

**Annual Research Programme**  
**(2015-16)**

**Agricultural Engineering Division**

**Program area** : **Irrigation Management of Field Crops**

**Project 1** : **Irrigation management for Pulse and Oil-seed lines and mutants using nuclear technique**

Objectives : - To develop irrigation management practice for maximizing yield  
- To develop irrigation management practice for optimizing yield and water productivity

Principal investigator : Dr. M. H. Ali, SSO & Head

Status : On-going

Last year, experiments were conducted on irrigation scheduling of mustard cultivars, water-logging effects on sesame mutants at different growth stages, and irrigation management effects on onion seed production. This year, experiments with sesame will be repeated.

Duration : 2013-2016

Source of fund : GOB, SRSD

**Experiment 1** : **Response of sesame mutants to water-logging at different growth stages**

Objectives : - To study the response of sesame to water-logging  
- To determine the critical stage(s) of sesame for water-logging

Status : 3<sup>rd</sup> year

Design and replication : RCBD, 3

Location : a) BINA farm, **Mymensingh** (Field and Lysimeter/pot)

b) BINA sub-station, **Magura**

Growing season : February 2016 – June 2016

Unit plot size : 6 m × 5 m (Field), 2 m × 1 m (Lysimeter)

**Treatments** : T<sub>1</sub> = Control (no water-logging)

T<sub>2</sub> = Water-logging at *early stage* (15 -20 DAS) for 24 hours

T<sub>3</sub> = Water-logging at *vegetative stage* (30 -35 DAS) for 24 hours

T<sub>4</sub> = Water-logging at *early flowering stage* (40 -45 DAS) for 24 hours

T<sub>5</sub> = Water-logging at *mid pod formation stage* (55 -60 DAS) for 24 hours

Mutants : V<sub>1</sub> = SM-8, V<sub>2</sub> = SM-9, V<sub>3</sub> = SM-067, V<sub>4</sub> = Binatil-2 (Check)

V<sub>5</sub> = Binatil-3 (Check)

Creation of water-logging: Saturating the root zone and ponding by 3 cm

Data to be collected : - Soil physical properties,  
- Root study after each treatment  
- Record of growth stages (days to flower initiation, maximum flowering, starting of pod formation, starting of pod ripening)  
- all types of weather data  
- Photo after each treatment  
- agronomic data (plant population, plant height)  
- Yield parameters ( including 1000 grain weight, etc.)  
- Plot yield

**Experiment 2 : Response of sesame mutants to water-logging for different durations**

- Objectives : - To study the response of sesame to water-logging  
- To determine the critical stages of sesame for water-logging
- Status : 2<sup>nd</sup> year
- Design and replication : RCBD, 3
- Location : a) BINA farm, **Mymensingh** (Field and Lysimeter/pot)  
b) BINA sub-station, **Magura**
- Growing season : February 2016 – June 2016
- Unit plot size : 6 m X 5 m
- Treatments : T<sub>1</sub> = No water-logging (control)
- T<sub>2</sub> = Water-logging at vegetative stage (30 -35 DAS) for 12 hours  
T<sub>3</sub> = Water-logging at vegetative stage (30 -35 DAS) for 48 hours  
T<sub>4</sub> = Water-logging at mid pod formation stage (50 -55 DAS) for 12 hrs  
T<sub>5</sub> = Water-logging at mid pod formation stage (50 -55 DAS) for 48 hrs
- Mutants : V<sub>1</sub> = SM-8, V<sub>2</sub> = SM-9, V<sub>3</sub> = SM-067, V<sub>4</sub> = Binatil-2 (Check)  
V<sub>5</sub> = Binatil-3 (Check)

Creation of water-logging: Saturating the root zone and ponding by 3 cm

- Data to be collected : - Soil physical properties,  
- Root study after each treatment  
- Record of growth stages (days to flower initiation, maximum flowering, starting of pod formation, starting of pod ripening)  
- all types of weather data  
- Photo after each treatment  
- agronomic data (plant population, plant height)  
- Yield parameters ( including 1000 grain weight, etc.)  
- Plot yield

