

Annual Research Programme
(2015-16)

Soil Science Division

PROGRAMME AREA 1: SOIL MANAGEMENT AND BIOFERTILIZER

Section 1: Soil Chemistry and Soil Fertility:

Project - 1	: Soil characterization and land degradation assessment using tracer technique
Objectives	: (i) To collect existing information on land, soil, major crops/cropping patterns, fertilization, etc. in selected AEZs (ii) To monitor/identify the indicators/processes with respect to physical, chemical, biological and economic aspects of land degradation (iii) To determine ¹³⁷ Cs status and its distribution in soils (iv) To develop land/crop management system for sustaining soil fertility and crop productivity in the study area (v) To characterize of the soils of BINA farm and substations
Personnel assigned	: Dr. Md. Mohsin Ali, CSO and Head (PI) Dr. M. Habibur Rahman, SSO Dr. M. M. Alam Tarafder, SSO Mr. M. R. Khan, SO Mrs. Rakhi Rani Sarker, SO Mr. Tarikul Alam, ASO Mr. M. A. Awal, SA-I Mrs. Nurun Nahar Begum, SA-I
Status	: On-going Selected soil series from the Old Himalayan Piedmont Plain (AEZ 1), Tista Meander Floodplain (AEZ 3), North Eastern Barind Tract (AEZ 27), Ganges River Floodplain (AEZs 11-12), Brahmaputra Floodplain (AEZ 9) and Madhupur Tract were studied during the period between 1960s and 2015. The site-specific soil degradation in terms of selected soil characters was found in the study areas.
Source of fund	: GOB
Experiment-1	: Evaluation of physico-chemical characters of soils in part of Brahmaputra, Ganges and Meghna River Floodplains, Madhupur Tract, Piedmont Plains and hilly areas
Objectives	: (i) To collect baseline information, existing soil database, major crops/cropping patterns, fertilization, hydrologic status, environment related factors, etc. of the study areas. (ii) To monitor the changes in selected physico-chemical characters of soils during the period between 1960s and 2015 (iii) To study the soil redistribution with the ¹³⁷ Cs status (iv) To analyze collected information for finding out whether the land undergone any degradation or not
Season(s)	: N/A
Methodology	: a) Collection of existing information on the soils, crops, cropping patterns, fertilizers application history, hydrological data etc. under the study area b) Collection and analysis of soils for selected physico-chemical characters e.g. pH, soil texture, organic matter, total N, avail.- P, S & Zn and exchangeable cations (Ca, Mg, and Na), heavy/ trace elements, etc. following standard methods. c) The information generated will be analyzed to find out the land degradation situation during the period between 1960s and 2015.
Treatments	: N/A
Design & replication	: Randomly collected soil samples
Location(s)	: 10 selected AEZs
Unit plot & total area	: N/A

Data to be recorded	:	Soil pH, texture, organic matter, total N, avail.- P, S & Zn and exchangeable cations (Ca, Mg, K and Na), heavy/ trace elements, etc.
Experiment-2	:	Field trials with major crops/cropping patterns in selected AEZs for sustaining soil fertility and crop productivity
Objectives	:	(i) To perform detailed baseline survey of the study area (ii) To establish nutrient trapping field trials with major crops/cropping patterns (iii) To evaluate soils in terms of fertility and biological productivity
Season(s)	:	Rabi to Kharif
Methodology	:	(a) Establishment of soil fertility experiments with major crops/cropping patterns in different bench mark soils (b) Monitoring of the indicators of soil quality for nutrient balance study of the experimental sites (c) Analysis of available information for soil fertility assessment in the soils under study
Treatments	:	T ₁ = control T ₂ = 10 tha ⁻¹ CD T ₃ = 5 tha ⁻¹ PM T ₄ = 3 tha ⁻¹ Rice straw +3 tha ⁻¹ PM T ₅ = 3 tha ⁻¹ saw dust +3 tha ⁻¹ PM T ₆ = 5 tha ⁻¹ Litre fall+5 tha ⁻¹ CD
Design & replication	:	RCBD
Location(s)	:	Mymensingh & Rangpur
Unit plot & total area	:	5m x 4m
Data to be recorded	:	Yield and yield contributing characters, etc.
Experiment-3	:	Characterization of the soils of BINA substation farms at Nalitabari, comilla and Khagrachari
Objectives	:	(i) To survey and collected soil samples from the substation and the samples to be analyzed for physico-chemical properties (ii) To evaluate the soils in relation to crop production potential
Season(s)	:	N/A
Methodology	:	(a) characterize of the soils for identification of soil series (b) Soil physical characteristics such as soil texture, bulk density, hydrological properties, etc. will be monitored. (c) Soil chemical characteristics such as pH, organic C, Total N, avail. -P, S & Zn, exchangeable cations (Ca, Mg, K and Na) and heavy/trace elements, etc. will be determined.
Treatments	:	N/A
Design & replication	:	N/A
Location(s)	:	Nalitabari and Khagrachari substations farms
Unit plot & total area	:	N/A
Data to be recorded	:	Soil chemical characteristics such as pH, organic C, Total N, avail. -P, S & Zn, exchangeable cations (Ca, Mg, K and Na) and heavy/trace elements, etc. will be determined.

