Bottle gourd while Ridge gourd gave the lowest gross margin compared to others . |
| 03 | Determination of fertilizer dose for Mustard-Boro-T. Aman cropping patterns | The experiment was conducted at the experimental farm of BRRI, Gazipur during T. Aman 2017 to Boro 2018 with the inclusion of mustard in the transition period between T. Aman and Boro rices under T. Aman –Mustard– Boro cropping pattern to determine the fertilizer dose through omission plot technique. There were four treatments: i) NPK, ii) – N, iii) – P and iv) – K. The variety BRRI dhan57, Barishoisha-14 and BRRI dhan28 were used for T. Aman rice, mustard and Boro rice, respectively. Recommended management practices were followed for rice and non-rice crops. The results showed that the grain yields of T. Aman, mustard and Boro varied from 3.03 to 4.08 t/ha, 0.24 to 0.77 t/ha and 3.56 to 7.23 t/ha, respectively (Table 1). The grain yields of all the tested crops were significantly influenced by the treatments. Cropping system based fertilizer recommendation (CSFR) for the tested crops have been calculated after completion of second year experiment and data were presented in Table 2. The required doses of N, P, K under CSFR for T. Aman, Mustard and Boro were 47.3, 2.71 and 24 kg/ha; 94, 22 and 36 kg/ha; and 116.2, 9.8 and 26.2 kg/ha, respectively whereas the individual crop based fertilizer recommended (ICFR) doses were 69, 10 and 41 kg/ha; 138, 36 and 50 kg/ha; and 119.6, 19.4 and 60 kg/ha, respectively (Table 2). Apparently the individual crop based recommended doses were higher compared to systems based recommendation for all the tested crops under T. Aman – Mustard – Boro cropping systems. However, the experiment should be executed one more year for valid conclusion. |
| 04 | Evaluation of establishment method of Mustard-Boro-T. Aman cropping pattern in medium highland ecosystem | Before starting the experiment initial soil sample was taken to estimate initial soil properties and soil analysis is going on. At rabi season 2017-18, mustard yields were 0.8, 0.9, 0.9 and 1.02 t/ha under T1, T2, T3 and T4 (check) treatments. After Mustard, Boro (BRRI dhan 28) yields were 6.31, 5.70, 5.50 and 5.78 t/ha under T1, T2, T3 and T4 treatments. After completion of the cropping pattern, REY (Rice equivalent yield) will be analyzed. |

| | | |
|---|---|---|
| 05 | Evaluation of non-rice crop establishment methods for sustainable crop production in saline areas | A field experiment was conducted in two locations over two years (2016-17 and 2017-18) during Rabi season at Dacope, Khulna and Amtali, Barguna to evaluate the performance of selected crops under different crop establishment methods. Two establishment methods were considered viz. (a) Dibbling for sunflower and maize and (b) Pit for sweet gourd and water melon. Fertilizers were applied as per recommendations. Sunflower produced statistically similar yield every year in both the locations. The highest yield (2.33 t/ha) of Sunflower was obtained from Amtali, Barguna in the year 2017-18 and the lowest (1.96 t/ha) was also in the same location in the year of 2016-17. The highest yield (8.51 t/ha) of maize was found at Dacope, Khulna during 2017-18 which is statistically similar with the yield of previous year (8.46 t/ha) at the same location. In Amtali, Barguna there is also no statistical difference in case of maize yield but location wise yield varied significantly. The average yield was found 8.46 t/ha and 7.62 t/ha in Dacope, Khulna and Amtali, Barguna, respectively while the national average of maize is about 10 t/ha (BBS, 2017).The yield of Sweet gourd varied significantly over the location in every year. The highest yield (13.5 t/ha) was found in Dacope, Khulna during 2017-18 (Table 07). The average yield of sweet gourd is 12.08 t/ha and 8.58 t/ha in Dacope, Khulna and Amtali, Barguna, respectively. This yield is much lower than the national average yield (20-25 t/ha) of sweet gourd under recommended condition. Some adverse factors like salinity and lack of irrigation may be the cause for this yield reduction. Performance of watermelon was comparatively poor than the other three crops in both location over two consecutive years. The highest yield (7.53 t/ha) of watermelon was found in Amtali, Barguna during 2017-18 which is much lower than the national average (18-22 t/ha). Based on the maize equivalent yield (MEY) sweet gourd produced the highest average yield (9.66 t/ha) followed by dibbled maize in Dacope. The lowest yeild (6.48 t/ha) of 'MEY' was observed in Dacope, Khulna for watermelon.Although the national average yield of sweet gourd and watermelon are found higher but it is remarkable that sweet gourd and watermelon were cultivated under stress conditions like salinity and lack of irrigation water where the land remains |

| | | |
|---|---|---|
| | | fallow during rabi season in this area. |
| 06 | Mulching techniques for pit crops to reduce soil salinity | An experiment was conducted in two sites over two years (2016-17 and 2017-18) during Rabi season at Dacope, Khulna and Amtali, Barguna to evaluate mulching material and mulching method for pit crops. Five experimental treatments were considered viz., (a) No mulch (control), (b) Rice straw at the top of the pit, (c) Rice husk at the top of the pit (d) Rice straw at bottom and the top of the pit and (d) Mulching with polythene sheet. Manure and basal dose of fertilizer was applied during pit preparation. Necessary intercultural operations were done as and when it necessary. The yield of sweet gourd varied significantly in different mulch material in years and also in locations. During 2016-17, T2 (Mulching with rice straw) and T3 (Mulching with rice husk) were produced significantly higher yield (13.47 t/ha and 13.05 t/ha, respectively) over all the treatment in Dacope, Khulna (Table 10). Mulching has significant effect on the yield of sweet gourd in both years at every location but the treatment differs location to location and also in year to year. Location wise average yield indicates that when rice straw used as mulch material at the bottom and above the pit then sweet gourd produced better yield than other treatments. Although the national average yield of sweet gourd is higher but it is remarkable that sweet gourd was cultivated under stress conditions like salinity and lack of irrigation water where the land remains fallow during rabi season in this area. Mulching with rice straw treatment is more profitable among the other treatments of mulching in Dacope.. |
| 07 | Evaluation of minimum tillage and crop residue retention in Wheat-Mungbean-T. Aman cropping system. | Establishment method by minimum tillage (EM) and Crop residue retention (CRR) had no significant effect on rice equivalent yield (REY) in Wheat-Mungbean-T. Aman cropping pattern. However, C3 (25% wheat and rice, 100% mungbean)treatment of CRR gave the highest rice equivalent yield (13.91t/ha) with Conventional tillage (T3), which was significantly similar with C2:T3(12.74t/ha), C4:T3(12.70 t/ha), C2:T2(12.72 t/ha) and C3:T2(12.60 t/ha) combinations. C1:T2 (12.59 t/ha) and C4:T2 (12.37 t/ha) combinations were significantly similar. C4:T1 combinations yielded the lowest (10.68 t/ha) followed by C3:T1(10.95 t/ha). |

# SOCIO-ECONOMICS AND POLICY PROGRAM AREA

## Agricultural Economics Division

### Research Progress 2017-18

| SL. No. | Title | Achievement |
|---|---|---|
| 1. | Constraints to Adoption of BRRI Released Modern Rice Varieties in Bangladesh: A Policy Option | ➢ Socio demographic factors like, family size and income, easy access to extension services and better market demand along with higher yield potential, good appearance and also good taste to eat had significant and positive influence to adopt a variety.<br>➢ Surveyed farmers of Mymensingh district opined that, though; performance of newly released BRRI varieties could not satisfy their expectation.<br>➢ Seed of the varieties which performed a bit better in the local demonstrations was not also sufficient; thus, the growers losing their interest about the BRRI varieties. |
| 2. | Evaluation of the Propensity of Indian Rice Varieties Adoption in Selected Areas of Bangladesh | ➢ In T. Aman season, among all Indian rice varieties, *Gutiswarna* was leading cultivar covering 39% area in Rangpur region, and in Dinajpur, it was 31% followed by swarna5 (5%).<br>➢ Most of the farmers continued to cultivate *Gutiswarna* due to its suitability in all types of lands; higher yield performance, better taste and quality straw.<br>➢ Due to some extent earliness of *Gutiswarna*, which facilitated to cultivate the next crop (Robi crops) also popularized it in both Rangpur and Dinajpur regions.<br>➢ In Boro season, *Zira* (71%) was the most dominant variety in Naogaon district due to yield advantage, good grain quality, lucrative price, required low intensive care, less susceptible to insects and diseases, high demand to the millers. |
| 3. | Farm level Adoption and Evaluation of Modern Rice Cultivation in Bangladesh | ➢ In Aus season, overall adoption of modern varieties was 91% of which BRRI varieties' coverage was about 66%. BRRI dhan48 ranked the top position (17%) in terms of area coverage followed by BRRI dhan28 (15%).<br>➢ In T. Aman season, overall adoption of BRRI varieties was apparently low (48%). BRRI dhan49 (11%) and BR11 (7%) were mostly adopted BRRI varieties in T. Aman season. Total adoption of Indian varieties in T.Aman season was 22% while it was 43-58% in some regions.<br>➢ Overall adoption of modern varieties in Boro season was about 99%, of which coverage of BRRI varieties was about 70%. BRRI dhan28 and BRRI dhan29 were the most dominant varieties; jointly covered 61% of total areas in Boro season. |

| | | |
|---|---|---|
| | | ➢ BRRI dhan48 produced the highest yield (4.01 ton/ha) in Aus season whereas BRRI dhan49 (4.62 ton/ha) and BRRI dhan29 (6.43 ton/ha) was the top yielder in T. Aman season and Boro season, respectively.<br>➢ Average yield of hybrids was 7.27 ton/ha whereas BRRI developed hybrids yielded 7.63 ton/ha in Boro season. |
| 4. | Estimation of costs and return of MV rice cultivation at the farm level | ➢ In Boro season, yield was higher due to better cropping environment, good management practices and use of better genotypes, consequently secured higher gross return.<br>➢ In T. Aman season gross and net return was higher due to lower costs of production and better market price.<br>➢ Overall, rice cultivation was profitable at current years' yield and price in terms of gross income and only the T. Aman and Aus rice was profitable in terms of net income. |
| 5. | Preference analysis of T. Aman rice varieties in the coastal areas in Bangladesh | ➢ Based on the performance of T. Aman rice in the trial plots in 2017-18, BRRI dha76 was the most preferred variety in Dacope due to its potentiality of transplanting in the fields with over a feet depth of water as well as less or no infestation of disease and long panicle with large number of grain.<br>➢ On the other hand, BRRI dhan54 was the most preferred variety at Amtali because of higher yield, matured for harvesting about 25-40 days earlier than the check varieties so that matured for food scared period.<br>➢ BRRI dhan77 was the second most preferred variety in Amtali mainly because of suitability of planting in stagnant water, matured for harvesting after drainage out stagnant water and long panicle so that expected higher yield.<br>➢ BBRI dhan73 was least preferred variety both in Dacope and Amtali, while BRRI dhan76 was the second least preferred variety in Amtali. |
| 6. | Vertical price transmission of rice in Bangladesh | ➢ Price transmission scenario was asymmetric from farm to retail level both in long and short run. An increase in the farm price led to rapid increase in the wholesale and retail prices.<br>➢ A decrease in farm price did not decrease in wholesale and retail price at the same rate. That means the processors (wholesalers/millers) enjoy a certain advantage over primary producers (farmers) and that retailers enjoy a certain advantage over processors.<br>➢ Final consumers are more likely to experience a decrease in their surplus from a price increase rather than to experience an increase in their surplus from a price decrease at the upstream. |
| 7. | Welfare effect of adaptation policy for rice price variation under climate change in Bangladesh | ➢ The support price policy creates a positive change in producer surplus of US$ 1,981 million, which is substantially higher than the consumer surplus (US$–1,785 million) in the intervened years.<br>➢ If the subsidized price policy is implemented, the price variation by 1.38% can be reduced and the change in |

| | | |
|---|---|---|
| | | consumer surplus (US$ 1,501 million) obtained in the intervened years.<br>➢ To adapt the unavoidable climate change and eliminate the number of victims of food insecurity, public food policy is necessary even if result of food policy is costly and ineffective. |

# Farm Management Division

## Research Progress 2017-2018

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| **3.1.** | **Rice Production Management** | |
| | **1.** Productivity and profitability of different short duration rice variety as affected by spacing. The experiment is in the field. | BRRI dhan75 with 20cm X 20cm spacing might be produced better Yield of rice. |
| | **2.** Effect of tillage operation on the productivity and profitability of rice cultivation. The data are being processed. | There will be no significant yield difference but T2 treatment might be profitable. |
| | **3.** Effect of organic matter on soil properties and yield of rice. The experiment is in the field. | Performance of BRRI recommended fertilizer and Poultry litter 3.0 t/ha + 1/2 BRRI dose are better. |
| | **4.** Evaluation of Shamolbangla bio-fertilizer on the yield and pest incidence | BRRI Recommended Fertilizer produce the highest grain yield (5.14 t/ha) followed by T1 and T2 treatment. |
| **3.2.** | **Survey and development of data base for labor management** | |
| | **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 |
| **3.3.** | **Management and utilization of land and other resources.**<br>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. |