**Project 2 : Irrigation management for Cereals**

- Principal investigator : Dr. M. H. Ali, SSO & Head
- Status : On-going
- Duration : 2014-2018
- Source of fund : GOB, SRSD

**Experiment 3 : Comparative assessment of water saving in Binadhan-14 (A Braus variety)**

- Objective : 1) To determine optimum water requirement of Binadhan-14 for optimum production  
2) To find out the water savings by Binadhan-14 compared to conventional cultivars
- Status : 2<sup>nd</sup> year
- Growing season : Boro and Aus, Jan. 2016- July 2016
- Design and replication: RCBD, 04
- Location : BINA HQ Farm, BINA sub-station Rangpur, Comilla, Ishurdi
- Plot size : 6 m × 5 m

Treatments : *Main plot (Time of sowing for saving irrigation):*  
 T<sub>1</sub>= Transplanting on 21<sup>th</sup> January (Irrigation at 3 days after disappearance of ponded water )  
 T<sub>2</sub>= Transplanting on 15<sup>th</sup> February (Irrigation at 3 days after disappearance of ponded water )  
 T<sub>3</sub>= Transplanting on 7<sup>th</sup> March (Irrigation at 3 days after disappearance of ponded water )  
 T<sub>4</sub>= Transplanting on 21<sup>st</sup> March (Irrigation at 3 days after disappearance of ponded water )

*Sub-plot (Variety):*  
 V1 = Binadhan 14  
 V2 = Binadhan-10  
 V2 = BRRIdhan 28  
 V3 = BRRIdhan 29

Data to be collected : Irrigation date and amount, yield and yield parameters, weather data, photo at each stage

**Experiment 4 : Evaluation of NERICA mutants and Green Super Rice (GSP) for drought tolerance in Aman season (field study)**

Objectives : - To study the response of NERICA mutants to water-stress  
 - To determine the critical stage(s) of NERICA mutants to water-stress  
 - To develop appropriate water management strategy for NERICA mutants

Status : 1<sup>st</sup> year

Design and replication : RCBD, 3

Location : (1) Chapainawabgonj: Sadar and Nachol  
 (2) Rajshahi: Godagari and Tanore

Growing season : July 2015 – Oct. 2015

Unit plot size : 9 m × 3 m

Total plot area : 42 m × 20 m

Treatments : T<sub>1</sub> = Control (farmer's practice, rainfed)  
 T<sub>2</sub> = normal levee (farmer's practice) and supplemental irrigation ( throughout the growing season) when plant available soil-moisture drops below 60%  
 T<sub>3</sub> = 20 cm height levee around the plot, and rainfed  
 T<sub>4</sub>= 20 cm height levee around the plot, and supplemental irrigation during booting to soft-dough, if plant available soil-moisture drops below 60%

Cultivars : **Aman** : V1 = N<sub>4</sub>/350/P-4(5), V2 = N<sub>10</sub>/350/P-5-4, V3 = N<sub>4</sub>/250/P-2(6)-26, V4 = N<sub>4</sub>/250/P-1(2), V5 = BINA-GSR-3, V6 = Check (BRRIdhan-59 )

Data to be collected : Soil physical and hydraulic properties, weather data, root study, Photo at each growing stage, yield and yield attributing plant characters ( plant density, plant height, panicle per hill, panicle length, 1000 grain weight, etc.)

**Experiment 5 : Evaluation of NERICA mutants for drought tolerance in Aus Season (field study)**

Objectives : - To study the response of NERICA mutants to water-stress  
 - To determine the critical stage(s) of NERICA mutants to water-stress  
 - To develop appropriate water management strategy for NERICA mutants

Status : 2<sup>nd</sup> year

Design and replication : RCBD, 3

Location : (1) Chapainawabgonj: Sadar and Nachol  
(2) Rajshahi: Godagari and Tanore

Growing season : Aus (March 2016– May 2016)

