

# BANGLADESH RICE RESEARCH INSTITUTE

## Plant Physiology Division

### Annual research program for the year 2021-2022

| Sl. No.                                 | Program area/Project (Duration)                                                                                            | Major objective(s)                                                                                                 | Annual budget (Thousand Tk.) |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Project 1: Salinity tolerance</b>    |                                                                                                                            |                                                                                                                    |                              |
| 1.1                                     | Exploring new sources of salinity tolerance from BRRI Gene Bank germplasm at the seedling stage                            | To identify salt-tolerant advanced breeding lines/genotypes at the seedling stage                                  | 200                          |
| 1.2                                     | Screening of advanced breeding lines for salinity tolerance at the seedling stage during T. Aman and Boro season           | To identify salt-tolerant advanced breeding lines/genotypes at the seedling stage                                  | 200                          |
| 1.3                                     | Characterization of advanced breeding lines at salinity stress for the whole growth period during Aman and Boro season     | To identify salt-tolerant advanced breeding lines/genotypes at the whole growth period                             | 200                          |
| 1.4                                     | Characterization of salt-tolerant varieties in artificial saline conditions for the whole growth period during Aman season | To know the level of salinity tolerance of newly release BRRI varieties                                            | 200                          |
| 1.5                                     | CRISPR-Cas9 mutagenesis of the <i>OsRR22</i> gene for improving salinity tolerance of rice                                 | To increase salinity tolerance via CRISPR-Cas9-targeted mutagenesis of the transcription factor gene <i>OsRR22</i> | 1000                         |
| <b>Project 2: Submergence tolerance</b> |                                                                                                                            |                                                                                                                    |                              |
| 2.1                                     | Identification of rice germplasm/advanced breeding lines for two weeks flash flood submergence tolerance                   | To identify tolerant germplasm/advanced breeding line for two weeks of complete submergence at vegetative stage    | 200                          |
| 2.2                                     | Confirmation of submergence tolerance of previously screened                                                               | To confirm the submergence tolerance of previously screened                                                        | 200                          |

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|                                     | <b>rice germplasm</b>                                                                                                              | rice germplasm                                                                                                                                                                                |                              |
| 2.3                                 | <b>Screening for stagnant flooding tolerance of Germplasm/advanced breeding lines at whole growth period during T. Aman season</b> | 1. To identify tolerant germplasm for water stagnation condition,<br>2. To observe tillering ability under water stagnation conditions                                                        | 200                          |
| 2.4                                 | <b>Evaluation of elongation ability of BRRI dhan91 under deep flooding condition</b>                                               | To observe the elongation ability of BRRI dhan91 under deep flooding condition                                                                                                                | 200                          |
| 2.5                                 | <b>Screening of some deep water rice for facultative elongation ability</b>                                                        | To find out the facultative elongation ability                                                                                                                                                | 200                          |
| 2.6                                 | <b>Study the elongation variability of some deep water rice at different age affected by flooding time</b>                         | To study the effect of initial flood on elongation rate                                                                                                                                       | 200                          |
| 2.7                                 | <b>Effect of 2-3 times consecutive flash flood submergence at certain days interval on rice genotypes</b>                          | To determine the degree of survivability and yield loss of submergence tolerant varieties as affected by 2-3 times consecutive flash flood submergence at different stage of vegetative phase | 200                          |
| <b>Project 3: Drought tolerance</b> |                                                                                                                                    |                                                                                                                                                                                               |                              |
| 3.1                                 | <b>Confirmation of performance for ALART/ RYT /AYT materials under drought stress at reproductive stage (TRB-Project)</b>          | To evaluate of <b>ALART/ RYT /AYT</b> materials under control drought condition in the net house                                                                                              | 200                          |
| 3.2                                 | <b>Screening germplasm for drought tolerance at reproductive phase (TRB-Project)</b>                                               | To identify rice germplasm tolerant to drought stress at reproductive phase                                                                                                                   | 200                          |
| 3.3                                 | <b>Evaluation of previously selected germplasm under drought stress</b>                                                            | To find out the correlation of field performance of tested genotypes                                                                                                                          | 200                          |

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|                                  | at reproductive phase in the rain-out shelter                                                                                                         | with the performance under control drought condition in the rain-out shelter                                                                                       |                              |
| 3.4                              | Physiological and biochemical characterization of advanced breeding lines under drought stress reproductive phase                                     | 1. To assess the effect of drought stress on growth and yield of the tested genotypes<br>2. To identify the physiological traits associated with drought tolerance | 300                          |
| 3.5                              | Characterization of rice germplasms under drought stress at reproductive phase using SSR marker                                                       | To study the genetic diversity of the germplasms                                                                                                                   | 300                          |
| <b>Project 4: Heat tolerance</b> |                                                                                                                                                       |                                                                                                                                                                    |                              |
| 4.1                              | Exploring new sources of heat tolerance from Bangladeshi rice germplasm                                                                               | To identify new sources of heat tolerance from Bangladeshi rice germplasm                                                                                          | 200                          |
| 4.2                              | Screening for high temperature tolerance of spikelet fertility QTL introgression lines                                                                | To identify high temperature tolerant lines under controlled condition                                                                                             | 200                          |
| 4.3                              | Observational trial of high temperature induced spikelet fertility introgression lines in the background BRRi dhan28 and BRRi dhan29                  | To identify high yielding and homogenous lines having phenotypic similarity with respective recipient parents                                                      | 200                          |
| 4.4                              | Marker assisted introgression of high temperature induced spikelet fertility QTL ( <i>qHTSF4.1</i> ) in the background of BRRi dhan48 and BRRi dhan62 | To develop heat tolerant Aus and T. Aman (short duration) lines                                                                                                    | 200                          |