# Agricultural Statistics Division

## Research Progress 2017-18

| SN | Research Progress | Expected Output |
|---|---|---|
| **IV: Program area: Socio-economic and Policy** | | |
| **1.** | **Stability Analysis of BRRI Varieties** | Stability index of BRRI varieties<br>Genotype x Environment Interaction effect of BRRI varieties<br>Genetic variability, heritability and genetic advance for yield and yield contributing characters<br>Database of BRRI varieties according to seasons, years and locations |
| | **1.1 Stability Analysis of BRRI Varieties (In collaboration with Plant Breeding Div., Plant Physiology Div., ARD and All Regional Stations of BRRI)**<br><br>Analysis for 2017-18 and Data collection for T. Amam/2018 is going on. | Stability index of BRRI varieties according to seasons |
| | **1.2 Genotype x Environment Interaction of BRRI varieties:** Analysis for 2017-18 and Data collection for T. Amam/2018 is going on. | Genotype x Environment Interaction effect of BRRI varieties |
| | **1.3 Genetic Variability, Heritability and Genetic Advance for Yield and Yield Contributing Characters of BRRI Released Rice Varieties:** Analysis for 2017-18 and Data collection for T. Amam/2018 is going on. | Genetic variability, heritability and genetic advance for yield and yield contributing characters<br>Association among different traits of BRRI released rice genotypes |
| | **1.4 Genetic Gain of BRRI Varieties in Bangladesh:** Data processing and initial analysis has already done. Now this program is leaded by Professor Dr. HP Piepho. All the processed data and information related this program was sent to him. | Genetic gain made in grain yield potential by BRRI released rice varieties in Boro and Aman season. |
| **2.** | **Multivariate Analysis of BRRI Varieties** | Database on rice and related crops.<br>Year wise Growth Rate (GR) of Rice Production in Bangladesh<br>Database on climatic factors |

| | | |
|---|---|---|
| | **2.1 Maintenance of rice and rice related variable database:** Now the entire databases are up to date | Database on rice and related crops.<br>Year wise GR of Rice Production in Bangladesh<br>Database on climatic factors |
| **3.** | **Agro Meteorology and Crop Modeling** | Forecast and validate daily crop weather for sustainable rice production.<br>Technical capacity enriches for crop management and smartly disseminates information of daily weather forecasting to the farmers.<br>DSSAT model validation for the assessment of climate change impacts on rice varieties released by BRRI.<br>Genetic coefficient of eight BRRI released rice varieties will be estimated.<br>Impact of climate change on rice growth and yield will be identified.<br>Yield of rice varieties will be forecasted.<br>Adaptation options for regional rice farmers will be analyzed<br>Location specific BRRI varieties and the factors affects on yield of BRRI Varieties in Bangladesh |
| | **3.1. Minimizing Agro Micro climatological Risk Factors for Maximizing Sustainable Rice Production in Bangladesh (In collaboration with Entomology Div., Plant Physiology Div., Soil Science, IWM Div., Plant Pathology Div., and Agril. Econ. Div.):** Daily weather forecasting and validation of the model is going on. Generating agro meteorological advisories based on weather forecasting is running. | Forecast and validate daily crop weather for sustainable rice production.<br>Technical capacity enriches for crop management and smartly disseminates information of daily weather forecasting and advisories to the farmers. |
| | ***3.2*** **Simulating of Climate Change Impact on Rice Growth and Yield in Bangladesh using DSSAT Model (In collaboration with Entomology Div., Plant Physiology Div., Soil Science, IWM Div., Plant Pathology Div., and Agril. Econ. Div.):** Due to lack of suitable land we failed to set up the experiments in BRRI HQ as well as R/S of BRRI. Again we will try to set up the experiments in T. Aman 2018. | Assess the impact of climate change on rice growth and yield and find the suitable rice variety(s) at different climatic condition for regional rice farmers. |

| | | |
|---|---|---|
| **4.** | 4.1. Effects of Climatic Factors on Yield of BRRI Varieties in Bangladesh: Data collection is going on for T. Aman from BRRI HQ as well as BRRI R/S and the Boro experiments are in the field. Also the R programs almost ready for analysis the data. | Effect of climatic factors on yield of BRRI Varieties |
| | **Utilization of Geographic Information System (GIS) in Rice Research** | **S**uitability maps for newly released BRRI varieties and find out vulnerable area for irrigated rice. |
| | **4.2 Suitability Mapping of BRRI dhan50, BRRI dhan63, BRRI dhan66, BRRI dhan71 and BRRI dhan72 (In collaboration with Plant Breeding Div., Soil Science Div. and ARD):** Suitability maps of BRRI dhan48 to BRRI dhan80 has been completed. | Suitable and not suitable areas for particular rice varieties |
| | ***4.3*** **Probability Mapping of Temperature and Rainfall on different rice season in Bangladesh:** Aus season average (2011-15) maximum and minimum temperature and total rainfall maps completed. Aman Season average (2011-15) minimum temperature and total rainfall maps completed. Boro season average (2011-15) minimum temperature map completed. | Year and season wise different climatic factors map of Bangladesh |
| **5.** | **Capacity Building Through Training** | Train up and self-dependent of BRRI scientists on experimental data analysis<br>Skills of BRRI scientists on research planning, program and report writing. |
| | **5.1 Training Program on Experimental Data Analysis:** Two days long training program conducted with titled "B4R and estimation of genetic gain of Breeding Lines Using R" with 32 participants funded by TRB-BRRI project | Skills of BRRI scientists on experimental data analysis will be enriched. |
| **6.** | **Information and Communication Technology (ICT)** | |

| | | |
|---|---|---|
| | **6.1 Digitalized Labour Salary Management System of BRRI (In collaboration with FM Div.):** ICT Cell of Agricultural Statistics division has been digitalized LSMS for BRRI including labours information, Two types of attendance (General attendance & Additional attendance), pay slips, allowances, deductions, leave, savings and net pays etc. Salary management system is easier than previous system for digitization. | Maintain the salary related information as well as labour information<br>Easy to access, accurate and consistent results will be obtained in the form of documents whenever the user needs.<br>To inherit all the properties with high security, fast, robust, flexible, reliable and scalable. |
| | **6.2 Activity: Online Labour wages Management System of BRRI (In collaboration with FM Div.):** Software design has been completed. Architecture of database has been completed. | Maintain the salary related information as well as labour information<br>Easy to access, accurate and consistent results will be obtained in the form of documents whenever the user needs.<br>To inherit all the properties with high security, fast, robust, flexible, reliable and scalable. |
| | **6.3 Activity: Online Application System of BRRI. (In collaboration with Administration of BRRI and Teletalk Mobile Company Ltd.):** Agreement was completed between BRRI and Teletalk Bangladesh Limited, on 8 March' 2017 for Web & SMS based online application system software. | To develop online application system of BRRI.<br>To host online application system at data center.<br>To manage and maintain online application system through regular updating of the information and documents. |
| | **6.4 Activity:**<br>LAN and internet connectivity of BRRI regional station(R/S)<br><br>• Established Local Area Network (LAN) connectivity at five regional stations i.e. Sonagazi, Comilla, Rangpur, Barisal, and Habigonj.<br>• Increased 2 Mbps full duplex, dedicated and 3.5G (3.5 Generation) internet bandwidth at four regional stations i.e. Rangpur, Sonagazi, Comilla and Habigonj. | 1. Bandwidth connectivity already increased from 40 Mbps to 45 Mbps and will increase more and distributes the bandwidth among client PC.<br><br>2. Manage and maintain regularly BRRI internet connectivity. |

| | | |
|---|---|---|
| | **6.5 Activity:**<br>e-File Management System of BRRI. *(In collaboration with Administration of BRRI)*<br><br>• e-File (Nothi) Management System was introduced at BRRI with help of A2i, Prime Minister's Office (PMO) on 24 September' 2017.<br>• Started and issued various file, official letter through e-Filing (Nothi) system at all research division, section and administration of BRRI HQ. | 1. Establishing hassle less and paperless office system.<br><br>2. Manage and maintain e-File (Nothi) Management system of BRRI. |
| | **6.6 Activity:**<br>Mobile Apps of "RKB" (Rice Knowledge Bank)<br><br>• RKB has been hosted at Google Play Store.<br>• Modern rice cultivation methods, rice insect and pest management, soil and fertilizer management ,irrigation and water management, quality rice seed production management, training and publications were been included here.<br>• RKB is one of the members of national apps Bangladesh (www.nationalappsbangladesh.com).<br>• It is an auto update application. | • Create more pages of RKB mobile apps.<br><br>• Extend, update and maintain regularly as routine work. |
| | **6.7 Activity:**<br>e-Tender System of BRRI<br><br>• e-Gp system has been implemented at BRRI.<br>• Started all type of procurement under e-GP on July' 2016.<br>• 82 (Eighty two) tenders have been submitted in e-GP system in collaboration with procurement cell, building & construction division and others research divisions. | 1. Establishing e-Governance.<br><br>2. Manage and maintain e-Tender system of BRRI. |

| | | |
|---|---|---|
| | **6.8 Activity:**<br>BRKB Website Management<br><br>• Updated latest information of Aman, Aus & Boro Rice varieties and production methods included latest variety of BRRI 86.<br>• All types of information like soil and fertilizer management, insects and pest management, rice diseases management and preservation methods have been updated. | • Provide more benefit to all users specially farmers, extension workers, researchers etc.<br><br>• Include more information as well as national issues associated with rice production and training. |
| | **6.9 Activity:**<br>Management Information System (MIS) of BRRI<br><br>• Data entry of all modules has been completed in MIS software by manpower of ICT Cell.<br>• Provided user ID and password of every module to all trained user.<br>• Create user ID for special purpose and provide all types of support service, installation process etc. | • Setup management information system at BRRI.<br><br>• Send MIS data to BARC data bank through VPN regularly. |
| | **6.10 Activity:**<br>BRRI Web Portal Management<br><br>• Rice database, Weather database, Year-wise database, Progress, Achievement, Program, Notice board, News, e services, individual web page with picture of Headquarter and all regional stations of BRRI etc. have been included in here.<br>• BRRI has been developed the web portal with both Bengali and English language. It is the largest web portal (www.portal.gov.bd) in the world and also has been incorporated with it as a first organization among the NARS institute.<br>• All types of tender documents, recruitment advertisement, necessary forms, necessary information rules and act/various gazette have been included this largest Web Portal of BRRI. | • Add new features regularly in BRRI web portal.<br><br>• Increase hosting spaces gradually. |

| | | |
|---|---|---|
| | **6.11 Activity:**<br>Management of BRRI HQ Local Area Network and Internet Connectivity<br><br>• Increased Digital Data Network (DDN) bandwidth connectivity from 40 Mbps to 51 Mbps. Now our internet speed is faster than previous once. Hence, we are providing sufficient speed among all scientist and officer of BRRI. | • Bandwidth connectivity already increased from 40 Mbps to 45 Mbps and will increase more and distributes the bandwidth among client PC.<br><br>• Manage and maintain regularly BRRI internet connectivity. |
| | **6.12 Activity:**<br>BRRI Networks Update, Maintenance and Extension<br><br>• At present, 297 *(*Two hundred Ninety Seven) are joined this *BRRI Networks* group. It will be increased more gradually.<br>• Updated regularly by ICT Cell to protect from all types of unwanted post, photo and other's spam. | • Store more research related activities post and necessary documents.<br><br>• Extend the group with adding more members and introduce more new feature for noble purpose. |
| | **6.13 Activity:**<br>BRRI Web Mail and Group Mail<br><br>• We have created individual e-mail id into BRRI domain for all scientists and all officers as per requirement of the Ministry of Agriculture (MoA).<br>• We have created group mail for all scientists as per requirement of BRRI scientists.<br>• BRRI Web mail & Group mail has been hosted at BCC (Bangladesh Computer Council) server. | • Create web mail ID and group mail as per requirement of BRRI scientists and officer's usage.<br><br>• Manage, maintain and update regularly web mail ID, password and group mail for security purpose. |
| | **6.14 Activity:**<br>**Personal Data Sheet of BRRI**<br><br>• Created Personal Data Sheet (PDS) database including various information fields for all scientists, officers, staffs as per requirement of the Ministry of Agriculture (MoA).<br>• We have distributed 339 user ID and password to all scientists, officers & stuffs personal mail and published user id list into BRRI website. | • Created Personal Data Sheet (PDS) database including various information fields for all scientists, officers, stuffs as per requirement of the Ministry of Agriculture (MoA). |

| | | |
|---|---|---|
| | **6.14 Activity:**<br>**Video Conference System of BRRI**<br><br>• Skype account has been created for all heads of BRRI. | • Establish whole infrastructure of video conferencing set up at BRRI for sharing information and monitoring different activities of BRRI HQ and regional stations.<br>• Set up highway network connectivity of video conferencing system. |

# Adaptive Research Division

## Research Progress 2017-2018

### A. TECHNOLOGY VALIDATION

**1. Title: Advanced Lines Adaptive Research Trial (ALART)**

| Sl. No. | Research Progress | Expected output/Output |
|---|---|---|
| **1.1** | **ALART, T. Aus 2017:** Advanced line NERICA10-7-PL2-B from two sources along with BRRI dhan48 as a check were tested in five locations. NERICA10-7-PL2-B gave higher grain yield with around 7 days shorter growth duration than the check BRRI dhan48. Although plant height of the line is slightly taller than BRRI dhan48, it showed lodging tolerance. | Considering yield, growth duration and other aspects NERICA10-7-PL2-B was recommended for Proposed Variety Trial (PVT). |
| 1.2 | **ALART, Rainfed lowland rice-1 (RLR-1), T. Aman 2017:** Five advanced lines: BR8192-10-1-2-3-4, BRRI dhan29-SC3-28-16-15-HR2 (Com), BR8204-5-3-2-5-2, IR11F190 and IR70213-10-CPA-4-2-2-2 along with BRRI dhan39 and BRRI dhan49 as checks were tested at farmers' field in eight locations. Most of the farmers showed their interest about BRRI dhan49 due to its higher yield, attractive grain size and phenotypic acceptance. A few farmers also showed their interest about BRRI dhan29-SC3-28-16-15-HR2 (Com) for its good yield, shorter duration and grain size. | Considering higher yield, attractive grain size, phenotypic acceptance and farmers' opinion, BRRI dhan29-SC3-28-16-15-HR2(Com) was recommended for PVT. |
| 1.3 | **ALART, Rainfed lowland rice-2 (RLR-2), T. Aman 2017:** Four advanced lines: BR8492-9-5-3-2, BR8210-10-3-1-2, BR8189-10-2-3-1-5 and BR8189-10-2-3-1-6 along with BRRI dhan49 and BR11 as checks were tested at farmers' field in eight locations. In respect to grain yield, grain size, growth duration and disease incidence, farmers' interest were mainly concentrated to BRRI dhan49. However, some farmers also showed their interest about BR8492-9-5-3-2 for its better yield, shorter growth duration and also grain size like BRRI dhan49. | Considering all necessary characteristics and farmers' opinion, BR8492-9-5-3-2 was recommended for PVT. |
| 1.4 | **ALART, Bacterial Blight Resistant (BBR), T. Aman 2017:** One BBR advanced line BR7959-14-2-1 along with BRRI dhan49 (Std. ck) and BR11 (Sus ck) were tested at farmers' field in eight locations. Compared to check varieties BRRI dhan49 and BR11, farmers did not show interest for the advanced line due to its bold type grain size and disease susceptibility. | Considering disease severity, irregular flowering and very large size grain, the line BR7959-14-2-1 was not recommended for PVT. |