Project – 2 : Determination of the critical limit of plant nutrients for different soils and crops using tracer technique

Objectives : i) To determine the agroecological regions which are deficient in phosphorus and sulphur
ii) To determine the critical level of soil phosphorus and sulphur for different crops

Personnel assigned : Dr. Md. Mohsin Ali, CSO and Head
Dr. Md. Habibur Rahman, SSO (PI)
Mr. Mahbubur Rahman Khan SO
Mrs. Rakhi Rani Sarker, SO
Mrs. Kamrun Nahar, ASO
Mr. Md. Kabinur Islam, SA-1

Status : On-going

Source of fund : ADP/GOB

Experiment-4 : Evaluation of soil test methods for phosphorus and its critical limit for Binadhan-14 in some soils using ³²P as tracer

Objectives : (i) To determine the best procedure for extracting soil P that provides the highest correlation with plant dry matter production
(ii) To determine critical level of soil P for rice

Season(s) : Kharif-I, 2016

Treatments : Available soil P will be extracted using five standard procedures and pot experiment will be conducted using twenty soils with three P rates

Design & replication : CRD with three replications

Location(s) : BINA glass house

Unit plot & total area : Total number of pots: 20X3X3 =180

Data to be recorded : - Analytical data for 14 essential elements.
- Extractable P by five methods
- Dry matter yield
- Plant concentration of N, P, K and S

Project - 3 : Integrated Plant Nutrition System (IPNS) for soil fertility management and increased crop production

Objectives : -To develop economically suitable combination of chemical fertilizers and organic manure for sustainable crop yield
-To generate technologies to overcome exploitation of nutrient resources and to sustain soil productivity in different areas
-To build up and maintain long-term soil fertility to prevent soil degradation

Personnel assigned : Dr. Md. Mohsin Ali, CSO and Head
Dr. Md. Habibur Rahman, SSO (PI)
Mr. Mahbubur Rahman Khan SSO
Mrs. Rakhi Rani Sarker, SO
Mrs. Kamrun Nahar, ASO
Mr. Md. Kabinur Islam, SA-1

Status : On-going.

Source of fund : ADP/GOB

Experiment-5 : Monitoring, management and nutrient dynamics of saline soil for increased crop production

Objectives : -To monitor the salinity of soil throughout the year
-To see the suitability of crops grown under different salinity condition
-To see any improvement in soils due to use of organic manure and crop residues with chemical fertilizers.

Season(s) : Rabi to Kharif

Crops : Rice

- Treatments : 5 (Five),
T₁= Control (Chemical fertilizer)
T₂= NPK+ Gypsum in two split
T₃= NPK+ Gypsum in two split + CD
T₄= NPK+ Gypsum in three split
T₅= NPK+ Gypsum in three split + CD
- Design & replication : RCBD with three replications
Location(s) : Satkhira
Unit plot & total area : 5m X 4m, 600 sq.m
Data to be recorded : Yield and yield contributing characters, analysis of plant samples, initial and post harvest soil.
- Experiment-6 : Fertilizer management practices for Mustard-Boro-T.aman rice cropping pattern**
- Objectives : (i) To find out the appropriate fertilizer packages for studied cropping pattern.
(ii) To maintain sustainable production and improve soil health.
- Seasons : Rabi to Kharif
Cropping pattern : Mustard-Boro-T.aman (Var. Binasharisha 10-Binadhan 14-Binadhan 7)
Treatments : 16 (Sixteen)
- | | | |
|----------------------|-----------------------------------|--------------------------|
| T ₁ = N0 | T ₁ = Control | T ₁ = Control |
| T ₂ = N1 | T ₂ = STB+CD (2.5t/ha) | T ₂ = STB |
| T ₃ = N2 | T ₃ = STB+CD (5t/ha) | T ₃ = STB |
| T ₄ =N3 | T ₄ = STB+CD(7.5t/ha) | T ₄ = STB |
| T ₅ = P0 | T ₅ = STB+PM(2t/ha) | T ₅ = STB |
| T ₆ = P1 | T ₆ = STB+PM(3t/ha) | T ₆ = STB |
| T ₇ = P2 | T ₇ = STB+PM(4t/ha) | T ₇ = STB |
| T ₈ =P3 | T ₈ = STB+MS(2t/ha) | T ₈ = STB |
| T ₉ = K0 | T ₉ = STB+MS(3t/ha) | T ₉ = STB |
| T ₁₀ = K1 | T ₁₀ = STB+MS(4t/ha) | T ₁₀ = STB |
| T ₁₁ = K2 | T ₁₁ = STB+RS(3t/ha) | T ₁₁ = STB |
| T ₁₂ =K3 | T ₁₂ = STB+RS(4t/ha) | T ₁₂ = STB |
| T ₁₃ = S0 | T ₁₃ = STB+RS(5t/ha) | T ₁₃ = STB |
| T ₁₄ = S1 | T ₁₄ = STB+VC(2t/ha) | T ₁₄ = STB |
| T ₁₅ = S2 | T ₁₅ = STB+VC(3t/ha) | T ₁₅ = STB |
| T ₁₆ =S3 | T ₁₆ = STB+VC(4t/ha) | T ₁₆ = STB |
- Design & replication : Note: A blanket dose of NPKSZnB will be applied based on treatment
RCBD with three replications
- Location(s) : Nalitabari, Sherpur
Unit plot & total area : 5m X 4m, 560 sq.m
Data to be recorded : Yield and yield contributing characters, analysis of plant samples, initial and post harvest soil.