Unit plot size : 9 m × 3 m  
Total plot area : 42 m × 20 m  
Treatments : T<sub>1</sub> = Control (farmer’s practice, rainfed)  
T<sub>2</sub> = normal levee (farmer’s practice) and supplemental irrigation ( throughout the growing season) when plant available soil-moisture drops below 60%  
T<sub>3</sub> = 20 cm height levee around the plot, and rainfed  
T<sub>4</sub>= 20 cm height levee around the plot, and supplemental irrigation during booting to soft-dough, if plant available soil-moisture drops below 60%

Cultivars **Aus** : V1 = N<sub>4</sub>/350/P-4(5), V2 = N<sub>10</sub>/350/P-5-4, V3 = N<sub>4</sub>/250/P-2(6)-26, V4 = N<sub>4</sub>/250/P-1(2), V5 = BINA-GSR-3, V6 = Check (BRRIdhan-48)

Data to be collected : Soil physical and hydraulic properties, weather data, root study, Photo at each growing stage, yield and yield attributing plant characters ( plant density, plant height, panicle per hill, panicle length, 1000 grain weight, etc.)

**Experiment 6 : Evaluation of NERICA mutants and GSR for drought tolerance in Pot culture (Aman season)**

Objective : - To study the response of NERICA mutants to water-stress  
- To determine the critical stage(s) of NERICA mutants to water-stress  
- To develop appropriate water management strategy for NERICA mutants

Status : 1<sup>st</sup> year  
Design and replication : RCBD, 3  
Location : BINA HQ, Mymensingh (Pot experiment)

Growing season : Aman ( July 2015 – Oct. 2015)

Unit plot size : Container size (1.5 m x 1.0 m x 0.28 m)  
Treatments : T<sub>1</sub> = Control (Rainfed)  
T<sub>2</sub> = Supplemental irrigation when plant available soil-moisture (PASM) drops below 60% (throughout the growing season)  
T<sub>3</sub> = Supplemental irrigation during *booting to soft-dough* stage, if PASM drops below 60%; and rainfed for the rest period  
T<sub>4</sub>= Supplemental irrigation when PASM drops below 75% (throughout the growing season)

Details in Table:

ID	Irrigation at-				
	Establishment	Tillering	Late tillering	Booting-heading	Flowering-soft dough
T <sub>1</sub>	-	-	-	-	-
T <sub>2</sub>	At 60% PASM	At 60% PASM	At 60% PASM	At 60% PASM	At 60% PASM
T <sub>3</sub>	-	-	-	At 60% PASM	At 60% PASM
T <sub>4</sub>	At 75% PASM	At 75% PASM	At 75% PASM	At 75% PASM	At 75% PASM

Cultivars **Aman** : V1 = N<sub>4</sub>/350/P-4(5), V2 = N<sub>10</sub>/350/P-5-4, V3 = N<sub>4</sub>/250/P-2(6)-26, V4 = N<sub>4</sub>/250/P-1(2), V5 = BINA-GSR-3, V6 = Check (BRRRI dhan-56)

Data to be collected : - Soil physical and hydraulic properties, weather data, root study, Photo at each growing stage, yield and yield attributing plant characters ( plant density, plant height, panicle per hill, panicle length, 1000 grain weight, etc.)  
- <sup>13</sup>C isotopic discrimination of leaves

**Experiment 7 : Evaluation of NERICA mutants and GSR for drought tolerance in Pot culture (Aus season)**

Objective : - To study the response of NERICA mutants to water-stress  
- To determine the critical stage(s) of NERICA mutants to water-stress  
- To develop appropriate water management strategy for NERICA mutants

Status : 2<sup>nd</sup> year  
Design and replication : RCBD, 3  
Location : BINA HQ, Mymensingh (Pot experiment)

Growing season : Aus (March 2015 – May 2015)