| | | |
|---|---|---|
| 1.5 | **ALART, GSR-Salinity, T. Aman 2017:** Two salt tolerant advanced lines: HHZ5-SAL12-DT3-Y2 and HHZ8-SAL12-Y2-DT1 along with BRRI dhan73 (Sus Ck) were tested at farmers' field in seven saline prone locations. Having similar growth duration both the tested advanced lines gave lower yield than the check variety BRRI dhan73. Grain type of the lines was also very similar to BRRI dhan73. | Compared to check variety BRRI dhan73, farmers did not show interest for the advanced lines. So, none of the lines was found suitable for PVT. |
| 1.6 | **ALART, GSR-Drought, T. Aman 2017:**<br>Three drought tolerant advanced lines: HHZ5-DT20-DT3-Y2, HHZ5-SAL10-DT3-Y2 and HHZ23-DT16-DT1-DT1 along with BRRI dhan71 as check were tested at farmers' field in eight drought prone areas. In respect to grain yield, growth duration, disease susceptibility and phenotypic acceptance, none of the advanced lines was preferred by the farmers compared to check variety BRRI dhan71. | Considering lower grain yield with similar growth duration to BRRI dhan71, more disease susceptibility and farmers' opinion, none of the lines was found suitable for PVT. |
| 1.7 | **ALART, Zinc enriched rice (ZER), T. Aman 2017:**<br>Four zinc enriched advanced lines: BR7528-2R-HR16-2-24-1, BR8410-16-4-17-9-1, BR7528-2R-HR16-12-23-P1 and IR84750-213-2-2-3-1 along with BRRI dhan62 and BRRI dhan72 as checks were tested at farmers' field in eight locations. In respect to grain yield with shorter growth duration, grain size, disease susceptibility and phenotypic acceptance, some farmers preferred BR7528-2R-HR16-2-24-1 compared to check variety BRRI dhan62 and 72. | Considering grain yield with shorter growth duration, grain size, disease susceptibility, phenotypic acceptance and farmers' opinion, BR7528-2R-HR16-2-24-1 was recommended for PVT. |
| 1.8 | **ALART, Premium quality rice (PQR), T. Aman 2017:** Three advanced lines for premium quality rice: BR8535-2-1-2, BR8536-27-2-1-2 and BR8234-1-3-7-1-3-HR21 (Com) along with BRRI dhan34, BINA dhan13 as standard checks and Kalizira as local check were tested at farmers' field in six locations. In respect to grain yield with shorter growth duration, grain size and phenotypic acceptance, farmers preferred BR8535-2-1-2 and BR8536-27-2-1-2 compared to standard check varieties. | Considering higher grain yield and earlier growth duration than the check varieties, grain size and farmers' opinion, BR8535-2-1-2 and BR8536-27-2-1-2 were recommended for PVT. |
| 1.9 | **ALART, Location specific shallow deep water rice (LSSDWR), B. Aman 2017:** Four advanced lines for location specific shallow deep water rice i.e. BR9390-6-2-2B, BR10260-7-19-2B, R10230-15-27-7B (Cutting), BR939-13-2-B (Tall), along with Fulkari as a check and also a local check (Swarnadhighi or Dalldighi or Biroi) were tested in nine locations. All the lines and check varieties were damaged in 3 locations out of nine, where maximum water depth was 160 to 244 cm at different growth stage. In the two locations, only check varieties were survived but all the advanced lines were damaged where maximum water depth was 91 to 138 cm at different growth stage. In the rest 4 locations, all the advanced lines including check varieties were survived but yields were not satisfactory. | Most farmers were not interested to cultivate LSSDWR lines due to its poor yield with long duration compared to their own cultivated varieties. So, none of the advanced lines was recommended for PVT. Location specific shallow deep water rice (LSSDWR) variety may come in future from the advanced lines and check |

| | | |
|---|---|---|
| | | varieties. |
| 1.10 | **ALART, Low glycemic index and Bacterial blight resistant rice (LGI and BBR rice), Boro 2018.** Two advanced lines for low glycemic index and bacterial blight resistant rice: BRC266-5-1-1-1 (Low GI) and BR8938-19-4-3-1-1 (BB Res) along with BR16 and BRRI dhan28 as checks were evaluated in eight locations. Farmers' interest was mainly concentrated for check variety BRRI dhan28 for its good yield with shorter growth duration, attractive grain size and phenotypic acceptance. | Having low glycemic index and bacterial blight resistance, both the lines may be recommended in future for PVT, if the irregularity of flowering and maturity is corrected. |
| 1.11 | **ALART, Salinity Tolerant Rice and Green Super Rice (STR & GSR), Boro 2018:**<br>Four salt tolerant advanced lines: IR83484-3-B-7-1-1-1 (STR), IR87870-6-1-1-1-1-B (STR), HHZ12-SAL2-Y3-Y2 (GSR) and HHZ5-DT20-DT2-DT1 (GSR) along with BRRI dhan28 (Ck) and BRRI dhan67 (R. Ck) were evaluated in seven locations. | Along with check variety BRRI dhan67, farmers showed their interest for HHZ12-SAL2-Y3-Y2 (GSR) and HHZ5-DT20-DT2-DT1 (GSR) due to its good yield with reasonable growth duration, attractive grain size, phenotypic acceptance and uniformity of its flowering and maturity. So, the advanced lines HHZ12-SAL2-Y3-Y2 (GSR) and HHZ5-DT20-DT2-DT1 (GSR) were recommended for PVT. |
| 1.12 | **ALART, Bacterial Blight Resistant (BBR), Biotechnology, Boro 2018:** Developed by Biotechnology Division, three advanced lines for bacterial blight resistant rice: BR(Bio)8333-BC5-1-20, BR(Bio)8333-BC5-2-16 and BR(Bio)8333-BC5-2-22 along with IRBB60 (R. Ck), Purbachi (S. Ck) and BRRI dhan29 (Std. Ck) were evaluated in eight locations. | Compared to BRRI dhan29, farmers did not show interest for any advanced lines. Considering all attributes, none of the lines was recommended for PVT. |
| 1.13 | **ALART, Favorable Boro-Short duration (FB-SD), Biotechnology, Boro 2018:** Developed by Biotechnology Division, five advanced lines for short duration in favorable condition: BR(Bio)9785-BC2-6-2-2, BR(Bio)9785-BC2-20-1-3, BR(Bio)9787-BC2-63-2-2, BR(Bio)9787-BC2-63-2-4 and BR(Bio)9787-BC2-173-1-3 along with BRRI dhan28 as check were evaluated in eight locations. | Along with BRRI dhan28, farmers showed interest about entry no. 3 and 4 for their good yield, growth duration, attractive grain size and phenotypic acceptance. Considering all attributes, BR(Bio)9787-BC2-63-2-2 was recommended for PVT. |

## B. TECHNOLOGY DISSEMINATION

**2. Title: Seed Production and Dissemination Program (SPDP) of BRRI varieties with other technologies under GOB and Projects (**SPIRA, ASRS, TRB, URSP (NATP2**)).**

| SN | Reseach Progress | | Expected Output/Output | | | |
|---|---|---|---|---|---|---|
| | Expt. Title: Seed Production and Dissemination Program (SPDP) | Locations | Total production through demo (ton) | Seeds retained by farmers (ton) | Farmers gained awareness through demo (no.) | Motivated Farmer (no.) |
| 2.1 | SPDP during B. Aus, 2017 using BRRI dhan43 & BRRI dhan65 | Eight upazilas of four districts (Rajbari, Sylhet, Narail and Magura) | 5.5 | 1.4 | 1185 | 350 |
| 2.2 | SPDP in Jhum cultivation during Aus 2017 using BRRI dhan43, BRRI dhan48 & BRRI dhan65 | Seven upazilas of three hilly districts (Khagrachari, Rangamati & Bandarban) | 5.5 | 1.0 | 1170 | 332 |
| 2.3 | SPDP in valley of hills during T. Aus, 2017 using BRRI dhan48 and BRRI dhan55 | Seven upazilas of three hilly districts (Khagrachari, Rangamati & Bandarban) | 10.8 | 2.10 | 1496 | 352 |
| 2.4 | SPDP during T. Aus 2017 using BRRI dhan48 | 17 upazilas of 11 districts (Sherpur, Meherpur, Gaibandah, Rangpur, Naogaon, Moulovibazar, Barguna, Patuakhali, Chuadanga, Chottogram & Sylhet) | 24.9 | 5. 30 | 1800 | 792 |
| 2.5 | SPDP during T. Aman 2017 using BRRI dhan34, 49, 54, 66, 70, 71, 72, 73, 75, 76 and 77 | 71 upazilas of 30 districts (Sherpur, Netrakana, Mymensingh, Khulna, Chuadanga, Jhinaidah, Meherpur, Pirojpur, Bhola, Joypurhat, Kurigram, Thakurgaon, Sylhet, Chottogram, Cox's Bazar, Khagrachari, Rangamati, Bandarban, Gaibandha, Naogaon, Jashore, Bagerhat, Patuakhali, Cumilla, Moulvibazar, Rajshahi, Chapai Nawabganj, Dinajpur, Barishal, Jhalokathi) | 134.8 | 24.6 | 20,685 | 5151 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2.6 | SPDP during Boro 2018 using BRRI dhan47, 50, 58, 60, 63, 67, 68, 69, 74 & 81) | 86 upazila of 36 districts (Kishoreganj, Narayanganj, Manikganj, Tangail, Gopalganj, Netrakona, Sherpur, Mymensingh, Kurigram, Joypurhat, Jessore, Bhola, BrahmanBaria, Khagrachari, Bandarban, Rangamati, Sylhet, Sunamganj, Gaibandha, Dinajpur, Thakurgaon, Panchagarh, Naogaon, C.Nawabganj, Jhinaidah, Patuakhali, Chittagong, Cox's Bazar, Moulovibazar, Khulna, Bagerhat, Dinajpur, Bagura, Comilla, Cox'sbazar, Bandarban,) | 415.4 | 57.1 | 22,022 | 4977 |
| 2.7 | Adaptive trial of modern rice varieties in Boro 2017-2018 throughout the country in collaboration with BRRI Regional Stations & other | Modern rice varieties like BRRIdhan58, 63, 67, 74 and 81 were used in the trials where BRRI dhan28 used as check variety. | Among the varieties, BRRI dhan58 either/or BRRI dhan74 gave the highest grain yield in most of locations where BRRI dhan67 was the 2nd highest yielder. BRRI dhan81, BRRI dhan67 and BRRI dhan58 were top ranking in the farmers' preferences | | | |
| | | | | | | |
| **Grand Total** | | | **596.9** | **91.5** | **48,358** | **11,954** |

**NB:**
SPIRA=Strengthening Physical Infrastructure and Research Activities of BRRI
ASRS=Adaptation and out-scaling of some selected rice varieties in stress prone environments
TRB= Transforming Rice Breeding Project
URSP= Up-scaling of BRRI Released New Promising Rice Varieties through Quality Seed Production at Farmers' Level

## C. PROMOTIONAL ACTIVITIES

### Farmers' training and field Day

| Sl No. | Farmers' training and promotional activities | Expected Output/Output |
|---|---|---|

| | | |
|---|---|---|
| | **3.1. Farmers training during 2017-18**<br>During the reporting period, ARD conducted a total of 62 Farmers' training at different locations of the country. | A total of 2110 trainees (1571 male and 366 female farmers and 146 male and 28 female SAAOs of DAE) participated. |
| | **3.2. Field Day/ Farmer's Rally**<br>ARD conducted 82 Field days at different locations of the country under GoB and different projects (SPIRA, TRB, ASRS and URSP (NATP2)) during Aus 2017, Aman 2017 and Boro 2018. | Around 14,000 participants including farmers, local leaders and DAE personnel were participated in the field days. |
| | **3.3 Production of quality seeds of BRRI released recent varieties during 2017-18**<br>Seeds of recent and promising rice varieties were produced in T. Aman/17 and Boro/18 seasons during the reporting period. A total of 7.0 tons quality seeds of different BRRI varieties were produced which were used and will be used for follow up adaptive research trials. | Farmer will get the quality seeds of the latest BRRI released varieties. This is an effective way for quick dissemination of newly released varieties among the farmers. |
| | **3.4 Seed support to stakeholders under TRB project.** Strengthening the dissemination process of promising rice varieties with free of cost. | A total of 915 kg seeds of BRRI dhan34, 49, 56, 57, 62, 66, 70, 71, 72, 73, 75 & 77 were provided with free of cost to 83 farmers of 25 upazila in 16 districts that cultivated in 185 bigha land. |

# Training Division

## Research Progress 2017-2018

| Sl. No. | Research Progress | Expected Output |
|---|---|---|
| I | **Program Area : Technology Transfer**<br>**Program Performing Unit : Training Division** | |
| | 1. Capacity Building and Technology Transfer Through Training | Knowledge and skill of the trained personnel on the subject matters will be increased. |

| | | |
|---|---|---|
| | 1.1 Hands-on training on modern rice production training for SAAO (SPIRA)<br><br>Duration: 1 week<br>Batch: 21<br>No. of participants: 527<br>Progress: Completed | Trained personnel will be able to identify field problems of rice cultivation and solve the problem. Rice production in the project area will be increased. |
| | 1.2. Training on hybrid rice development and seed production<br><br>Participant: BRRI Scientists & NGO Officers<br>Duration: 5 days<br>Batch: 2<br>No. of participant: 62<br>Progress: Completed | Knowledge of the trainees about hybrid rice development and seed production will be increased. |
| | 1.3. Training on hybrid rice and seed production (Hybrid project)<br><br>Participant: SAAO (DAE)<br>Duration: 5 days<br>Batch: 2<br>No. of participants: 53<br>Progress: Completed | Knowledge about hybrid rice seed production technologies will be enriched and supply of hybrid rice seeds in the field level will be increased. |
| | 1.4. Modern rice production training<br><br>Participant : Imam of different mosques<br>Duration: 3 days<br>Batch: 5<br>No. of participants: 150<br>Progress: Completed | Knowledge of the participants on modern rice production will be enriched. So that they can disseminate the rice production related technology through their common lecture. As a result the total production of the country will be increased. |
| | 1.5. Farmers training<br><br>Duration: 1 day<br>Batch: 40<br>No. of participants: Farmers 1200, SAAO 80<br>Progress: Completed | Knowledge about modern rice production technologies of the farmers of Haor areas will be enriched. |
| **II** | **Evaluation of imparted training program** | |
| | Training programe: 1-week training programe.<br>Progress: Completed | This will help improvement of training course and method of training. |