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|----------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Project 5: Cold tolerance</b> |                                                                                                            |                                                                                                                                                                                        |                              |
| 5.1                              | <b>Exploring new sources of cold tolerance from BIRRI Gene Bank collections at seedling stage</b>          | To identify rice genotypes which can tolerate low temperature at seedling stage                                                                                                        | 200                          |
| 5.2                              | <b>Screening of advanced breeding lines for seedling stage cold tolerance (TRB-Project)</b>                | To identify advanced breeding lines which can tolerate low temperature at seedling stage                                                                                               | 200                          |
| 5.3                              | <b>Characterization and evaluation of some selected rice genotypes for cold tolerance</b>                  | To characterize rice genotypes at natural cold condition                                                                                                                               | 200                          |
| 5.4                              | <b>Screening of advanced breeding lines for cold tolerance (SDCTR-Project)</b>                             | To identify cold tolerant advanced breeding lines for whole growth period                                                                                                              | 200                          |
| 5.5                              | <b>Effect of polythene covering on seedling raising in Boro season</b>                                     | To identify the most suitable technique for protecting Boro rice seedling from cold injury                                                                                             | 300                          |
| <b>Project 6: Growth studies</b> |                                                                                                            |                                                                                                                                                                                        |                              |
| 6.1                              | <b>Investigation of photosensitivity of advanced breeding lines and varieties</b>                          | To know the photosensitivity of advance breeding lines and recently released T. Aman varieties                                                                                         | 200                          |
| 6.2                              | <b>Study of phenological development of newly released BIRRI varieties</b>                                 | 1. To observe the phenological development at different growing season,<br>2. To estimate the genetic coefficient for crop simulation                                                  | 200                          |
| 6.3                              | <b>Determination of growth stages of some rice varieties as affected by sowing time during Aman season</b> | 1. To determine the duration of the different growth phases of rice varieties at various transplanting dates,<br>2. To detect appropriate degree days to initiate panicle in different | 200                          |

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|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
|                                                    |                                                                                                                             | transplanting dates                                                                                                                                                                                                            |                              |
| 6.4                                                | <b>Determination of growth stages of some rice varieties as affected by sowing time during Boro Season</b>                  | 1. To determine the duration of the different growth phases of rice varieties at various transplanting dates,<br>2. To detect appropriate degree days to initiate panicle in different transplanting dates                     | 200                          |
| 6.5                                                | <b>Identification of regeneration ability Aus rice varieties</b>                                                            | To determine the regeneration ability of Aus rice varieties                                                                                                                                                                    | 200                          |
| 6.6                                                | <b>Determination of growth phase of short duration (60 days in India) Aus rice varieties</b>                                | To determine the duration of the different growth phases and yield potential of Indian Aus rice varieties                                                                                                                      | 200                          |
| 6.7                                                | <b>Screening of Pre-harvest sprouting of some newly released BRRI varieties</b>                                             | To check the pre-harvesting sprouting resistance on newly released BRRI varieties                                                                                                                                              | 200                          |
| <b>Project: Yield potential</b>                    |                                                                                                                             |                                                                                                                                                                                                                                |                              |
| 7.1                                                | <b>Generation of male sterile rice line for two-line hybrid system by editing <i>TMS5</i> gene using CRISPR/Cas9 system</b> | 1. To generate a novel thermo-sensitive genic male sterile line by editing <i>TMS5</i> gene via CRISPR/Cas9 for two-line hybrid system,<br>2. To evaluate the suitability of the TGMS line in two-line hybrid breeding program | 1000                         |
| 7.2                                                | <b>Lodging tendency in BRRI developed T Aman varieties</b>                                                                  | To determine the lodging characters of four BRRI varieties at different nitrogen levels                                                                                                                                        | 200                          |
| <b>Project 8: C4 rice research and development</b> |                                                                                                                             |                                                                                                                                                                                                                                |                              |
| 8.1                                                | <b>Investigation of anatomical and</b>                                                                                      | 1. To identify leaf anatomical                                                                                                                                                                                                 | 500                          |

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|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
|                                            | <b>photosynthetic differences in rice leaves and C4 species</b>                                                                              | <p>differences between rice and C4 species.</p> <p>2. To explore differences of photosynthetic related parameters between rice and C4 species</p>                                                             |                                     |
| 8.2                                        | <b>Optimizing chlorophyll fluorescence imaging system for photosynthetic efficiencies of C3 and C4 species in different stress condition</b> | <p>1. To identify photosynthetic efficiencies of C3 and C4 species under low CO<sub>2</sub> stress</p> <p>2. To explore photosynthetic differences of rice under salinity, submergence and drought stress</p> | 500                                 |
| <b>Project 9: Crop Weather Information</b> |                                                                                                                                              |                                                                                                                                                                                                               |                                     |
| 9.1                                        | <b>Automatic weather station data collection and storage</b>                                                                                 | To collect, transfer and storage of automatic weather station data                                                                                                                                            | 200                                 |
| 9.2                                        | <b>Manual weather station data collection and maintenance</b>                                                                                | To collect, transfer and storage of different weather variables                                                                                                                                               | 200                                 |