Project – 4 : Isotopic studies of organic carbon management

- Objectives : -To identify the potential increase of soil organic matter
-To observe the organic matter turn over
-To quantify the amount of organic carbon derived from applied organic matter
- To improve soil quality and crop yield
- Personnel assigned : Dr. Md. Mohsin Ali, CSO and Head
Dr. Md. Habibur Rahman, SSO (PI)
Dr. M.B. Hossain, SSO
Mr. Mahbubur Rahman Khan SO
Mrs. Kamrun Nahar, ASO
Mr. Md. Kabinur Islam, SA-1

Status	:	New
Source of fund	:	ADP/GOB
Experiment-7	:	Stable carbon isotope depth profiles and soil organic carbon dynamics
Objectives	:	-To determine the amount of carbon content in different soil depth -To determine depth profile of organic carbon content in soil
Season(s)	:	Rabi to Kharif
Crops	:	Rice-Vegetable
Treatments	:	Four level of organic matter incorporation
Design & replication	:	RCBD with three replications
Location(s)	:	BINA farm, Mymensingh,
Unit plot & total area	:	5m x 4m, 600 sq.m
Data to be recorded	:	$\delta^{13}\text{C}$ data from soil analysis
Experiment-8	:	Organic carbon and stable ^{13}C isotope in conservation agriculture and conventional systems
Objectives	:	-To quantify soil organic carbon (SOC) and soil C derived from C_3 (rice) and C_4 (maize) using $\delta^{13}\text{C}$ stable isotope
Season(s)	:	Rabi to Kharif
Treatments	:	5 (Five), T ₁ = Minimum tillage + No residue T ₂ = Minimum tillage + rice straw (C_3 plant) T ₃ = Minimum tillage + maize straw (C_4 plant) T ₄ = Conventional tillage + rice straw (C_3 plant) T ₅ = Conventional tillage + maize straw (C_4 plant)
Design & replication	:	RCBD with three replications
Location(s)	:	BINA farm Mymensingh
Unit plot & total area	:	5m X 4m, 600 sq.m
Data to be recorded	:	$\delta^{13}\text{C}$ data from soil analysis
Experiment- 9	:	Influence of organic and inorganic sources of nitrogen on N transformation and uptake under rice –mungbean - rice cropping system with ^{15}N tracer
Objective(s)	:	i). To determine physico-chemical properties of soil ii). To estimate nitrogen and organic carbon status in soil iii). To determine respiration capacity of soil iv). To determine yield and nutrient uptake capacities of rice and mungbean crops
Materials	:	^{15}N enriched fertilizer and rice straw
Methods	:	Randomized complete block design (RCBD) with four replications
Treatments	:	T ₁ = Control (unfertilized) T ₂ = 100 $\mu\text{g } ^{15}\text{N g}^{-1}$ soil as $(\text{NH}_4)_2\text{SO}_4$ (10% a.e.) T ₃ = 100 $\mu\text{g } ^{15}\text{N g}^{-1}$ soil as rice residue T ₄ = 75 $\mu\text{g } ^{15}\text{N g}^{-1}$ soil as rice residue + 25 $\mu\text{g N g}^{-1}$ soil $(\text{NH}_4)_2\text{SO}_4$ T ₅ = 50 $\mu\text{g } ^{15}\text{N g}^{-1}$ soil as rice residue + 50 $\mu\text{g N g}^{-1}$ soil $(\text{NH}_4)_2\text{SO}_4$ T ₆ = 25 $\mu\text{g } ^{15}\text{N g}^{-1}$ soil as rice residue + 75 $\mu\text{g N g}^{-1}$ soil $(\text{NH}_4)_2\text{SO}_4$ Basal dose of PKSZnB will be used according to FRG' 2012
Plot size	:	4m×3m=12m ²
Location	:	BINA head quarter farm, Mymensingh
Data to be collected	:	Total and mineral nitrogen, organic carbon, yield of rice and mungbean and other physico-chemical properties.

Project – 5 : Fertilizer recommendation for elite mutants/varieties developed by BINA

Objectives : i) To evaluate the fertilizer use efficiency and the fertilizer requirement of the elite mutants developed at BINA
ii) To recommend fertilizers for different mutants varieties of the crops of BINA

Personnel assigned : Dr. Md. Mohsin Ali, CSO and Head
Dr. Md. Habibur Rahman, SSO(PI)
Mr. Mahbubur Rahman Khan SO
Mrs. Kamrun Nahar, ASO
Mr. Md. Kabinur Islam, SA-1

Status : On-going

Source of fund : ADP/GOB

Experiment-10 : Fertilization recommendation for different mutants/lines developed by BINA

Objectives : -To evaluate the fertilizer use efficiency and to recommend different fertilizers for different mutants/lines

Season(s) : Rabi to Kharif

Crops : Rice (Mutants), Mustard-rapeseed(Mutants), Soybean(Mutants), Onion (Mutants) and Wheat (Mutants)

Treatments : 16 (Sixteen), Four levels of each elements (N, P, K and S) for response curve

Design & replication : RCBD with three replications

Location(s) : BINA substation farms

Unit plot & total area : 5m X 4m, 540 sq.m

Data to be recorded : Yield and yield contributing characters, analysis of plant samples, initial and post harvest soil.