# Regional Station, Sagardi, Barishal

## Research Progress 2017-18

| Sl # | Research Progress | Expected output |
|---|---|---|
| **Programme area/Project with duration:** Regional Station, 2017-18 | | |
| **1** | **Varietal development** | |
| | **i) Development of Tidal Submergence Tolerant Rice:** In Aman2017, 1171 seeds were obtained from 36 crosses. In F1 confirmation, 9 plant materials were selected and confirmed. A total of 1633 progenies of F2 population were selected from 9 parental materials. For developing the erect and dense panicle, 8 materials were selected for further procedure. During Boro 2017-18, 39 F1 population were selected from 54 cross combinations; a total of 106 panicles were selected from 8 $F_2$ population for further process in $F_3$; 7 progeny were selected for F4 progeny. | Generate better genotypes |
| | ii) **Observational trial (OT):** During T. Aman 2017 a total of 297 lines was selected for re-observational trial. Among 266 entries tested during Boro 2017-18, sixteen (16) were selected for further process and the rest were recommended for re-observational trial. | Generate better genotypes |
| | iii) **Preliminary Yield Trial (PYT):** In PYT-1, all the nine advanced lines gave higher yield (7.66- 9.57 t/ha) than standard checks BRRI dhan58 (7.56 t/ha) and BRRI dhan28 (7.24 t/ha) during Boro 2017-18. Among fourteen advanced lines along with checks BRRI dhan28 and BRRI dhan58 tested for PYT-2 during Boro 2017-18, 10 gave more or similar yield than check varieties. In PYT-3, all the three advanced lines gave more or similar yield than checks | Generate better genotypes |
| | iv) **Regional Yield Trial (RYT):** Out of four lines BR(Bio)8961-AC26-16 gave higher yield (6.25t/ha) than check varietyBRRI dhan49 (5.93t/ha) during Aman 2017. In Boro 2017-18, three RYT were conducted of which BR (Bio)9777-26-4-3 gave higher yield (8.64 $tha^{-1}$) compared to check variety BRRI dhan58 (7.07 $tha^{-1}$) in RYT (Bio) FB. In RYT (BB) disease resistant, the line BR9650-35-4-3 gave higher yield (8.55 t/ha) then BRRI dhan58 (6.75 t/ha) and BRRI dhan29 (6.88 t/ha). In other RYT tested lines were not satisfactory compared to check. | Better genotypes would be used for further advancement |
| | v) **Proposed Variety Trial (PVT):** Only one PVT were conducted during Aman 2017 from where BR (Bio)9786-BC2-132-1-3 gave around 0.8t/ha higher yield than corresponding check BRRI dhan49.Two PVT were evaluated during Boro2017-18. Breeding line BRRI dhan29-SC3-28-16-10-8-HR1(Com) gave almost 0.6t/ha higher yield than check BRRI dhan28. In other PVT, BR(bio)9876-BC2-59-1-2 also gave 0.5 t/ha higher yield than Check variety BRRI dhan29. | New variety would be developed |
| | vi) **Proposed Variety Evaluation Trail of Hybrid Rice:** In Aman 2017, out of 8 entries two viz. H1210 (5.16t/ha) and H1214 (4.93t/ha) produced higher yield than others. In Boro2017-18, 35 entries were evaluated and 2 | New Hybrid rice variety would be |

| Sl # | Research Progress | Expected output |
|---|---|---|
| | entries produced more than 10t/ha yield. | identified |
| | **vii) Golden rice evaluation trial:** All the growth and yield parameters of transgenic event IR 112060 GR2-E:2-7-63-2-96 were statistically identical to non-transgenic control BRRI dhan29 but only 1000 grain weight differed significantly (higher in BRRI dhan29) in the confined trial. There were no indications of altered disease susceptibility of GR2E rice compared to control BRRI dhan29, were there no indications that GR2E rice was a preferred host for pest insects. | Transgenic rice would be developed |
| **2** | **Pest Management** | |
| | **i) Integrated approach on rice false smut disease management:**<br>False smut disease was increased with the increasing of N-level. Higher false smut disease was observed at 3rd seeding time (15 July) followed by 2nd (30 June) and 4th (30 July) while no disease was recorded at 1stST (15 June). Lower number of balls on panicle was observed when N2 (1/3rd less than optimum N) and C3 (Azoxystrobin+Propiconazole) were applied at 4th ST. | False smut disease management technique would be established |
| | ii) **Screening of chemicals against blast disease of rice during T. Aman 2017:**<br>Out of fifteen chemicals tested against rice blast disease five viz. Tebuplus75, Quickout50WP, Dlink 32.5, Mcvo 75, Trooper/Nativo significantly reduced neck blast over negative control (plain water used) and was similar to standard check (Trooper). | Effective chemical (s) against blast disease would be identified |
| | **iii) Survey & monitoring of rice diseases:**<br>In Aman 2017, Bacterial Leaf Blight and Blast were recorded as major diseases. Sheath blight, brown spot and false smut were also observed as a promising disease. High yielding variety BRRI dhan34, BRRI dhan62 and local variety Sakkhorkhora, Kumragoir, Kalijira, Montasirmotawere highly infected by blast disease during the survey period.<br>In Boro 2017-18, Blast was recorded as major diseases. Sheath blight, brown spot and false smut (later cultivated crop) were also observed as a promising disease. High yielding variety BRRI dhan28 and, BRRI dhan63 were highly infected by blast disease during the survey period. | Database would be created in order to develop forecasting models. |
| | **iv) Identification of climatic factors for disease and insect pest development and their management in Barishal region:**<br>Temperature at 28-30$^0$C, humidity at 80-90%, rainfall along with rice variety BRRI dhan52 increased Gall midge infestation; closer spacing, shade, higher humidity and lower temperature was conducive for leaf folder multiplication. Blast disease was less in BRRI dhan67 but high in BRRI dhan61. Standing water and spraying of Trooper reduced Blast incidence. Avoiding transplanting in mid August and use of optimum dose of Urea decreased false smut incidence. Gall midge was higher in Dasmina, Patuakhali while leaf folder was higher at Shanker Pasha, Pirojpur. Stem borer was found higher in Local varieties followed by BR 23 and BRRI dhan52. Local varieties, BRRI dhan76 and BRRI dhan77 having long growth duration were infested by rice bug. In case of disease, bacterial leaf blight was the major disease followed by | Climatic factors for disease and insect pest development would be identified |

| Sl # | Research Progress | Expected output |
|---|---|---|
| | brown spot, blast and sheath blight. Those diseases were higher in local varieties compared to HYV rice. | |
| | **v) Blast disease management demonstration trial:**<br>Yield of BRRI dhan61 increased by 30% in research practice (RP) over farmers' practice (FP) in blast disease management demonstration trial. Similarly neck blast disease incidence decreased by 83% in RF over FP. | Farmers would be familiarized with effective Blast management practices |
| | **vi) Insect pest and natural enemy incidence in light trap at BRRI Barisal**<br>In light trap total population of YSB (14718) was higher followed by GLH (3978), LHC (3401), mole cricket (2922), BPH (2822), LF (2751), rice bug (1182) and WBPH (979). Other insect pests were present at a limited amount. Among the natural enemies total population of Staphylinid beetle (7395), Green mirid bug (2432), Carabid beetle (2721) and Pygmy grass hopper (1008) were most prevalent. | Database would be created in order to develop forecasting models. |
| **3** | **Crop-Soil-water management** | |
| | **i) Long-term missing element trial:**<br>All the nutrients (N, P, K, S and Zn) should be applied during Boro season in Charbadna farm to maintain soil nutrient levels as well as for better yield of BRRI dhan58. For Boro rice, N is the most yield limiting nutrient. | Yield limiting factor (fertilizer) would be identified |
| | ii) **Maximizing rice yield through the application of balanced fertilizer and organic amendment in Tidal flooded soil:**<br>In case of chemical fertilizer all the tested BRRI varieties exhibited higher yield compare to other treatments. Sesbania incorporation and 50% N and 100% P-K-S-Zn (STB) gave comparatively higher yield than azolla incorporation treatment in all varieties. | Nutrient status of Tidal flooded soil would be understand |
| | iii) **Screening of modern rice varieties for efficient zinc utilization in Tidal flooded soil:**<br>Almost all the tested varieties gave positive responses with the application of zinc (2.5kg/ha). Among the tested varieties, BR23, BRRI dhan 49 and BRRI dhan76 reacted more significantly than others. | Zinc status of soil would be understand |
| | **iv) Effect of planting time on different rice varieties:**<br>In T. Aman 2017, experiment with four planting time and ten rice varieties were not successful due to severe rat damage though second time of planting was observed having higher yield. In Boro 2017-18, rice transplanted in 25 December and 10 January gave higher yield than the other four time of planting. | Suitable planting time for rice would be identified for better yield |
| | **v) Use of less saline water resources for increasing cropping intensity in Barishal region:**<br>Under Boro cultivation using fresh tidal water (<0.7ds/m) from river and canal through LLP and plastic pipe water distribution system, BRRI dhan74 gave 6.9t/ha yield at Bakerganj and BRRI dhan67gave 6.6t/ha at Nolcity. | Cropping intensity would be increased |

| Sl # | Research Progress | Expected output |
|---|---|---|
| | **vi) Planting time for Boro rice cultivation in saline areas (APSIM model):**<br>In the study of planting time for Boro rice cultivation in saline areas (APSIM model) in coastal region, higher yield was recorded when rice transplanted at 15-25 December. | Planting time for Boro rice cultivation in saline areas would be identified |
| | vii) **Water resources assessment for dry season crop cultivation in selected polders of coastal region:**<br>Total 84.4 km long primary and secondary canals were surveyed in polder 43/1. About 5022009 and 4268707 cubic meter water was stored in the canals during January and February, respectively. Water salinity of the study polder varies from 0.31 to 0.65 dS/m during January. Stored volume reduced by 15% in February, 11% in March and 8% in April. But canal water salinity remained in permissible limit for irrigation. But improper operation of gate valve sometimes causes salt water intrusion and increase water salinity in some polder areas. | Potential Irrigation Water Source for Boro Cultivation in Barisal Region would be identified |
| | **viii) Assessment of suitable water resources availability for irrigation to increase crop production in tidal areas of Barisal region:**<br>Higher salinity (5.4dS/m) was found in Charduani, Patharghata at March 2018 and decreased onward. Water at the upstream part of BoleshorandBurisshor River was found suitable for irrigation throughout the dry season. | Explore the source of suitable water for irrigation |
| | **ix) Evaluation of bio-organic fertilizer in soil plant system:**<br>In T. aman 2017, Biofertilizer(2tha$^{-1}$), NPKS (100%), NKS (75%) + Biofertilizer (2 tha$^{-1}$) and control were tested on BRRI dhan71 of which BOF along with NKS (75%) gave higher yield than other treatments. But in Boro 2017-18, Bio-organic fertilizer was not effective. | Reduction of use of chemical fertilizer by using Bio-organic fertilizer |
| **4** | **Socio-Economics and Policy** | |
| | **Stability analysis of BRRI released HYVs of rice:**<br>In Stability analysis, the highest yield was observed in BRRI dhan52 (5.55 t ha$^{-1}$) followed by BR22 (5.3 tha$^{-1}$) during T. Aman 2017. In Boro varieties, higher yield was observed in BRRI Hybrid dhan5 (7.0 tha$^{-1}$) followed by BRRI dhan74 (6.8 tha$^{-1}$) while lower yield was found in BR17 (2.3 tha$^{-1}$) (rat damage). | Region basis suitable rice varieties would be identified |
| **5** | **Technology transfer** | |
| | **i) Advanced Line Adaptive Research Trial (ALART) in T. Aman 2017:**<br>During T. Aman 2017, out of five ALART, only one ALART for Rainfed Lowland Rice (RLR-1) was successful where line BR8204-53-2-5-2 was superior in yield (5.08 tha$^{-1}$) to other entries and check BRRI dhan49 (4.13 t/ha). Other ALARTs were damaged due to heavy rainfall and excess tidal pressure. | Generate better genotypes |
| | **ii) Demonstration, seed production and scaling up of MV rice in** | Farmers would |

| Sl # | Research Progress | Expected output |
|---|---|---|
| | **Barisal region**<br>In the demonstration trial under GOB during T. Aman 2017, BRRI dhan76 and BRRI dhan77 gave 4.87 and 4.92 t/ha grain yield, respectively. During Boro 2017-18, among the five demonstrated varieties the mean yield of BRRI dhan67 was the highest (6.9 $tha^{-1}$) and the lowest yield was obtained by BRRI dhan28 (5.6 $tha^{-1}$) at five locations of four districts.<br>In the demonstration under SPIRA project tested varieties showed 73-88% yield advantage over local varieties during T. Aman 2017. In Boro higher yield was recorded in BRRI Hybrid dhan3 (8.67 t/ha) and lower in BRRI dhan61 (6.01 t/ha) under SPIRA project.<br>Average 5.39 t/ha (ranged from 5.16-5.61 t/ha) yield was recorded in the demonstration of BRRI dhan72 under HP project. | be motivated to cultivate HYVs of rice |
| | **iii) Farmer's training under different projects**<br>BRRI Barishal Regional Station conducted 17 farmers' trainings during the reporting period. A total of 260 male and 160 female farmers were trained under GoB training program. Under SPIRA project a total of 75 male and 45 female farmers got training on modern rice production technologies. | Awareness for adopting improved rice cultivation technologies would be grown |
| | **iv) Farmers' Field Day under different projects**<br>Ten field days were conducted of which three under NATP Phage 2 (Project ID CRG 698) (1 at Bhola, 1 at Potuakhali and 1 at Jhalakathi) and seven under SPIRA projects (3 during T. Aman and 4 during Boro season). About 1500 (740 male and 760 female) farmers, extension personnel, administrative peoples, public leaders were targeted to participate on these programs. Farmers liked BRRI dhan52 for its higher grain yield (5.91 t/ha at Bhola) and the ability to survive under flash flood for upto 14 days. They also liked BRRI dhan72 for higher yield (5.33 t/ha at Jhalakathi), shorter growth duration (130 days) and Zn content. They were embraced with the newly developed submergence tolerant varieties BRRI dhan76 (5.17 t/ha at Dumki, Patuakhali) and BRRI dhan77 (5.01 t/ha at Dumki, Patuakhali) as it can replace locally cultivated rice varieties. Farmers were motivated with the varieties BRRI Hybrid dhan3 during Boro due to satisfactory grain yield (8.67 t/ha). | Awareness for adopting improved rice cultivation technologies would be grown |
| **6** | **Seed production** | |
| | **i) Hybrid seed production**<br>A total of 50 kg of BRRI Hybrid dhan5 was produced and provided to the farmers of this region to cultivate and disseminate | BRRI released HYVs of rice would be disseminated |
| | **ii) Breeder seed production**<br>In T. Aman 2017, a total of 12,761 kg breeder seed of BR23, BRRI dhan34, BRRI dhan41, BRRI dhan44, BRRI dhan52, BRRI dhan62, BRRI dhan71, BRRI dhan72, BRRI dhan76 and BRRI dhan77 were produced while in Boro 2017-18, a total of 27,000 kg of BR26, BRRI dhan28, BRRI dhan29, BRRI dhan47, BRRI dhan67 and BRRI dhan74 were produced. | |
| | **iii) TLS production** | |

| Sl # | Research Progress | Expected output |
|---|---|---|
| | In T. Aman 2017, a total of 5016 kg and in Boro 2017-18, a total of 14,000 kg TLS were produced. | |

# Regional Station, Bhanga, Faridpur.

## Research Progress 2017-2018

| Sl. No. | Research Progress | Expected Output |
|---|---|---|
| 1. | **Variety Development** | |
| | **Advancement of generation through FRGA (Breeding for developing high yielding rice varieties for single Boro cropping pattern)**<br>Through field RGA 2,605 $F_3$progenies were maintained during T. Aman, 2017 at BRRI Regional Station, Bhanga in case of 'Breeding for developing high yielding rice varieties for single Boro cropping pattern'. | These lines could be advanced for further evaluation |
| | **Proposed Variety Trial (PVT) conducted**<br>During Boro, 2017-18, the promising proposed lines BRRI dhan29-SC3-28-16-10-8-HR1(Com) for short duration and BR(Bio)9786-$BC_2$-59-1-2 for alternative of BRRI dhan29. | These lines were released as Boro variety namely BRRI dhan88 and BRRI dhan89. |
| | **Regional Yield Trial (RYT)**<br>Monibandhobi genotype could not out-yield the standard check variety BRRI dhan46 in RYT, T. Aman, 2017. Among RYTs during Boro, 2017-18, the promising lines were: IR09A235 in RYT-1 (FBR-1), the lines BR(Bio)9777-26-4-3 and BR(Bio)9777-118-6-4 in of RYT-2 (FBR-2), Shampakatari (Shingra-Natore) and BR9207-45-2-2 in RYT(PQR), the lines BR8634-23-1-1-BHA-10, BR8269-60-2-HR-2-1-1-BHA-2, BR8634-23-1-1-BHA-1 and IR101762-1-1-1 in RYT-4 (ZER-1). None of line found promising. | These lines could be advanced for further evaluation |
| 2. | **Farming Systems Research** | |
| | **Identification of potential rice variety in Wheat/Onion-Jute-Relay Aman cropping pattern under shallow deep water rice ecosystem**<br>In Identification of potential rice variety in Jute-Relay Aman-Onion cropping pattern under shallow deep water rice | Productivity and |

| Sl. No. | Research Progress | Expected Output |
|---|---|---|
| | ecosystem, the highest REY (Rice equivalent yield) was obtained from BRRI dhan75 (21.47 t/ha), followed by BRRI dhan72 (20.46 t/ha) and BRRI dhan39 (20.45 t/ha). | profitability of the farmers will be increased. |
| **3.** | **Crop Management** | |
| | **Effect of nitrogen and potassium management on growth and yield of short duration T. Aman rice**<br>In nitrogen and potassium management on growth and yield of short duration T. Aman rice in BRRI dhan71 and BRRI dhan75, the highest grain yield was obtained from N ($1/3^{rd}$ at basal +$1/3^{rd}$ at 15 DAT+ $1/3^{rd}$ at 30 DAT) + K as basal (BRRI recommended) practice. In nitrogen management on growth and yield of BRRI Hybrid dhan5 in Boro season the highest yield was obtained from N @ 124 kg/ha (8.06 t/ha), followed by USG treated plot (8.02 t/ha) and N @ 111 kg/ha (7.98 t/ha). | Suitable N and K management practice will be identified for higher yield of short duration T. Aman varieties. |