Unit plot size : Container size (1.5 m x 1.0 m x 0.28 m)  
Treatments : T<sub>1</sub> = Control (Rainfed)  
T<sub>2</sub> = Supplemental irrigation when plant available soil-moisture (PASM) drops below 60% (throughout the growing season)  
T<sub>3</sub> = Supplemental irrigation during *booting to soft-dough* stage, if PASM drops below 60%; and rainfed for the rest period  
T<sub>4</sub> = Supplemental irrigation when PASM drops below 75% (throughout the growing season)

Details in Table:

ID	Irrigation at-				
	Establishment	Tillering	Late tillering	Booting-heading	Flowering-soft dough
T <sub>1</sub>	-	-	-	-	-
T <sub>2</sub>	At 60% PASM	At 60% PASM	At 60% PASM	At 60% PASM	At 60% PASM
T <sub>3</sub>	-	-	-	At 60% PASM	At 60% PASM
T <sub>4</sub>	At 75% PASM	At 75% PASM	At 75% PASM	At 75% PASM	At 75% PASM

Cultivars (**Aus**) : V1 = N<sub>4</sub>/350/P-4(5), V2 = N<sub>10</sub>/350/P-5-4, V3 = N<sub>4</sub>/250/P-2(6)-26, V4 = N<sub>4</sub>/250/P-1(2), V5 = BINA-GSR-3, V6 = Check (BRRRI dhan-48)

Data to be collected : - Soil physical and hydraulic properties, weather data, root study, Photo at each growing stage, yield and yield attributing plant characters ( plant density, plant height, panicle per hill, panicle length, 1000 grain weight, etc.)  
- <sup>13</sup>C isotopic discrimination of leaves

- Experiment 8** : **<sup>13</sup>C isotopic discrimination of Wheat cultivars at varying water stress in Lysimeter**
- Objective : To assess the isotopic signatures of carbon and oxygen in plant dry samples to evaluate wheat plants for their tolerance to water stress at different growth stages under field conditions.
- Design and replication: Single replicated
- Location : BINA Farm, Mymensingh
- Growing season : November, 2015-March, 2016
- Plot size : 2 m × 1 m
- Treatment : T<sub>1</sub> = Irrigation (at FC) during 60 days  
 T<sub>2</sub> = Irrigation from 0 to 30 days and stress from 30 to 60 days (drops of 60% plant available water)  
 T<sub>3</sub> = Stressed from 0 to 30 days (drops of 60% plant available water) and irrigation from 30 to 60 days  
 T<sub>4</sub> = Stressed throughout the 60 days [(0–60) ST].
- Cultivars : V1 = L-880-43, V2 = BARIghom-26
- Data to be collected : Sampling of shoot and root at different stages, <sup>13</sup>C data

**Program area** : **Groundwater Management**

**Project 3** : **Studies on groundwater recharge for sustainable use of groundwater using tracer and other advance techniques (Mymensingh Area)**

***Rationale:***

Sustainable use of groundwater must ensure not only that the future resource is not threatened by overuse and depletion, but also those natural environments that depend on the resource. Quantitative determination of the rate of natural groundwater recharge is a pre-requisite for efficient groundwater resource management. Recharge is also critical in any analysis of groundwater systems and the impacts of withdrawing native water from them.

- Objectives** : (1) To quantify natural groundwater recharge from rainfall  
 (2) To determine rainfall-recharge relationship  
 (3) To suggest sustainable use of groundwater based on actual recharge

Principal investigator : Dr. M. H. Ali, SSO & Head  
 Status : 2<sup>nd</sup> year

**Experiment-9** : **Quantifying natural groundwater recharge using tracer technique**

- Season : April, 2015 – October, 2015
- Location : BINA HQ, Mymensingh (Field)
- Treatments : 01 [Application of tracer (Chloride) ]
- Data to be taken :
- Sampling of the soil profile (at the point of tracer application)
  - Soil particle size analysis of different layers
  - Determination of soil hydraulic properties (FC, SC, WP, K<sub>sat</sub>)
  - WT data recording (7 days interval, and next day of each heavy rainfall events – to trace any bypass flow)
  - Weather data (and ET<sub>0</sub>)