Project – 6 : Evaluation of soil-plant health monitoring kit for fertilizer recommendation practices

Objectives : i) To recommend fertilizer dose for crops using soil test kit
ii) To compare yield performance of crops with conventional method

Personnel assigned : Dr. Md. Mohsin Ali, CSO & Head
Dr. M.B. Hossain, SSO (PI)
Mrs Sahin Akter SA-1

Status : New

Source of fund : GOB

Experiment-11 : Effect of different fertilizer recommendation practices on crop and soil

Objectives : i) To observe yield and soil quality and relate between soil test kit and lab. analytical methods

Season(s) :

Crops :

Materials : Soil test kit, magnifying glass, chemicals, fertilizers and other accessories

Methods : Randomized complete block design (RCBD) with four replications

Treatments : T₁=control (unfertilized)

T₂=Soil test kit based fertilizer recommendation

T₃= T₂ + 25%

T₄= T₂ + 50%

T₅= T₂ + 75%

T₆= T₂ + 100% = T₉

T₇= T₂ + 125%

T₈= T₂ +150%

T₉=Lab soil test based fertilizer recommendation (STB)

Design & replication :
 Location(s) : BINA head quarter farm, Mymensingh, Wheat Research Centre, Dinajpur
 Unit plot & total area : 4m×3m=12m²
 Data to be recorded : N,P,K,S,Zn elements, organic carbon, yield attributes and yield of crop.

Project – 7 : Studies on adsorption and desorption capacities of 10 selected AEZs soils

Objectives : i) To compare the nutrients and heavy metals sustained capacity in different soils of Bangladesh
 Personnel assigned : Dr. Md. Mohsin Ali, CSO & Head
 Dr. M.B. Hossain, SSO (PI)
 Mrs Sahin Akter SA-1
 Status : New
 Source of fund : GOB

Experiment-12 : Adsorption and desorption capacities of different nutrients and heavy metals using 10 AEZ soils

Objectives : i) To compare the fertilizers and heavy metals sustained capacity in different soils of Bangladesh
 Season(s) :
 Crops :
 Materials : Soils, chemicals, centrifuge and other accessories
 Methods : Completely randomized design
 Treatments : 10 AEZs soil with different dose of nutrients and heavy metals (N,P, K, Cd, As and Pb), different degrees of organic carbon will be set according to standard methods.
 Design & replication :
 Location(s) : BINA HQ, Mymensingh
 Unit plot & total area :
 Data to be recorded : Soil physical and chemical properties, adsorption and desorption capacities of N, P, K, Cd, Pd, As

Project – 8 : Fallout Radionuclide (FRN) studies

Objective(s) : i) To develop fallout radionuclides (¹³⁷Cs, ²¹⁰Pb and ⁷Be) methodologies for measuring soil erosion-deposition over several spatial and time scale in Bangladesh.
 ii) To develop national data bases of fallout radionuclides (¹³⁷Cs, ²¹⁰Pb and ⁷Be) in soil with reference value.
 iii) To measure soil and nutrient loss/gain.
 iv) To utilize these techniques to assess the impact of short term changes in land use practice.
 v) To determine the source of sediments by Compound Specific Stable Isotope (CSSI) analysis.
 Personnel assigned : Dr. Md. Mahbubul Alam Tarafder, SSO (PI)
 Dr. Md. Mohsin Ali., CSO and Head
 Md. Mahbubur Rahman Khan, SO
 Mrs. Sadia Tasmin, SO (R&D)
 Mrs. Nurun Nahar Begum, SA-I
 Mr. M. A. Awal, SA-I
 Status : On going
 Both laboratory and field studies will be done according to the project purpose. However, the following approaches and methodologies will be used to achieve the objectives of the proposed research project.