# Regional Station, Cumilla

## Research Progress 2017-2018

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| 1. | **Development of improved genotypes with high yield potential along with earliness, photoperiod sensitivity, acceptable grain quality and resistance to diseases and insect pests.** | | |
| **T. Aman 2017** | | | |
| 1.1 | Hybridization | To introgress genes from diverse genetic background for the improvement of standard varieties. | Forty-nine crosses were made using 64 parents. |
| 1.2 | $F_1$ Confirmation | Confirmation of crosses as true $F_1$ | Twenty one were confirmed and registered in BRRI Cumilla. |
| 1.3 | Growing of $F_2$ population | To select progenies better than the standard varieties | Two hundred and thirty eight progenies were selected from population of 37 crosses. |
| 1.4 | Pedigree Nursery ($F_3$, $F_4$, $F_5$ and $F_6$ generations) | To select progenies from the segregating populations better than the standard varieties | Fifty eight (58), 203, 107 and 211 plant were selected from $F_3$, $F_4$, $F_5$ & $F_6$ generation, respectively and 10 breeding lines were bulked from $F_4$ and $F_6$ generation. |

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| 1.5 | Observational trial (OT) | To select genetically fixed lines with uniform plant height, heading, plant type, and grain type along with high yield potential | Eleven genotypes were selected from 65 genotypes based on high yield performance, shorter growth duration and other good agronomic characters. |
| 1.6 | International Rice Observational Nursery (IRLON) | To select genotypes from the diverse genetic background having earliness, good grain type, compact panicle, lodging resistance, disease and insect resistance and high yield potential at rainfed condition | Thirteen genotypes (13) were selected based on agronomic characters and better phenotypic performance as compared with standard checks. |
| 1.7 | Evaluation of Multi-Parent Advanced Generation Intercross Lines | To select genotypes from the diverse genetic background having earliness, good grain type, compact panicle, lodging resistance, disease and insect resistance and high yield potential at rainfed condition. | Thirty (30), 10, 10, 10, 15, 10, 16 and 11, genotypes were selected from MAGIC INDICA 2014, MAGIC INDICA 2014 , MAGIC PLUS 2014, MAGIC PLUS 2014, MAGIC GLOBAL 2015, MAGIC GLOBAL 2015, MAGIC INDICA 2015, MAGIC INDICA 2015 based on agronomic characters and better phenotypic performance as compared with standard checks. |
| 1.8 | Preliminary Yield Trial (PYT) | Initial yield evaluation and selection of desirable lines compared to standard checks | In PYT#1 (Com) considering the yield performance (3.55-3.02 t/ha) BRC315-14-2-3-1-1 and BRC315-14-2-3-2-1 were selected. |
| 1.9 | Secondary Yield Trial (SYT) | Confirmation of yield evaluation in a replicated trial and selection of desirable lines compared with standard checks | In SYT#1 (Com) considering the yield performance (5.63 – 5.57 t/ha) and growth duration (116-139 days), IR 11L433 and IR 12L232 were selected as compared with standard checks. No genotypes were selected from SYT#GSR due to damaged by rat. |
| 1.10 | Regional Yield Trial (RYT) | To evaluate specific and general adaptability of the genotypes in on-station condition | In RYT#2 (RLR), BR 8204-5-3-2-5-2 and BR 8192-10-1-2-3-4 were selected for higher yield (4.93-4.32 t/ha) than standard check BRRI dhan32 (1.66 t/ha). In RYT# (MER), BR8442-9-5-2-3-B1 and BR7528- |

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| | | | 2R-HR16-3-98-1 were selected based on the yield performance (4.99-4.54 t/ha) as compared with standard checks (4.52 - 4.11 t/ha). No genotypes were found promising in respect of yield performance, growth duration, lodging tolerant, rat damage and other agronomic characters from RYT#1 (RLR), RYT#3 (RLR), RYT#4 (RLR), RYT#5 (RLR), RYT#6 (RLR), RYT#7 (RLR), RYT#1 (GSR), RYT#1 (PQR), RYT#2 (PQR), RYT#3 (PQR) and RYT# Biotech |
| 1.11 | Advanced Yield Trial (AYT) | Evaluation of advanced breeding lines for development of variety suitable for Cumilla region | In AYT#2 (RLR), IR70213-10-CPA 4-2-2-2 and BR8210-10-3-1-2 were selected for high yield performance (5.16-4.91 t/ha) as compared with standard checks (4.32-3.80 t/ha). In AYT#3 (PQR), considering the yield performance BR8522-44-5-1 was selected (4.29 t/ha), growth duration (129 days) and lodging tolerant ability as compared with checks BRRI dhan70 (2.20 t/ha and 136 days) and Kalizira (0.86 t/ha and 146 days). Considering the yield performance, growth duration, lodging tolerant, rat damage and other agronomic characters no genotypes were selected from AYT#1 (Com), AYT#4 (DR) and AYT#5 (MER-LS). |
| 1.12 | Advanced Yield Trial (AYT) Farmer (Water Stagnation) | Evaluation of advanced breeding lines for development of variety suitable for water stagnation area of Cumilla region | AYT# Farmer (Water Stagnation), based on yield performance (5.02-2.62 t/ha), plant height (128-123 cm) and growth duration (128-146 days) BR7846 -14 -1-2-1-4, BR7847 -17-3-3-2-3, BR7849 -35-2-2-1-1, BR7849 -48-1-2-1-2, BR7841 -34-1-1-2-2 and BR7841 -53-1-2-1-1 were selected as compared with check BRRI dhan44 (2.95 t/ha, 121cm and 136 days). |
| 1.13 | Advanced Yield Trial (AYT) Farmer (RLR & PQR) | Evaluation of advanced breeding lines for development of variety suitable for Cumilla region | AYT# (RLR Farmer) considering the yield performance (4.35 t/ha) and growth duration (123 days) B10533F-KN-12-2 was selected as compared with standard checks |

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| | | | (4.27-3.86 t/ha and 127-137 days). In AYT# (PQR Farmer), BR8226-8-5-2-2 was selected for higher yield (3.22 t/ha) and lesser growth duration (137 days). |
| | Multi location Trial (MLT) | To evaluate specific and general adaptability of the genotypes in on-station condition | No genotypes were selected due to damaged by flood. |
| 1.14 | Breeder Seed Production | To produce breeder seeds of T. Aman varieties with a target amount | In total, 2325 kg BR22, 525 kg BRRI dhan32, 975 kg BRRI dhan48, 5175 kg BRRI dhan49 and 1650 kg BRRI dhan62 and 2625 kg BRRI dhan75 breeder seeds were produced and sent to GRS division, BRRI Gazipur. |
| **Boro 2017-18** | | | |
| 1.15 | Hybridization | To develop breeding population with high yield potential along with earliness and acceptable grain quality | Eighteen crosses were made using 43 parents |
| 1.16 | $F_1$ Confirmation | To confirm $F_1$ s as true crosses | All crosses (26) were confirmed and registered in BRRI cross list with station code BRC588 to BRC626. |
| 1.17 | Growing of $F_2$ population | Selection of progenies with emphasis on earliness, strong culm, high yield potential and disease and insect resistance at field condition | Sixteen thousand eight hundred and sixty two (16862) plant progenies were selected from population of 39 crosses. |
| 1.18 | Pedigree Nursery ($F_3$, $F_4$, $F_5$ $F_6$ and $F_7$) | Selection of desirable segregates with emphasis on earliness, strong culm, high yield potential and disease and insect resistance at field condition | Six hundred and forty three (643), 231, 79, 45 and 18 plant progenies were selected from $F_3$, $F_4$, $F_5$, $F_6$ and $F_7$ generations, respectively and 153 breeding lines were bulked from $F_5$, $F_6$ and $F_7$ generation. |
| 1.19 | Observational Trial (OT) | To select genetically fixed lines/ homogenous lines with uniform plant height, heading, plant type and acceptable grain quality along with high yield potential | Sixty nine genotypes were selected among 45 genotypes from OT based on high yield performance and other good agronomic characters. |

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| 1.20 | Preliminary Yield Trial (PYT) | Initial yield evaluation and selection of desirable lines compared to standard checks | BRC366-1-1-2-2, BRC333-2-2-1-1-2, BRC333-2-2-1-2-1, BRC333-2-2-1-3-2, BRC333-2-2-1-3-3, BRC344-1-1-1-1-1, BRC344-3-1-2-1-2, BRC344-4-1-1-1-3, BRC345-5-2-2-1-1 and BRC345-5-2-2-1-2 were selected from PYT-Com (SD) for higher yield (6.15-7.66 t/ha) as compared with standard checks (6.14-6.72 t/ha). In PYT-Com(MLD), 17 entries viz. BRC364-1-2-1-1, BRC364-1-2-1-2, BRC324-1-1-1-1-2, BRC324-1-1-1-5-1, BRC325-1-2-1-1-3, BRC325-11-1-2-1-2, BRC325-11-1-3-1-1, BRC325-11-1-3-1-4, BRC328-6-2-2-1-2, BRC328-6-2-2-3-1, BRC328-6-2-3-2-2, BRC329-1-1-1-4-2, BRC331-1-2-1-2-1-2-1-1, BRC331-1-2-2-1-1, BRC337-3-2-2-1-1, BRC337-3-2-2-1-3, BRC326-L-2, gave higher yield (6.50-8.01 t/ha) than the checks varieties (6.06-6.18 t/ha) BRRI dhan28 and BRRI dhan63 with almost similar growth duration to BRRI dhan63 (151 days).<br><br>In PYT-Com (LD), based on high yield performance (8.14-7.27 t/ha) and growth duration (153-153 days) four test lines viz. BRC335-4-1-1-2-1, BRC325-11-1-1-1, BRC335-1-3-2-2-1 and BRC335-1-3-2-1-1 were selected as compared with checks (6.35-6.13 t/ha) with almost similar growth duration. Among the tested lines of very long duration PYT-Com(VLD) and PYT-IIRON, none was selected due to unappreciable performance compared to checks. |
| 1.21 | Secondary Yield Trial (SYT) | Confirmation of yield evaluation in a replicated trial and | In SYT#1 (IIRON), IR 11A318, and IR 11A307 were selected for higher |

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| | | selection of desirable lines compared with standard checks | or similar yield (6.35-6.06 than the checks (6.08-4.56 t/ha) and showing almost similar growth duration (147-152) as compared with standard check BRRI dhan58 (147 days). Considering the high yield performance (8.23-6.89 t/ha) and growth duration (150-159 days) GSRIR1-DQ129-Y4-L1, GSRIR1-DQ150-R5-Y1, HUANGHUAZHAN, GSRIR1-DQ121-Y6-D2, GSRIR1-DQ146-L18-Y1, GSRIR1-DQ138-L15-Y1, GSRIR1-DQ135-Y2-Y1, GSRIR1-DQ136-Y3-Y2, GSRIR1-DQ130-Y5-Y1, GSRIR1-DQ138-L11-Y2, GSRIR1-DQ127-L15-L2, GSRIR1-DQ125-L2-D2, GSRIR1-DQ157-R6-D1, GSRIR1-DQ60-D2-D1, GSRIR1-DQ122-D2-D1, GSRIR1-DQ125-124-Y1, GSRIR1-DQ142-Y1-Y1 and GSRIR1-DQ62-D7-D1 were selected from SYT#2 (MST). In SYT#3 (Super yielder), GSRIR2-8-Y5-SU1-L2, GSRIR2-1-R5-N1-Y3, GSRIR2-8-Y14-SU3-R2, GSRIR2-17-R14-L1-L2, GSRIR2-5-L10-U1-R2, GSRIR2-5-L10-Y1-Y2, GSRIR2-1-Y16-S1-R2 and GSRIR1-24-D19-Y2-Y1-L1 were selected for higher yield (7.13-6.43 t/ha) than the checks BRRI dhan75 (6.38 t/ha) and BRRI dhan69 (6.14 t/ha). |
| 1.22 | Regional Yield Trial (RYT) | To evaluate specific and general adaptability of the genotypes in on-station condition | In RYT#1 (Biotech), BR (Bio) 9777-26-4-3, BR (Bio) 9777-106-7-4, BR (Bio) 9777-113-12-5 and BR (Bio) 9777-118-6-4 were selected for higher yield (7.60-8.50 than the check (6.261 t/ha) and showing almost similar growth duration (153-155) as compared with standard check BRRI dhan58 (154 days). In |

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| | | | RYT-1(ZER), BR8634-23-1-1-BHA-10 were selected for higher yield (6.74-6.07 t/ha) and considerable growth duration (156 days). None of the entries were selected from RYT#2 (ZER), RYT#3 (ZER), RYT (Insect). DINAZPUR MINIKET and SHAMPAKATARI were selected from RYT(PQR). In RYT(FB), two lines viz. IR99061-B-B-7 and IR14N126 were selected based yield (6.24-6.58 t/ha) and growth duration(145-146). |
| 1.23 | Evaluation of Spike gene lines | Initial yield evaluation and selection of desirable lines compared to standard checks | IR64-NIL5 {IR64(qTSN4.4-YP9)} and IR101686-1-1{NSIC 158(qTSN4.1-YP4)} were selected for satisfactory yield potential (5.22-4.79 t/ha) and showing other good agronomic characters as compared with standard check BRRI dhan28 (3.00 t/ha). |
| 1.24 | Advanced Yield Trial | To evaluate the advanced breeding lines for development of variety suitable in Cumilla region | In AYT-Com, BRC297-15-1-1-1, BRC302-1-4-4-4, BRC302-2-1-2-1, BRC302-2-1-2-1, BRC269-15-1-1-3 and BRC302-18-1-2-1 were selected for higher yield (6.55-6.29 t/ha) with almost similar growth duration (143-151 days) as compared with the checks. In AYT-IIRON, none of genotypes were selected. |
| 1.25 | Proposed Variety Trial (PVT) | Evaluation of promising genotypes by NSB team for releasing as new varieties | In PVT (Com) proposed line HHZ23-DT16-DT1-DT1 gave 1.18 t/ha higher yield and showed 3 days later growth than BRRI dhan60 (6.05 t/ha and 148 days). Its yield range was 9.27- 5.89 t/ha for ten locations and it had high lodging tolerant ability. On the other hand, proposed line BR8245-2-1-4 gave 1.26 t/ha higher yield and showed 7 days later growth duration than BRRI dhan28. Its yield range was 7.88-5.80 t/ha for ten locations and grain size was long slender. So, proposed lines HHZ23- |