- Experiment 10** : **Estimation of groundwater recharge using  $^{14}\text{C}$  dating**
- Season : April, 2015 – Dec., 2015
- Location : BINA HQ, Mymensingh
- Samplings : Water samplings from different observation wells, DTW
- Data to be taken :  $^{14}\text{C}$  analysis of water samples, water-table data
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- Experiment 11** : **Estimation of groundwater recharge using Lysimeter**
- Season : April, 2014 – October, 2014
- Location : Field Lysimeter, BINA HQ, Mymensingh
- Treatments : Not applicable
- Replication : 10
- Data to be taken :
- Drainage collection and volume measurement from each Lysimeter box (next day of each heavy rainfall events, and 7 days interval for the remaining days)
  - WT data recording (7 days interval, and next day of each heavy rainfall events)
  - Weather data and ET<sub>0</sub>
  - Soil particle size analysis of different layers (at the end of the season)
  - Determination of soil hydraulic properties (SC, FC, WP, K<sub>sat</sub>)
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- Experiment 12** : **Studies on groundwater dynamics at BINA HQ and its substations**
- Objective : To generate long-term data series
- Season : Year-round
- Location : BINA HQ and its substations
- Treatments : Not applicable
- Data to be taken : Water-table data recording (15 days interval)
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- Program area** : **Water Quality**
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- Project 4** : **Studies on surface and groundwater quality under climate change perspectives**
- Objectives** :
- (1) To examine water quality at different AEZ
  - (2) To generate base-line data of water quality for climate change study
  - (3) To suggest sustainable use of water
- Duration : 2014 -15 – 2016-17 (3 yrs)
- Project fund : GOB, SRSD
- Principal investigator : Dr. M. H. Ali, SSO & Head
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- Experiment 13** : **Estimating temporal pattern of groundwater quality at different new BINA sub-stations**
- Objectives : (1) To determine water quality parameters throughout the year  
(2) To suggest sustainable use of water
- Status : On-going (2<sup>nd</sup> year)
- Location : BINA new sub-stations (Chapi Nowabgonj, Sherpur, Jamalpur, Gopalgonj, Sunamgonj, Khagrasory, Noakhali)
- Time of sampling : At the beginning, mid- and end of rainy season (April-July- Oct.)

**Experiment 14 : Studies on water quality of the costal saline area of Bangladesh for its sustainable use**

**Objectives** : To assess the salinity and quality of surface and groundwater over the year for growing HYV Boro rice

**Location** : Satkhira

**Season** : July 2015 – June 2016

**Parameters to be studied:** EC, pH, exchangeable cations ( $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{K}^+$  and  $\text{Na}^+$ ),  $\text{NO}_3\text{-N}$ , As,  $\text{CO}_3^-$ ,  $\text{HCO}_3^-$ ,  $\text{SO}_4^-$ ,  $\text{Fe}^{+++}$ ,  $\text{Cl}^-$ ,  $\text{B}^+$ , heavy metals, etc

**Data to be collected** : Water samples will be collected and quality parameters will be determined for assess monthly variation at from the study areas. The samples will be collected from surface water (some selected pond, river, lake, etc.), groundwater (DTW, STW, HTW, etc.), and soil.

**Program area** : **Water Management for saline area**

**Project 5 : Development of appropriate water management practices for increasing crop productivity and water productivity in saline area**

**Objectives** :

- i) To develop suitable water management practices for increasing crop productivity and water productivity in saline area
- ii) To develop suitable cropping pattern considering the spatial and temporal characteristics of salinity

**PI** : Dr. M. H. Ali, SSO and Head

**Status** : On-going.  
Previously, experiments were conducted on some BINA developed crop varieties for their suitability in saline environment. This year experiment will also be conducted for optimum water requirement of salt tolerant wheat lines (as per requirement of the Plant Breeding Division) and other wheat/rice cultivars.