- Experiment – 13** : **Identification and establish of reference site for reference inventories.**
- Objective(s) : To determine the reference inventories of ^{137}Cs , ^{210}Pb and ^7Be .
- Methods : The selection of reference sites is central for successful execution of a ^{137}Cs based erosion study. The reference site is used to establish the ^{137}Cs inventory in the study region against which the changes in inventory, both in disturbed sites and in depositional environments, can be assessed. 10 sites from Chittagong Hill Tracts (CHT), Chittagong and Cox's Bazar, Sylhet, Comilla and Netrokona will select which has experienced neither soil loss nor sediment deposition as the inventory reflects only the atmospheric input of the specific radionuclides. 15 composite soil samples will collect from each site using an 8-cm diameter hand operated core sampler. Sampling depth will be 0-30 cm with 5 cm increment. Soil samples will air-dried, weighed, and pass through a 2 mm sieve. ^{137}Cs concentration will measure using a high-purity germanium (HPGe) gamma spectrometry detector. Soil erosion-deposition rate will calculate using mass balance model 2.
- Location(s) : Chittagong Hill Tracts (CHT), Chittagong and Cox's Bazar, Sylhet, Comilla and Netrokona
- Data to be collected : Environmental data, long-term land use data, ^{137}Cs , ^{210}Pb and ^7Be concentration, SOC, N, P, K, S etc.
- Experiment – 14** : **Development of national database of FRN in soil and soil nutrient loss/gain in different time scale**
- Objective(s) : i) To develop national soil erosion-deposition database in different places in Bangladesh.
- Season(s) : Year round
- Methods : 30 slopes from Chittagong Hill Tracts (CHT), Chittagong and Cox's Bazar, Sylhet, Comilla and Netrokona will select to develop national database of FRN. Every slope will divide into 7 sections (Top slope, Upper slope, Middle slope 1, Middle slope 2, Middle slope 3, Lower slope and Slope bottom), 3 composite soil samples will collect from each section using an 8-cm diameter hand operated core sampler. Sampling depth will be 0-30 cm for top and upper slope, 0-45 cm for middle slope and 0-60 cm for lower slope and slope bottom with 5 cm increment. Soil samples will air-dry, weighed, and pass through a 2 mm sieve. One part of the soil will use for ^{137}Cs ^{210}Pb and ^7Be concentration using a high-purity germanium (HPGe) gamma spectrometry detector. Soil erosion-deposition rate will calculate using MBM 2. Another part of soil will analyze for physical (soil texture, pH, bulk density etc.) and chemical properties (SOC, N, P, K and S) following standard procedure.
- Location(s) : Chittagong Hill Tracts (CHT), Chittagong and Cox's Bazar, Sylhet, Comilla and Netrokona
- Data to be collected : Environmental data, long-term land use data, ^{137}Cs , ^{210}Pb and ^7Be concentration, SOC, N, P, K, S etc.
- Experiment –15** : **Measurement of soil and nutrient loss due to tillage practices by FRN techniques.**
- Objective(s) : To determine the loss of soil and nutrients due to soil erosion on cultivated slope.
- Season(s) : Year round
- Treatments : i) No tillage
ii) Conventional tillage
iii) Light tillage (5 cm)
iv) Medium tillage (15 cm)
v) Deep tillage (25 cm)

Design & Repln.	:	RCBD with four replications
Location(s)	:	Khakrachari.
Unit plot & total area	:	$6 \times 5 \text{ m}^2$, total 700 m^2
Data to be collected	:	^{137}Cs , ^{210}Pb , ^7Be , SOC, N, P, K and S concentration.
Experiment – 16	:	Determination of sediment source in a small catchment by Compound Specific Stable Isotope (CSSI) technique.
Objective(s)	:	(i) To determine source of sediment in a small catchment
Season(s)	:	Dry season
Methods	:	Collection of soil samples in a depth of 2 cm from different sources of soil erosion and deposition. A composite sample of 10 samples will make for a source. In this way 9 erosion and 1 depositional soil samples will collect from the catchment. Preparation of soil samples for CSSI analysis and send it to IEDA, CAAS, Beijing, China.
Location(s)	:	Sutiakhali, Mymensingh
Unit plot & total area	:	1 km^2
Data to be recorded	:	Bulk $\delta^{13}\text{C}$ (‰), $\delta^{13}\text{C}$ of CSSI fatty acids (Myristic acid, Palmitic acid and Oleic acid)
Project – 9	:	Agricultural land management for improving soil fertility and irrigation efficiency
Objective(s)	:	(i) To improve soil fertility and crop productivity through integrated use of organic and inorganic fertilizers. (ii) To explore, utilize and promote efficient use of organic fertilizer raw material resources. (iii) To develop and share water management technologies for enhancing water use efficiency.
Personnel assigned	:	Dr. Md. Mahbubul Alam Tarafder, SSO (PI) Dr. Md. Mohsin Ali, CSO and Head Md. Mahbubur Rahman Khan, SO Mrs. Sadia Tasmin, SO (R&D) Mrs. Nurun Nahar Begum, SA-I Mr. M. A. Awal, SA-I
Status	:	On going
Source of fund	:	Asian Food and Agriculture Cooperation Initiative (AFACI)
Experiment – 17	:	Effect of integrated nutrient management on soil fertility and productivity of Vegetable-T. Aus rice-T. Aman rice cropping pattern
Objective(s)	:	To determine the fertilizer and moisture level for crops.
Cropping pattern	:	Vegetable-T. Aus rice-T. Aman rice
Treatments	:	T ₁ : RD T ₂ : STB T ₃ : Chemical fertilizer (IPNS) + CD (@ 5.0 t ha^{-1}) T ₄ : Farmers' practice T ₅ : Control
Design & Replication	:	RCBD with four replications
Location(s)	:	Sutiakhali, Mymensingh
Unit plot & total area	:	$4 \times 5 \text{ m}^2$ total 500 m^2
Data to be recorded	:	Initial soil analysis, Yield and yield components of crops, Nutrient uptake, Nutrient balance, Nutrient use efficiency, Amount of irrigation water, Price of input and output (for economic analysis), Weather data (e.g. rainfall, temperature etc.), Post harvest soil analysis