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| | | | DT16-DT1-DT1 and BR8245-2-1-4 may be recommended for releasing as varieties for high yield performance, high lodging tolerant ability and long slender characteristic as compared to standard checks. Besides, HHZ23-DT16-DT1-DT1 gave 71.0% milling outturn, 3.1 L/B ratio, 23.2 gm 1000 wt and 3.0 Imbibitions Ratio. On the other hand, BR8245-2-1-4 gave 71.6% milling outturn, 3.2 L/B ratio, 21.6 gm 1000 wt and 3.4 Imbibitions Ratio. Amylose contain of HHZ23-DT16-DT1-DT1 and BR8245-2-1-4 were 25.9% and 24.2%, respectively. |
| 1.26 | Breeder Seed Production | To increase of breeder seeds for Boro season with a target amount | In Boro, 7950 kg BRRI dhan28, 4862 kg BRRI dhan29, 3215 kg BRRI dhan58, 2587 kg BRRI dhan69 and 4493 kg BRRI dhan74 breeder seeds were produced and were sent to GRS division, BRRI Gazipur. |
| 2. **Crop-Soil-Water Management Progress** | | | |
| **T. Aman 2017** | | | |
| 2.1 | Long-term effects of some macro and micronutrients on yield and nutrition of upland rice | Determine nutrient deficiency problems in soil, long-term yield trend of rice under different nutrients managements | BRRI dhan57, BRRI dhan62 and BRRI dhan75 produced 4.33, 4.27 and 5.21 t/ha grain yield respectively with added NPKZnS fertilizers. Omission of N from complete treatment had a significantly effect on grain and straw yield of tested varieties. In case of BRRI dhan57, grain yield was drastically reduced due to omission of Potassium |
| 2.2 | Effects of N rates on the yield of BRRI dhan75 | To determine the N response behavior of of BRRI dhan75 | $N_{80}$ produced highest grain yield. On the other hand, $N_{120}$ produced highest straw yield |
| **Boro 2017-18** | | | |
| 2.3 | Long-term effects of some macro and micronutrients on yield and nutrition of upland rice | Determine nutrient deficiency problems in soil, long-term yield trend of rice under | i) BRRI dhan58, BRRI dhan69 and BRRI dhan75 produced 6.79, 8.53 and 8.64 t/ha grain yield respectively with added NPKZnS fertilizers. Omission of N from complete treatment had significant effect on grain and straw yield of tested |

| SL# | Name of the experiment | Objectives | Progress |
|---|---|---|---|
| | | different nutrients managements | varieties. |
| | Effect of N rates on the yield of BRRI dhan28 | To determine the N response behavior of of BRRI dhan28 | $N_{120}$ produced highest grain yield. On the other hand, $N_{160}$ produced highest straw yield. |
| 2.5 | Evaluation of bio-organic fertilizer in the soil plant system | To determining performances of bio-organic fertilizer on BRRI dhan58. | The treatment, T3 = N (70%) +KS (100%) + Bio fertilizer (2 ton/ha) was best for grain yield and straw yield on BRRI dhan58 |

# Regional Station, Habiganj

## Research Progress 2017-2018

| Sl. No. | Research program/Research progress | Expected Output |
|---|---|---|
| 1. | **Expt**. Advanced yield trial (AYT) of Nepali varieties, Boro 2017-18<br>**Progress**: A total of 22 genotypes were evaluated under wet direct seeded condition. The highest number of panicle (24/hill) and yield (6.0 t $ha^{-1}$) was found in Khumal-7 among the test entries with 159 days growth duration. The highest spikelet degeneration was observed in the genotype Khumal-5. | 1. Suitable cold tolerant variety will be selected that might be used to develop a better cold tolerant variety. |
| 2. | **Expt.** Observational yield trial (OYT # Cumilla), Boro 2017-18<br>**Progress**: A total of 19 advance lines with four check varieties were tested. The genotype BRC394-1-1-2-1 produced the highest grain yield (8.15 t $ha^{-1}$) with growth duration 161 days than all the checks (4.19-7.10 t $ha^{-1}$). | 2. Suitable advanced line will be identified that helps to develop better high yielding variety. |
| 3. | **Expt.** Observational yield trial (OYT#ES), Boro 2017-18<br>**Progress**: A total of 382 genotypes along with 5 check varieties BRRI dhan28, BRRI dhan29, BRRI dhan58, BRRI dhan63 and BRRI dhan81 were tested. The genotype code new306 was produced the highest grain yield 9.93 t $ha^{-1}$ with growth duration 145 days followed by new14 (9.37 t $ha^{-1}$), new98 (9.20 t $ha^{-1}$). | 3. Suitable breeding zones and zone specific rice germplasms will be selected. |
| 4. | **Expt.** Preliminary yield trial (PYT#FBR), Boro 2017-18<br>**Progress**: A total of 57 genotypes along with three check varieties BRRI dhan28, BRRI dhan50 and BRRI dhan58 were evaluated. Ten genotypes produced the highest grain yield (7.01-7.87 t $ha^{-1}$) than all the check varieties. | 4. Suitable breeding lines will be selected to develop better high yielding variety. |
| 5. | **Expt.** Advanced yield trial (AYT#FBR), Boro 2017-18<br>**Progress**: A total of eleven genotypes along with three check varieties BRRI dhan28, BRRI dhan58 and BRRI dhan29 were evaluated. The genotypes BR9679-2-3-4 (7.30 t $ha^{-1}$) and BR9213-45-2-1 (7.27 t $ha^{-1}$) produced about 0.7 t/ha higher yield than check variety BRRI dhan58 (6.62 t $ha^{-1}$) with similar growth duration. | 5. Suitable breeding lines will be selected to develop better high yielding variety. |
| 6. | **Expt.** Advanced yield trial (AYT)- water saving, Boro 2017-18<br>**Progress:** In total, eight genotypes along with three check varieties BRRI dhan28, BRRI dhan58 and BRRI dhan29 were evaluated. The two genotypes BR8780-10-5-1 (7.36 t $ha^{-1}$) and GSR IR1-17-D6-Y1-D1-11 (7.30 t $ha^{-1}$) gave the highest grain yield than the all check varieties (6.59-6.91 t $ha^{-1}$). The other three genotypes BR8109-29-2-2-3 (7.03 t $ha^{-1}$), GSR IR1-5-D7-Y3-S1 (6.98 t $ha^{-1}$) and IR98814-11-1-3-1 (6.91 t $ha^{-1}$) produced the similar grain yield with the check variety BRRI dhan29 (6.91 t $ha^{-1}$). | 6. Suitable breeding lines will be selected to develop better water saving high yielding variety. |
| 7. | **Expt.** Advanced yield trial (AYT#ES), Boro 2017-18 | 7. Suitable breeding zones |

| Sl. No. | Research program/Research progress | Expected Output |
|---|---|---|
| | **Progress:** A total of 378 genotypes along with 6 check varieties were tested. The genotype IR15A3768 was produced the highest grain yield 9.92 t $ha^{-1}$ with growth duration 148 days followed by IR 106452-B-B-B-PRN B-PRN B-PRN 114 (9.71 t $ha^{-1}$), IR16A1472 (9.65 t $ha^{-1}$). | and zone specific rice germplasms will be selected. |
| 8. | **Expt.** Confined field trial (CFT) of golden rice in multi environment, Boro 2017-18<br>**Progress**: One transgenic line IR112060 GR2-E:2-7-63-2-96 and one non-transgenic control as standard check variety BRRI dhan29 were evaluated. The tested transgenic line IR112060 GR2-E:2-7-63-2-96 performed little bit lower yield than check variety BRRI dhan29 in respect of panicle number, panicle length, fertility and grain yield. | 8. It will help to develop golden rice variety. |
| 9. | **Expt.** Head to Head trial at different locations of Sylhet region, Boro 2017-18 (TRB funded)<br>**Progress**: A total of twenty trials (Sixteen were conducted at different location of Habiganj district, three at Sunamganj and one at on station) were conducted using five Boro varieties (BRRI dhan28, 58, 63, 67 and 74). Preference of BRRI dhan58 was first by the farmers' of seventeen locations and yield ranges from 6.43 – 7.73 t $ha^{-1}$ with 144-152 days growth duration. Position of BRRI dhan28 was second by the farmers' of seven locations and yield ranges from 5.56 - 6.75 t $ha^{-1}$ with 135-147 days growth duration | 9. Location specific suitability of newly released varieties will be identified. |

| Sl. No. | Research program/Research progress | Expected Output |
|---|---|---|
| 10. | **Expt.** A total of 11 RYT were conducted during reporting year<br>**Progress**: BR9011-19-1-2 produced significantly higher yield (5.89 t $ha^{-1}$ and 112 days) but 2 days longer growth duration than check BRRI dhan48 in T. Aus 2017.<br>The genotype BR8548-8-22-5-15 yielded higher (4.34 t $ha^{-1}$) than check BRRI dhan39 (4.34 t $ha^{-1}$) with similar growth duration in T. Aman 2017.<br>The ZER line BR8269-60-2-HR2-1-1-BHA-2 produced similar grain yield (6.97 t $ha^{-1}$ and 150 days) with check variety BRRI dhan74 (6.71 t $ha^{-1}$ and 149 days) in Boro 2017-18.<br>The PQR entries BR9207-45-2-2 and BR859-5-3-3-4-2 produced significantly higher grain yield (6.68 and 6.61 t $ha^{-1}$) than the check varieties BRRI dhan28, BRRI dhan50 and BRRI dhan63 (5.66-6.31 t $ha^{-1}$) with4-6 days shorter growth duration in Boro 2017-18.<br>Three genotypes BR859-5-2-5-2-2, Dinazpur Minikat (Rangpur) and Shampakatari (Shingra-Natore) produced significantly higher yield (6.01, 6.15 and 6.20 t $ha^{-1}$) than check variety BRRI dhan50 (5.66 t $ha^{-1}$) in Boro 2017-18.<br>The GSR entry HHZ12-Y4-Y1-DT1 produced highest grain yield (7.09 t $ha^{-1}$ and 148 days) than check BRRI dhan69 (6.66 t $ha^{-1}$) with six days shorter duration in 2017-18.<br>FBR line IR09A235 produced about 1.70 t $ha^{-1}$ higher yield than check BRRI dhan58 (7.11 t $ha^{-1}$) with two days earlier in 2017-18.<br>FBR entries IR12A288, IR99090-B-B-62 and BR8938-30-2-4-2-1 also produced about 0.96, 0.93 1.10 t $ha^{-1}$ higher yield respectively, than check BRRI dhan58 (7.11 t $ha^{-1}$) with similar duration in Boro 2017-18.<br>FBR entry BR(Bio)9777-26-4-3 yielded highest (7.21 t $ha^{-1}$) than check BRRI dhan58 (6.40 t $ha^{-1}$) with similar growth duration. BR(Bio)9777-118-6-4 also produced significantly higher yield (6.79 t $ha^{-1}$) than BRRI dhan58 with two days longer duration in 2017-18. | 10. New advanced lines will be selected for developing better variety. |
| 11. | **Expt.** A total of five PVT were conducted during reporting year<br>**Progress**: The proposed line NERICA10-7-PL2 produced significantly higher grain yield and four days earlier growth duration than the check variety BRRI dhan48 in T. Aus season<br>The proposed line BR6848-3B-12 (5.12 t $ha^{-1}$) produced higher grain yield and two days earlier growth duration than the check variety BRRI dhan43 (4.68 t $ha^{-1}$ and 99 days) in B. Aus season<br>BR-RS(Raj)-PL4-B and BR-SF(Rang)-PL1-B produced gave higher grain yield but four days longer growth duration than the check variety BRRI dhan49 (4.31 t $ha^{-1}$ and 135 days) in T. Aman season<br>BR(Bio)9786-BC2-132-1-3 (4.91 t $ha^{-1}$ and 128 days) produced higher grain yield and seven days earlier growth duration than the check variety BRRI dhan49 (3.92 t $ha^{-1}$ and 135 days) in T. Aman season | 11. It helps to release procedure of new variety. |
| 12. | **Expt.** Adoption and yield of different BRRI released Aus, Aman and Boro varieties in Sylhet region<br>**Progress**: Survey was conducted in 2017 and it was found that higher adoption of BRRI dhan48 had (43.6%) followed by BRRI dhan28 (17.2%) and BR26 (8.3%). In T. Aman, BRRI dhan49 was (22.1%) followed by | 12. Adoption and yield of different BRRI released Aus, Aman and Boro varieties in Sylhet region will be determined. |

| Sl. No. | Research program/Research progress | Expected Output |
|---|---|---|
| | BR11 (18.0%), BR22 (8.8%) and BRRI dhan52 (3.9%) and in Boro, BRRI dhan28 was (39.8%) followed by BRRI dhan29 (30.1%), BRRI dhan58 (3.10%) and BR19 (1.2%) | |
| 13. | **Expt.** Long-term missing element trial for diagnosing the limiting nutrient in soil<br>**Progress**: This is a long term experiment that initiated at Habiganj farm in 2007-08 to identify the yield limiting nutrient (s). Besides NP, K is the most yield limiting nutrient element in BRRI Habiganj farm. | 13. Yield limiting factor of rice in haor areas will be determined. |
| 14. | **Expt.** Suitability study of BRRI dhan62 with BRRI dhan28 in low-land haor areas during Boro 2017-18<br>**Progress**: In terms of growth duration and yield, BRRI dhan62 is not suitable for cultivation in Boro season in comparison with BRRI dhan28 in haor areas. | 14. Suitability of alternate variety in haor areas will be identified. |
| 15. | **Expt.** Effect of planting time on yield of different Boro varieties in haor area<br>**Progress**: Regarding BRRI dhan63, 01 January<br>(forty-day-old seedling) is the best time for transplanting. In case of BR14, BRRI dhan74 and BRRI hybrid dhan5, 15 January is the best time for transplanting in BRRI Habiganj farm. | 15. In climate change situation, optimum time of Boro transplanting will be determined. |
| 16. | **Expt.** Effect of planting time on the grain yield of BRRI dhan81 in haor area, Boro 2017-18<br>**Progress**: Optimum time of BRRI dhan81 is 23 November seeding (TP: 28 December) to achieve higher yield. | 16. Optimum planting time of BRRI dhan81 will be determined for higher yield. |
| 17. | **Expt.** Survey of rice insect pests in Sylhet region<br>**Progress**: The population of short horned grass hopper (SHG) was found highest in sweep net collection 24/20 sweep during Aus season followed by green leafhopper (GLH), rice leaf roller (RLR) and rice hispa (9.87, 5.0 and 3.67/20 sweep respectively). But in T. Aman season rice hispa (RH) population found highest 144/20 sweep followed by GLH and SHG (11.87 and 9.73/20 sweep respectively. | 17. The insect pest population, their damage intensities and abundance of the natural enemies will be observed. |
| 18. | **Expt.** Demonstration of wet-direct seeding crop establishment technique<br>**Progress**: The highest grain yield was observed in BRRI dhan29 (8.80 and 8.90 t/ha) in hand seeding and seeding by drum seeder respectively at BRRI farm Habiganj with a growth duration 151-152 days. The yield in farmers field was relatively low (6.03 to 6.13 t/ha) due to poor water and weed management. | 18. Benefit of wet direct seeding of rice in Boro season in haor areas will be observed. |
| 19. | **Expt.** TLS production during Aman and Boro 2017-18 season<br>**Progress**: More than 22 M. tons TLS were produced from four T. Aman and three Boro varieties during the reporting year. Aman seeds were distributed and sold to the local farmers according to their demand. | 19. Seed demand of suitable BRRI released varieties will be fulfilled to the farmers. |
| 20. | **Expt.** Breeder seed production during Boro 2017-18 season<br>**Progress**: A total of 23.73 Metric tonnes Breeders seeds were produced from four Boro rice varieties during the reporting year and all the seeds were sent to the Genetic Resource and Seed Division, BRRI Gazipur | 20. Breeder seed demand of suitable BRRI released varieties will be fulfilled to BADC and other seed producing organization. . |