**Source of fund** : GOB, SRSD, CCTF

**Experiment 15 : Irrigation management for wheat lines under saline condition**

**Objective(s)** :

- To find out the effect of brackish water on wheat yield
- To find out the effect of brackish water on soil physical properties
- To find out the tolerance limit of wheat due to brackish water irrigation and effect on yield

**Season** : Rabi (November 2015 – March 2016)

**Treatments:**

- :  $T_1$  = Control (no irrigation)
- :  $T_2$  = One irrigation at vegetative stage with *canal water* \*
- :  $T_3$  = One irrigation at vegetative stage with saline *STW water* + Gypsum application (@208 kg/ha
- :  $T_4$  = Irrigation at vegetative and heading/flowering stage with *canal water*
- :  $T_5$  = Irrigation at vegetative stage with saline *canal water* + Gypsum application (@208 kg/ha
- :  $T_6$  = Irrigation at vegetative and heading/flowering stage with *STW water* + Gypsum application @ 208 kg/ha

\* “Canal water” means rainwater harvested in natural/man-made canal.

Wheat lines : V1 = L-880-43, V2 = BARIghom-26 (check)  
 Plot size : 4 m x 3 m  
 Replication : 3  
 Location : Satkhira  
 Design : RCBD with split-plot arrangement  
 Data to be collected : - Water salinity, soil salinity, soil physical and chemical properties, salinity of drainage water, etc.  
 - Agronomical data: yield and yield parameters at harvest, CID for root and shoot

**Experiment 16. Landscape salinity management study with wheat (IAEA coordinated project, with Soil Science Division)**

Season : Rabi (November 2015 – April 2016)  
 Location : Satkhira

**Exp.17: Studies on different levels of amendment to ameliorate the salinity effect to cultivate salt tolerant HYV rice**

**Objectives** :

- To evaluate the various amendment practices to ameliorate salinity effect of salt tolerant HYV rice cultivars
- To find out the scope to use the saline water for irrigation use amendment practices for increasing crop productivity

**Design** : RCRD with three replications  
**Season** : November 2015 – April 2016  
**Location** : Field Lysimeter yard, BINA, Mymensingh

**Treatments**

A : Salinity level (4): 0, 6, 9 and 12 dSm<sup>-1</sup>  
 B: amendment: (5) :  
 T<sub>1</sub>= Organic matter (ash & cow dung) @ 3 ton ha<sup>-1</sup>,  
 T<sub>2</sub>= Gypsum @ 150 kg ha<sup>-1</sup>,  
 T<sub>3</sub>= Gypsum @ 200 kg ha<sup>-1</sup>,  
 T<sub>4</sub> = Combinations of T<sub>1</sub> and T<sub>2</sub>  
 T<sub>5</sub> = Combinations of T<sub>1</sub> and T<sub>3</sub>

B : Rice genotypes/ varieties (3): Three most tolerant rice varieties obtained from previous experiment (Binadhan-8, Binadhan-10, BRRI dhan 47)

**Data to be collected** : Soil physical and hydraulic properties, All types of weather data, Irrigation amount applied, EC and pH of pot water & soil, root and shoot length, Na<sup>+</sup>, K<sup>+</sup> and Ca<sup>2+</sup> concentration in root and shoot, root and shoot dry weight and yield and yield parameters. (Δ) carbon isotopes discrimination for water use efficiency of plants

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**Head of Agricultural  
Engineering Division**

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**CSO (RC)**

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**Director (Research)**

**ANNUAL RESEARCH BUDGET 2015-16  
FOR AGRICULTURAL ENGINEERING DIVISION**

Items Program/ Project	No of Experi- ments	Source of fund	Laborers	Chemicals/Glass wares	Travel	Inputs	Project Total
Project 1	2	GOB	*	-	-	10	340
Project 2	6	GOB	60**	-	150	150	360
Project 3	4	GOB	*	20	10	20	50
Project 4	2	GOB	*	40	80	30	150
Project 5	3	GOB	25**	20	80	40	155
Grand Total	17		85	80	320	250	735

\* Labor wages will be paid centrally by the Institute.

\*\* Figures shown are meant for off station laborers only

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**Head of Agricultural  
Engineering Division**

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**CSO (RC)**

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**Director (Research**