- Experiment – 20** : **Residual effects of Zn and B fertilization on Wheat under Wheat-Mungbean-T.aman cropping pattern in calcareous soil**
- Objective(s) : To assess the requirement and residual effect of Zn and B fertilization on crops in calcareous soil
- Season(s) : Rabi-Kharif I- Kharif II
- Treatments : 1. NPKS (control)
2. B₁
3. Zn₁
4. B₁Zn₁
5. B₁Zn₂
6. B₁Zn₄
7. B₁Zn₆
- Design & Repln. : RCBD with 3 replication
- Location(s) : Farmer's field, Ishurdi and Magura
- Unit plot & total area : 4 × 5 m², total 500 m²
- Data to be collected : Initial soil analysis, Plant height, Population, Panicle/spike length, Panicle/plant, 1000 seed weight, Grain yield, Straw yield and chemical analysis of soil, plant and grain.
- Experiment – 21** : **Biofortification of Zn and Fe in rice, wheat and lentil by Zn and Fe fertilization and variety selection**
- Objective(s) : To improve yield and biofortification of Zn & Fe in rice, wheat and lentil by Zn and Fe application and variety selection.
- Season(s) : Rabi-Kharif I- Kharif II
- Crops : Rice, wheat and lentil
- Treatments : Zn: 0 and 3 kg/ha for rice, wheat and 2 kg/ha for lentil
Fe: 0 and 4 kg/ha for rice, wheat and 2 kg/ha for lentil
Other nutrients: N, P, K & S at a recommended rate to all plots
- Design & Repln. : Split plot with 3 replication; Main plots – Zn or Fe, Sub-plots – Varieties
- Location(s) : Farmers' fields in Muktagacha, Mymensingh (AEZ 9)
BINA substation & Farmers' fields, Ishurdi, Pabna (AEZ 11)
- Unit plot & total area : 4 × 5 m², total 500 m²
- Data to be collected : Initial soil analysis for NPKSZn & Fe, Plant height, Population, Panicle/spike length, Panicle/plant, 1000 seed weight, Grain yield, Straw yield and chemical analysis of soil, plant and grain for NPKSZn.
- Experiment – 22** : **Evaluation of the methods of fertilization (seed, soil & foliar) for improvement of yield and Zn and Fe enrichment of grains**
- Objective(s) : Evaluation of methods of fertilization (seed, soil and foliar) to improve yield and Zn & Fe enrichment in grains.
- Season(s) : Rabi-Kharif I- Kharif II
- Crops : Rice, wheat and lentil
- Treatments : **Zn treatments:**
T₁: No Zn application (Zn control)
T₂: Soil application of Zn @ 3 kg /ha for rice, wheat and 2 kg/ha for lentil
T₃: Foliar spray of Zn @ 0.4% ZnSO₄.7H₂O at vegetative & flowering stages
Fe treatments:
T₁: No Fe application (Fe control)
T₂: Soil application of Fe @ 4 kg /ha for rice, wheat and 2 kg/ha for lentil
T₃: Foliar spray of Fe @ 0.4% FeSO₄.7H₂O at vegetative & flowering stages
Other nutrients: N, P, K & S at a recommended rate to all plots
Crop variety: 5 selected varieties for each crop (selection from the first year)
- Design & Repln. : Split plot with 3 replication; Main plots – Zn or Fe, Sub-plots – Varieties