# Regional Station, Kushtia

## Research Progress 2017-2018

| SL. No | Research Program/progress | Expected output |
|---|---|---|
| | **Program area/ project with duration** | |
| **Varietal development Program area** | | |
| | **T. Aus, 2017-18** | |
| 1. | Proposed variety trial, Upland Aus (Direct seeded, PVT-1)<br>BR6848-3B-12 against BRRI dhan43 (ck) | Proposed HYV for Direct seeded Aus rice has already been released as BRRI dhan83. |
| 2. | Proposed variety trial, (PVT-2)<br>NERICA 10-7-PL2-B against BRRI dhan48 (ck) | Proposed HYV for T. Aus rice has already been released as BRRI dhan82. |
| 3. | Regional yield trial (T. Aus, RYT-1)<br>Tested advance breeding lines(14):<br>BR9011-48-4-3, BR9039-9-1-3,<br>BR8348-49-3-4-3, BR9011-46-2-2,<br>BR8781-5-2-3, BR8776-17-4-2,<br>BR9011-15-2-4, BR9039-7-2-4,<br>BR9011-19-1-2, BR9011-9-4-2,<br>BR9011-34-3-2, BR9011-64-1-2,<br>BR9039-28-3-2, BR9011-67-4-1<br>Checks: BRRI dhan48 and BR26 | Superior HYV for Upland Aus rice will be developed. |
| 4. | Regional yield trial (T. Aus, Biotech. RYT-2)<br>Tested advance breeding lines(5):<br>BR(Bio) 8961-AC26-16, BR(Bio) 9785-BC2-19-3-1, BR(Bio) 9785-BC2-19-3-5,<br>BR(Bio) 9789-BC2-63-2-4, BR(Bio) 9785-BC2-120-2-1<br>Check: BRRI dhan48 | HYV for T. Aus rice will be developed. |
| **T. Aman, 2017-18** | | |
| 5. | Proposed variety trial (Biotech. PVT-1)<br>BR(Bio)9786-BC2-132-1-3 against<br>BRRI dhan49 (Ck) | Proposed HYV for T. Aman Rice has already been released as BRRI dhan87. |
| 6. | Proposed variety trial (Breeding, PVT-2)<br>i.BR-RS(Raj)-PL4-B,<br>ii.BR-SF(Rang)-PL1-B against BR11(Ck) and BRRI dhan49 (Ck) | Proposed HYV for Rainfed Lowland Rice will be released. |

| | | |
|---|---|---|
| 7. | Regional yield trial (ZER, RYT-1)<br>Tested advance breeding lines(6):<br>BR8442-12-1-3-1-B1, BR7528-2R-19-HR16-E5-136-1, BR7833-19-2-3-5-P8-4,<br>BR7528-2R-19-HR16-E5-136-5, BR8444-66-1-2-1, BR8442-12-1-3-1-B5,<br>Checks: BRRI dhan33, BRRI dhan39,<br>BRRI dhan72 and BINA dhan7 | HYV for Zinc enriched T. Aman rice will be developed. |
| 8. | Regional yield trial (RLR-1, RYT-2)<br>Tested advance breeding lines(11):<br>BR8841-24-1-1-2, BR8841-24-1-1-3,<br>BR8841-38-1-2-1, BR8526-38-2-1,<br>BR8824-68-3-2-4, BR8826-38-3-2-2,<br>BR8841-22-2-4-2, IR10F102, BR7781-10-2-3-2,<br>IRRI132, BR8522-21-4-8,<br>Checks: BRRI dhan39 and BRRI dhan49 | HYV for Rainfed Lowland Rice T. Aman rice will be developed. |
| 9. | Regional yield trial (RLR-2, RYT-3)<br>Tested advance breeding lines(7):<br>BR8214-3-7-2-1, BR8214-5-1-16,<br>BR8226-13-1-2 , BR8822-56-2-5-2,<br>BR8822-48-1-1-5, BR8503-1-2-3-5 ,<br>BRRI dhan29-SC3-28-16-15-HR2(Com),<br>Checks: BRRI dhan39 and BRRI dhan49 | |
| 10. | Regional yield trial (PQR-1, RYT-4)<br>Tested advance breeding lines(7):<br>BR8850-10-12-2-3, BR8850-10-12-3-1,<br>BR8850-33-4-4-2 , BR8851-12-4-2-3,<br>BR8493-12-7-4(Com), BR8493-16-5-1(Com),<br>BR8493-3-5-1(Com),<br>Checks: Kalizira and BINA dhan13 | HYV for Premium Quality T. Aman rice will be developed. |
| 11. | Regional yield trial (PQR-2, RYT-5)<br>Tested advance breeding lines(3):<br>BR8526-2-1-1-4 (Com), BR8846-32-2-4-2,<br>BR8846-38-2-4-2 ,<br>Checks: BRRI dhan37 and Kataribhog (Local) | HYV for Premium Quality T. Aman rice will be developed. |
| 12. | Regional yield trial (IRR, RYT-6)<br>Tested advance breeding lines(6):<br>BR8692-15-4-2-1, BR8693-4-1-1-1,<br>BR8693-8-4-2-1, BR8693-17-6-2-1,<br>BR8698-12-5-3-2, BR8693-17-6-2-2 ,<br>Checks: BRRI dhan49 and BRRI dhan33 (Resistant) | HYV for Insect Resistant T. Aman rice will be developed. |
| 13. | Regional yield trial (DRR, RYT-7)<br>Tested advance breeding lines(9):<br>BR9140--11-2-3-2, BR9140-5-22-5-1, | HYV for Disease Resistant T. Aman rice will be developed. |

| | | |
|---|---|---|
| | BR9140-8-25-6-3, BR8547-5-3-5-13, BR8548-7-6-4-2, BR8548-6-5-2-12, BR8548-8-22-5-15, BR9138-8-10-5-3, BR10390-35-8<br>Checks: BRRI dhan39 (Susceptible) and BRRI dhan49 (Susceptible), IRBB60 (Resistant) | |
| 14. | Regional yield trial (Biotech., RYT-8)<br>Tested advance breeding lines(4):<br>BR(Bio)8961-AC14-9, BR(Bio)8961-AC15-10, BR(Bio)8961-AC22-14, BR(Bio)8961-AC26-16<br>Check: BRRI dhan49 | HYV for T. Aman rice will be developed. |
| 15. | Regional yield trial (GRS, RYT- 9)<br>Tested advance breeding lines(1):<br>Monibandhobi<br>Checks: Rajasail (Local) and BRRI dhan46 (Standard) | HYV for T. Aman rice will be developed. |
| **Boro, 2016-17** | | |
| 16. | Proposed variety trial (Biotech.-LWR, PVT-1)<br>BR(BE)6158RWBC2-1-2-1-1 against BRRI dhan29 | Proposed HYV for Low Water Requirement Boro Rice will be released. |
| 17. | Proposed variety trial (FBR, Biotech, PVT-2)<br>BR(Bio)9786-BC2-59-1-2 against BRRI dhan29 | Proposed HYV for Favoroble Boro Rice will be released. |
| 18. | Proposed variety trial (FBR, Breeding, PVT-3)<br>BRRI dhan29SC3-28-16-10-8-HR1(Com) against BRRI dhan28 | Proposed HYV for Favoroble Boro Rice will be released. |
| 19. | Regional yield trial (PQR, RYT-1)<br>Tested advance breeding lines(6):<br>BR8590-5-2-5-2-1, BR9207-45-2-2, BR8590-5-2-5-2-2, BR8590-5-3-3-4-2, Dinajpur Miniket (Rangpur), Shampakatari (Shingra-Natore)<br>Checks: BRRI dhan28, BRRI dhan50 and BRRI dhan63 | HYV for Premium Quality Boro rice will be developed. |
| 20. | Regional yield trial (DRR, RYT-2)<br>Tested advance breeding lines(4):<br>BR9942-38-4, BR9943-2-1, BR9943-2-2, BR9650-35-4-3<br>Checks: BRRI dhan58 (Susceptible), BRRI dhan29 (Sus.) and IRBB60 (Resist.) | HYV for Disease Resistant Boro rice will be developed. |
| 21. | Regional yield trial(IRR, RYT-3)<br>Tested advance breeding lines(6):<br>BR8335-10-6-3-10, BR8336-5-7-2-4, BR8336-7-4-3-7, BR8339-6-2-5-2, BR8340-5-6-1, BR8340-5-8-4 | HYV for Insect Resistant Boro rice will be developed. |

| | | |
|---|---|---|
| | Checks: BR3 (Susceptible), BRRI dhan28 (Standard) and T27A (Tolerant) | |
| 22. | Regional yield trial (FBR, RYT-4)<br>Tested advance breeding lines(10):<br>IR06N220, IR99061-B-B-7, IR12A288, IR09A235, IR14N126, IR99056-B-B-15, IR99090-B-B-62, IR99092-B-B-91, IR14D111, BR8938-2-4-2-1<br>Checks: BRRI dhan28 and BRRI dhan58 | |
| 23. | Regional yield trial (GSR, RYT-5)<br>Tested advance breeding lines(3):<br>HHZ12-Y4-DT1-Y3, HHZ12-Y4-Y1-DT1, HHZ15-DT7-SAL4-SAL1<br>Checks: BRRI dhan28, BRRI dhan58 and BRRI dhan69 | |
| 24. | Regional yield trial (ZER-1, RYT-6)<br>Tested advance breeding lines(10):<br>BR8269-60-2-HR2-1-1-BHA-2, BR8634-23-1-1-BHA-1, BR8634-23-1-1-BHA-10, BR8634-23-1-1-BHA-2, BR8634-23-1-1-BHA-3, BR8634-23-1-1-BHA-5, BR8634-23-1-1-BHA-6, BR8634-23-1-1-BHA-7, BR8634-23-1-1-BHA-8, IR101762-1-1-1<br>Checks: BRRI dhan28, BRRI dhan29 and BRRI dhan74 | HYV for Zinc Enriched Boro rice will be developed. |
| 25. | Regional yield trial(ZER-2, RYT-7)<br>Tested advance breeding lines(4):<br>BR7528-2R-19-16-RILL-1, BR7528-2R-19-16-RILL-15, BR7528-2R-19-16-RILL-18, BR7528-2R-19-16-RILL-49<br>Checks: BRRI dhan28 and BRRI dhan74 | |
| 26. | Regional yield trial (ZER-3, RYT-8)<br>Tested advance breeding lines (2):<br>BRRI dhan62, BRRI dhan57<br>Checks: BRRI dhan28 | |
| 27. | Regional yield trial (Biotech., RYT-8)<br>Tested advance breeding lines(4):<br>BR(Bio)9777-26-4-3, BR(Bio)9777-106-7-4, BR(Bio)9777-113-12-5, BR(Bio)9777-118-6-4<br>Checks: BRRI dhan58 | HYV for Boro rice will be developed. |
| **Socio Economics and Policy Program Area** | | |
| 28. | Stability analysis of BRRI varieties<br>T. Aus: Total tested varieties 08(Eight)<br>T. Aman: Total tested varieties 38(Thirty eight)<br>Boro: Total tested varieties 36(Thirty six) | Stability of the released BRRI HYV rice will be assessed under diverse environmental conditions. |
| **Crop-soil-water management Program Area** | | |

| | | |
|---|---|---|
| 29. | Optimization of irrigation water for maximum year round production | Appropriate technology will be developed for efficient water management under terminal drought. |
| **Technology Transfer Program Area** | | |
| 30. | Farmers' training, Field day and Agricultural Fair | - Farmers will be trained up with BRRI developed modern rice production technologies.<br>- BRRI's technologies will be disseminated. |

# Regional Station, Rajshahi

## Research Progress: 2017-2018

| Research Progress | Expected output |
|---|---|
| **1.0 Survey & monitoring of rice insects and diseases:** Survey was conducted at Rajshahi Region during 2016-2017. Blast, sheath blight and bacterial blight were recorded as major diseases. | To create database on the occurrence and distribution of different rice insects and diseases with respect to varieties, cropping patterns, seasons, locations and environment in order to develop forecasting models. Identifying emerging insects and diseases with changed environment. |
| **2.0 Variety Development Program (VDP):** For proposed variety trial (PVT), proposed lines BR6848-3B-12was yielded higher against their respective check<br>In Boro season, proposed breeding lineBRRI dhan29-SC3-28-16-10-8-HR1(com)produced higher yield than the check variety BRRI dhan28 with 2 days earlier growth duration. The tested FBR line BR(Bio)9786-BC2-59-1-2 and LWR line BR(BE)6158RWBC2-1-2-1-1 produced higher yield than the check variety BRRI dhan29.<br>A total of 45 breeding lines were evaluated in RYT T. Aman 2017 of which 8 entries appeared promising. for further advancement.<br>During Boro 2017-18, eleven breeding lines appeared promising for further advancement.<br>In RYT Boro, one genotype for fabourable Boro, one disease resistant and one short duration biotechnolgy material were selected. | This line released as B. Aus variety namely BRRI dhan83.<br>These lines released as Boro variety namely BRRI dhan88 and BRRI dhan89.<br>These line could be used for further advancement<br>These line could be used for further advancement<br>This line could be used for further advancement |
| **3.0 VDP/ STRASA project**<br>In Aman season, ten promising drought tolerant advanced lines were identified for PVS function. | Better genotypes could be used for further advancement. |
| **4.0 Effects of tillage with crop establishment methods and residue management under Aman** | Productivity and profitability of the farmers |

| | |
|---|---|
| **rice-wheat-mungbean system:** Grain yield of rice is increased in conventional transplanting system compared with dry seeding but the system productivity as well as gross margin remained was found higher in transplanting of rice with rice transplanter + bed/strip planter wheat and mungbean system | will be increased. |
| **5.0 Evaluation rice varieties under jute+rice-wheat cropping pattern and conservation tillage system:** Jute+relay BRRI dhan71-bed/strip wheat gave higher yield and higher profit margin compared with farmers practice and also with jute+relay BRRI dhan39-bed/strip wheat. | Productivity and profitability of the farmers will be increased. |

# Regional Station Rangpur

## Research progress, 2017-18

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| 01. | Variety Development Program (VDP)<br>1.1 Development of rice varieties suitable for Rangpur region<br>Hybridization, $F_1$ confirmation, $F_2$ population and F3 generation, Observational Trial BRRI dhan49 NILs and New Plant Type (NPT), Preliminary Yield Trial (PYT) of BRRI dhan49 NILs<br><br>1.2 Regional Yield Trial (RYT)<br>A total 107 advanced breeding lines (17Aus, 50T. Aman and 40Boro) in 19 RYTs (2Aus, 10T. Aman and07 Boro) was conducted.<br><br>1.3 Advanced line adaptive Trial (ALART)<br>A total of 28 advanced breeding lines (17T. Aman and 11Boro) in 8 ALARTs were tested.<br><br>1.4 Proposed Variety Trial (PVT)<br><br>4 promising lines were tested in 4 PVTs | 18 crosses were made, 14 crosses were confirmed, 14 F2 population and 5F3 were grown in field RGA, 20 lines were selected from OT,<br><br>20 promising lines were selected and these lines could be used for further advancement or in breeding program.<br><br>07 promising lines were selected and these lines could be used for further advancement.<br><br>All tested lines |

| | | |
|---|---|---|
| | | performed better than their respective check varieties. Among these tested lines BRRI dhan83, BRRI dhan88 and BRRI dhan89 approved by the National seed board (NSB). |
| **02** | Breeding for submergence and water stagnation tolerance (STRASA Project)<br>2.1 Growing and Screening of pedigree generations<br><br><br><br>2.2 Advanced Yield Trial (AYT)<br><br><br><br>2.3 Participatory Variety Selection (PVS) - Mother trial | <br><br>In total 272 tolerant progenies which were showed better plant typewere selected from $F_3$ to $F_7$ pedigree populations<br><br>IR13F548 performed better among the tested lines and it could be used for further evaluation.<br>IR13F441 PVS-3) performed better and it could be used for further advancement |
| **03** | Transforming Rice Breding (TRB)<br><br>3.1 Development of Transplant Aus (T. Aus) Rice<br><br>Preliminary Yield Trial (PYT)<br><br><br>Regional Yield Trial (RYT)<br><br><br>3.2 Breeding for submergence (SUB) and water stagnation (SFT) tolerance rice<br>Observational Yield Trial (OYT)<br><br><br><br>3.3 Development of drought tolerant rice | <br><br><br>BR9006-10-2-1-1could be used for further evaluation<br><br>BR9011-67-4-1 could be used for further advancement.<br><br>IR94391-131-358-19-B-1-1-1 gave the highest survival percent (34.0) and yield (3.78 t/ha) with this flood situation. This could be further |

| | | |
|---|---|---|
| | Preliminary Yield Trial (PYT) | advancement. |
| | Regional Yield Trial (RYT) | The highest yield was found in IR94391-131-358-19-B-6-1-4 (6.25 t/ha) whereas check variety BRRI dhan71 gave 4.46 t/ha yield. It could be further advancement. |
| | 3.4 Development of rainfed lowland rice (RLR)<br>Regional Yield Trial (RYT) | IR88965-39-1-6-4 yielded highest (4.99 t/ha) among the tested entries where check variety BRRI dhan71gave 4.82 t/ha yield. |
| | 3.5 Development of cold tolerant rice<br>Preliminary Yield Trial (PYT) | IR101465-5:33could be further advancement. |
| | 3.6 Development of disease resistance (BB) rice<br>Preliminary Yield Trial (PYT) | BR10712-5R-186 (7.10 t/ha and 158 days) and BR9989-23-CS1-1-CS2-18-2-3 (6.98 t/ha and 155 days) appeared superior and these lines could be used for further advancement<br><br>BR9943-40-3-2 (7.84 t/ha and 163 days) could be used for further advancement |
| **4.0** | **CROP-SOIL-WATER MANAGEMENT**<br>4.1 Effect of Crop Establishment Methods and Nutrient Management on the Performance of BRRI newly develop Boro, T.Aus and T. Aman varieties at Rangpur region<br><br>4.2 Effect of Organic (Vermi compost) and Inorganic fertilizer on fine rice yield and quality at Rangpur region in T. | In Boro season treatment N2M2 (6.68 t/ha) but in Aus N2M1 (4.00 t/ha) performed highest grain yield than other treatments |

| | | |
|---|---|---|
| | Aman and Boro season | Organic and inorganic fertilizer combinations perform well in both seasons. |
| **5.0** | **Technology transfer**<br>5.1 Varietal Demonstration (40nos)<br><br>5.2 Farmers Training (10nos)<br><br>5.3 Seed production (Breeder/TLS)- 9ton | Farmers of Rangpur region have got suitable location specific BRRI varieties<br><br>Knowledge on modern rice production technology has improved.<br><br>National and regional seed demand will be meet up to some extend |

# Regional Station, Satkhira-9400

## Research Progress 2017-2018

| Sl. No. | Research Progress | Expected output |
|---|---|---|
| **1.** | **Variety Development Program (VDP)**<br>In Boro season, proposed breeding line BRRI dhan29-SC3-28-16-10-8-HR1(com) produced higher yield with 2 days earlier growth advantage against the check variety BRRI dhan28. The tested FBR line BR(Bio)9786-BC2-59-1-2 yielded higher than the check variety BRRI dhan29 with 4 days earlier growth duration.<br>A total of 85 breeding lines were evaluated in RYT during T. Aman 2017 of which 9 entries appeared promising for further advancement.<br>Twelve breeding lines appeared promising for further advancement among the tested 67 entries during Boro 2017-18. | These lines released as Boro variety namely BRRI dhan88 and BRRI dhan89<br><br>Selected lines could be used for further advancement |
| **2.** | **Transforming Rice Breeding/STRASA/Green Super Rice Program**<br>A total of 646 and 269 progenies were selected from 62 and 18 crossing populations from $F_2$ to $F_4$ in Aman and Boro season, respectively. Seventy eight lines were selected from $F_5$ for observational trial (OT) in both the seasons. | Better genotypes could be used for further advancement |

| | | |
|---|---|---|
| | In rapid generation advance (RGA), total of 5716 and 3347 panicles were collected from $4F_3$ and $7F_4$ populations, respectively<br><br>Among 87 genotypes, 51 OT lines were selected for next salinity breeding program during Aman 2017. Aside from this, 25 and 19 entries were selected from Assasuni and Koyra respectively during Boro 2017-18.<br><br>From 127 STBN entries, 55 genotypes were selected in Aman 2017; where 60 were selected in Boro 2017-18 based on their saline tolerance ability and yield.<br><br>In PYT, five boro genotype and five T.Aman genotype for salinity material were selected. | |
| **3.** | **Effect of missing nutrient on T.Aman and Boro rice production**<br>Balanced fertilizer application is needed for higher yield in saline and non saline gher where N is the most critical nutrient element. The second most critical nutrient is K and P for saline and non saline gher, respectively. Higher grain yield was found in 25% and 50% higher dose of N (155 kg $ha^{-1}$) and K (90 kg $ha^{-1}$), respectively in saline ecosystem. | Productivity and profitability of the farmers will be increased |
| **4.** | **Demonstration of integrated rice-fish system**<br>BRRI dhan30 showed more adaptable for rice-fish system in saline area. | Productivity and profitability of the farmers will be increased |
| **5.** | **Technology Transfer**<br>BRRI dhan73 in T. Aman season and BRRI dhan67 in Boro season showed better performance in saline gher system. Total 100 demonstrations (Aus, Aman and Boro) were conducted during 2017-18 under SPDP program. Fifteen farmer's training (360 farmers) and eighteen field days were arranged and attended two agricultural fair during this year | To disseminate and popularize BRRI varieties and rice production technologies |
| **6.** | **Breeder and Truthfully labeled seed production**<br>A total of 20.99 ton breeder seed and 22.26 ton of TLS was produced during the reporting period. | To produce breeder seed to fulfill the requirement of BRRI HQ and ensure quality seed as well as disseminate the varieties to the farmers seeing that their demand |

# BRRI Regional Station, Sonagazi, Feni

## Research Progress 2017-2018

| Sl. No | Research Progress | Expected output |
|---|---|---|
| 1. | **Regional yield trial (RYT):** Under Regional Yield Trial a total of 107 breeding lines were tested during Aus, Aman and Boro seasons. Among the tested lines; ten lines during Aus season were suggested for advanced trial. During T. Aman season two Rainfed Lowland Rice (RLR), one Zinch Enriched Rice (ZER), one Disease Resistant Rice (DRR) were evaluated under on-station condition which were supplied from Plant breeding division. The RLR lines BR8841-24-1-1-2, BR8841-38-1-2-1, BR8214-3-7-2-1, BR8214-5-1-16, BR8822-56-2-5-2 and BR8822-48-1-1-5 were selected for further trial. The advanced lines IR09A235, IR99056-B-B-15, IR99090-B-B-62, IR99092-B-B-91, IR14D111 and BR8938-30-2-4-2-1 were recommended for advanced trial as Favorable Boro Rice (FBR). | Selection of region based suitable advanced breeding lines and could be used as Advanced Lines Adaptive Research Trial (ALART). |
| 2. | **Advanced Lines Adaptive Research Trial (ALART):** The general and specific adaptability of some potential advanced breeding lines were tested in farmers' field collaborating with DAE. Five categories of ALARTs were conducted during T. Aman, 2017 such as, RLR-1, RLR-2, ZER and BBR. The ALARTs were also conducted during Boro season which were; FB-SD, BBR-Bio and LGI-BBR at Sonagazi upazila of Feni district. Data were collected on yield and yield contributing characters, phenotypic acceptance at vegetative and reproductive stage, insect and disease reaction and lodging records. Collected results with reports were submitted to adaptive research division of BRRI, head quarter. | Well performed lines could be used as PVT. |
| 3. | **Proposed variety trials:** The proposed line NERICA10-7-PL2-B produced 4.39 t/ ha having growth duration 104 days which produced 0.69 ton increased yield than check variety. The tested line was 4 days earlier than check variety and released as BRRI dhan82. The pure lines BR-RS(Raj)-PL4-B and BR-SF(Rang)-PL1-B were tested under PVT as a replicated trial along with checks BR11 and BRRI dhan49. The yield of tested lines and check varieties decreased drastically due to severe infestation of BLB and lodging at milking stage due to stormy wind. | Depending on the recommendation of field evaluation committee some lines will release as new variety. |

| | | |
|---|---|---|
| 4. | **Survey and monitoring of rice diseases:** Survey was carried out at farmers' fields of Laxmipur, Noakhali, Feni and Chattogram districts both in T. Aman, 2017 and Boro, 2017-18. Sheath blight, Brown spot, Sheath rot and BLB infestation were observed in different scores during T. Aman season. Neck blast was very much severe during Boro season where BRRI dhan28 was found as most susceptible. Others were also affected in different degrees such as BRRI dhan29 and BRRI dhan58. Farmers were very much afraid about neck blast during Boro season. | A precautionary measures against neck blast disease will possible. |
| 5. | **Breeder seed production:** Nucleus seeds were supplied from Genetic Resources and Seed (GRS) Division for breeder seed production during Aman and Boro seasons. BRRI dhan34 and BRRI dhan70 were cultivated during Aman season whereas BRRI dhan28, BRRI dhan29, BRRI dhan33 and BRRI dhan63 during Boro season. All produced seeds were sent to GRS division of BRRI, Gazipur**.** A total of Breeder seed during Aman and Boro were 2.80 tons and 11.31 tons respectively. | Enrichment of breeder seed stock. |
| 6. | **Truthfully labeled seeds (TLS) production:** Truthfully labeled Seed (TLS) production activities were undertaken at BRRI research field during Aus, 2017, Aman 2017 and Boro 2017-18. This seed production category was an easy way without any supervision of SCA but quality was maintained providing our own facilities and declared truthfully. Seeds were produced as per physical and technical capacity, opportunity and local need of BRRI, Sonagazi. Total production of TLS during Aus, Aman and Boro were 964 kg, 9064 kg and 310 kg respectively. | Increasing the availability of seed for farmers use. |
| 7. | **Seed Production and Dissemination Program (SPDP):** During upland Aus, 2017, SPDPs were conducted in Sobarnachar upazila of Noakhali district and Sandip upazila of Chattagram district. BRRI dhan43 was used as cultivar in those upazilas. A total of 2438 kg seeds produced in demonstrated areas from which 698 kg seeds were retained by the farmers. The demonstrations were conducted in 5 upazila (Senbug, Companigonj, Potia , Mirsorai and Chokoria) of three coastal districts (Noakhali, Chattpgram, Coxs bazaar) during T. Aus 2017. BRRI dhan48 was used as cultivar in those upazila. A total of 9711 kg seeds produced in demonstrated areas from which 2539 kg seeds were retained by the farmers. The demonstrations on SPDP were conducted in 19 Upazilas of 8 districts of jurrisdicted areas of BRRI regional station, Sonagazi during T. Aman season under core program. The grand total of seed production from demonstrated plots were 29812 kg and farmers retained 10261 kg of seeds for next year cultivation. The demonstrations on SPDP were conducted in 3 Upazilas of 3 districts of jurrisdicted areas of BRRI regional station, Sonagazi during T. Aman season under SPIRA project. BRRI dhan75 and BRRI dhan78 were used as cultivar in those upazilas. The total seed production of BRRI dhan75 and BRRI dhan78 were 6297 kg and 5101 kg whereas retained seeds were 1515 kg and | Rapid dissemination of BRRI released varieties among the farmers. |

| | | |
|---|---|---|
| | 1510 kg of those varieties respectively. The demonstrations on SPDP were conducted in 15 Upazilas of 6 districts of jurrisdicted areas of BRRI regional station, Sonagazi during Boro season under core program. The grand total of seed production from demonstrated plots were 75103 kg and farmers retained 20074 kg of seeds for next year cultivation. The demonstrations on SPDP were conducted in 4 Upazilas of 3 districts of jurrisdicted areas of BRRI regional station, Sonagazi during Boro season under SPIRA project. The grand total of seed production from demonstrated plots were 18908 kg and farmers retained 5206 kg of seeds for next year cultivation. | |
| 8. | **Farmers' training:** During 2017-18 a total of 20 farmers' training were arranged and 700 farmers were trained about modern rice production technology. | Capacity building of farmers about modern rice production technologies. |
| 9. | **Field day:** Field days were arranged for awareness building and create interest among the farmers and concerned extension workers mainly in demonstration sites with the collaboration of DAE and local farmers at different locations of jurrisdicted areas of the station. About 150-200 persons (farmers, researchers, extension service providers, local leaders, public representatives and administrative people etc.) were invited in a field day. A total of 18 field days were arranged during Aus, T. Aman & Boro season. Nearly 3600 progressive farmers, local leaders, DAE field stuff, public representatives & NGO workers participated in those occasions. | Rapid dissemination of newly released rice varieties and other technologies throughout the country. |