Location(s)	: Farmers' fields in Muktagacha, Mymensingh (AEZ 9) BINA substation & Farmers' fields, Ishurdi, Pabna (AEZ 11)
Unit plot & total area	: 4 × 5 m ² , total 500 m ²
Data to be collected	: Initial soil analysis for NPKSZn & Fe, Plant height, Population, Panicle/spike length, Panicle/plant, 1000 seed weight, Grain yield, Straw yield and chemical analysis of soil, plant and grain for NPKSZn.
Project – 11	: Delineation of Soil Micronutrients Status in Major AEZs of Bangladesh
Objective(s)	: i) Delineation of micronutrients status in Piedmont plain, Tista, Brahmaputra, Ganges and Meghna floodplain soils by chemical analysis ii) Identification of micronutrient(s) deficient soils and their deficiency level based on analytical values
Personnel assigned	: Md. Forhadul Islam, SSO (PI) Dr. Md. Mohsin Ali, CSO & Head Mrs. Rakhi Rani Sarker, SO Mrs. Kamrun Nahar Begum, ASO Kabinur Islam, SA-I
Status	: New Around 30% of the world's human population has diets deficient in zinc. Zinc deficiency in humans affects physical growth, the functioning of the immune system, reproductive health and neurobehavioral development. Therefore the zinc content of staple foods, such as rice and wheat, is of major importance. However, it will be necessary to monitor both the zinc concentrations in the cereal grains and also the soil to ensure that the enrichment of the grains occurs without the accumulation of zinc in soils to possibly harmful levels
Source of fund	: GOB
Experiment – 23	: Micronutrient status of calcareous and noncalcareous paddy soils and implication for human health through rice products
Objective(s)	: i) To evaluate physicochemical characteristics of soils (texture, pH, OC, total N, exchangeable K, total and available status of P & S). ii) To measure total and DTPA-extractable micronutrient concentrations in paddy soils iii) To study the correlation between the DTPA-extractable metals with some soil properties iv) To evaluate transfer of Zn, Fe, Mn, and Cu from soil to plant v) To determine human daily intake of metal via rice consumption
Methodology	: The soil and paddy samples will be collected from mostly farmers' fields of Old Himalayan Piedmont Plain (AEZ 1), Tista Meander Floodplain (AEZ 3), Old Brahmaputra Floodplain (AEZ 9), High Ganges River Floodplain (AEZ 11) and Low Ganges River Floodplain (AEZ 12), Madhupur Tract (AEZ 28). GPS reading will be recorded on every site of sample collection. Some basic line information like village, union, upazila, land type, soil series and land use will be noted during collection of every soil sample. The selected AEZs under soil test will from Old Himalayan Piedmont Plain (AEZ 1), Tista Meander Floodplain (AEZ 3), Old Brahmaputra Floodplain (AEZ 9), High Ganges River Floodplain (AEZ 11) and Low Ganges River Floodplain (AEZ 12). GPS reading will be recorded on every site of sample collection. Some basic information like village, union, upazila, land type, soil series and land use will be noted during collection of every soil sample. The data includes some basic soil characteristics viz. pH & organic matter, macronutrients viz. N, P, K, S, Ca & Mg and micronutrients viz. Fe, Mn, Zn, Cu & B contents

Treatments : -
 Design & Replication : -
 Location(s) : BINA H/Q, Mymensingh
 Unit plot & total area : -
 Data to be recorded : -

Project – 12 : Requirement of zinc and boron application for different cropping patterns

Objective(s) :
 Personnel assigned : Md. Forhadul Islam, SSO (PI)
 Dr. Md. Mohsin Ali, CSO & Head
 Mrs. Rakhi Rani Sarker, SO
 Mrs. Kamrun Nahar Begum, ASO
 Md. Kabinur Islam, SA-I

Status :
 Source of fund : GOB

Experiment – 24 : Requirement of zinc and boron application for Wheat-Mungbean-T.Aman Cropping Patterns

Objective(s) : i. To determine the requirement of zinc and boron application for Wheat-Mungbean-T. Aman cropping patterns at Rangpur (AEZ 3)
 ii. To assess nutrient uptake by 1st year crop cycle.

Methodology :

Treatments :

Wheat

T₁: Zn₀B₀ T₂: Zn₂B_{1.5}
 T₃: Zn₄B_{1.5} T₄: Zn₆B₃

Mungbean

T_{1.1}: Zn₀B₀ T_{2.1}: Zn₀B₀
 T_{2.2}: Zn₂B₀ T_{2.3}: Zn₂B_{1.5}
 T_{3.1}: Zn₀B₀ T_{4.1}: Zn₀B₀

T. Aamn rice

T_{1.1.1}: Zn₀B₀ T_{2.1.1}: Zn₀B₀
 T_{2.1.2}: Zn₂B₀ T_{2.2.1}: Zn₀B₀
 T_{2.2.2}: Zn₂B₀ T_{2.3.1}: Zn₀B₀
 T_{2.3.2}: Zn₂B₀ T_{3.1.1}: Zn₀B₀
 T_{3.1.2}: Zn₂B₀ T_{4.1.1}: Zn₀B₀

Subscripts of Zn & B represent kg ha⁻¹.

Other nutrients: N₁₂₀, P₂₅, K₆₀, S₁₅ Kg/ha.

Design & Replication : Randomized Complete Block Design (RCBD) with 3 replications

Location(s) : Rangpur Substation (AEZ 3)

Unit plot & total area : 3m x 2m, Total plots: 10 x 3 = 30

Data to be recorded : i) Initial soil properties (texture, pH, OC, total N, exchangeable K, and available status of P & S and micronutrients).
 ii) Crop yield parameters and Crop yield (main product and by-product).
 iii) Nutrient concentration of main product and by-product.
 iv) Nutrient uptake by crops (by calculation from nutrient concentration and crop yield).
 v) Final soil properties (same as initial soil properties, except texture) after completion of 2-crop cycles

Experiment – 25 : Requirement of Zinc and Boron Application for Mustard- Boro-T. Aman Cropping Patterns

Objective(s) : i. To determine the requirement of zinc and boron application for Mustard- Boro-T. Aman cropping pattern at Comilla (AEZ 19)
 ii. To assess nutrient uptake by 1 year crop cycle.

Project -13	:	Assessment of arsenic and heavy metal contamination in soils, crops and water in selected areas
Objectives	:	(i) To study the arsenic and heavy metal contamination in soils, crops and water. (ii) To study the mechanisms of arsenic and heavy metal contamination in soil, crops and water.
Personnel assigned	:	Dr. Md. Mohsin Ali, CSO and Head (PI) Dr. Md. Habibur Rahman, SSO Dr. M. M. Alam Tarafder, SSO Mrs. Rakhi Rani Sarker, SO Mr. Tarikul Alam, ASO Mrs. Kamrun Nahar, ASO Mr. M. A. Awal, SA-I Mrs. Nurun Nahar Begum, SA-I Mr. Md. Kabinur Islam, SA-1
Status	:	On-going Arsenic status in the selected soil series of the Old Himalayan Piedmont Plain (AEZ 1), Tista Meander Floodplain (AEZ 3), North Eastern Barind Tract (AEZ 27), Brahmaputra Floodplain (AEZ 9), Madhupur Tract and soil & water from Ganges River Floodplain (AEZs 11-12) were studied.
Source of fund	:	GOB
Experiment-27	:	Impact of arsenic contamination in soil, water and plant samples from contaminated STW & DTW areas
Objective(s)	:	(i) To determine the As level in soil, water and plant samples in the selected area. (ii) To determine soil and water properties (pH, texture, OM, P, K, S, FeO, and Mn, etc.).
Cropping pattern	:	N/A
Treatments	:	N/A
Design & Replication	:	N/A
Location(s)	:	Contaminated sites from Faridpur, Gopalganj, Jessore, Satkhira and Netrokona will be selected for collecting soil, water and plant samples. Soil and water samples will be collected from contaminated STW command area during irrigated Boro season following standard sampling protocol, and plant samples will be collected in both Boro and T. aman seasons. Soils will be collected from different depth (0-15, 15-30, 30-45, 45-60 cm) of a soil profile from the selected site. Physico- chemical parameter of soil will be determined to evaluate the magnitude of arsenic contamination.
Unit plot & total area	:	N/A
Data to be recorded	:	- Chemical and physical parameters of soil water and plant (pH, Clay content, P, K, S, FeO, and Mn) will be determined. - Arsenic concentration will be measured.
Experiment-28	:	Assessment of heavy metal concentrations in agricultural land from industrial waste polluted area
Objectives	:	-To identify amount of heavy metal concentration in agricultural soil -To determine amount of heavy metal uptake by crop -To determine heavy metal toxicity in soil
Season(s)	:	Rabi to Kharif
Crops	:	N/A
Treatments	:	N/A
Design & replication	:	RCBD with three replications
Location(s)	:	Bhaluka, Mymensingh
Unit plot & total area	:	N/A
Data to be recorded	:	Base line survey of selected location

Experiment-29	Assessing the amount of micro & heavy metal content in rice and vegetable grown in industrial polluted areas of Mymensingh
Objectives	: -To identify amount of heavy metal concentration in agricultural soil -To determine amount of heavy metal uptake by vegetable -To determine heavy metal toxicity in vegetable
Season(s)	: Rabi- Kharif
Crops	: Rice & Vegetable
Treatments	: 5 (Five), T ₁ = Control T ₂ = Industrial waste T ₃ = Industrial influent T ₄ = Industrial waste & influent T ₅ = Influent from canal
Design & replication	: RCBD with three replications
Location(s)	: Valuka, Mymensingh
Unit plot & total area	: 5m X 4m, 600 sq.m
Data to be recorded	: Yield and yield contributing characters, analysis of plant samples, initial and post harvest soil

Section 3: Soil Physics

Project – 14	: Supporting climate proofing rice production system (CRiPS) based on nuclear application in Bangladesh (FAO/IAEA Project - RAS / 5065)
Objectives	: i. To develop appropriate soil and nutrient management approaches for rice under saline and submergence conditions. ii. To select effective salt tolerant rice varieties under different sources of water iii. To select effective sub-mergence tolerant rice varieties in different inundation level
Personnel assigned	: Mr. M. E. Haque (PI), PSO Dr. Md. Mohsin Ali, CSO and Head Mr. M. Elius Hossain, SO Mr. A. N. A. Haque, SO Mr. M. Islam, SO & OIC, Sunamganj Mrs. S. R. Ghosh, SO, Satkhira Mr. M. J. Alam, SA-1
Status	:
Source of fund	: FAO / IAEA

Experiment-30	: Response of salt tolerant rice varieties to different nutrient management practices at saline areas in Bangladesh
Objectives	: a. To investigate the performance of different salt tolerant rice varieties in saline area. b. To know the effect of different irrigation water sources on the growth and yield of rice
Season(s)	: Boro, Salinity level: 6-8 ds/m, 8-10 ds/m, 10-12 ds/m,
Crops	: Binadhan-10, BRRI dhan58

Treatments	: Main plot treatments (salt tolerant variety) $V_1 =$ Control (BRRI Dhan58) $V_2 =$ Binadhan-10 Sub-plot treatments (Fertilizer 3 Nos.) $T_1 =$ Recommended dose of N,P,K,S,Zn (STB) $T_2 =$ Recommended dose of N, P, S, Zn (STB) + Double dose of K $T_3 =$ Recommended dose of N, P, S, Zn (STB) + Double dose of K + Crop residue 3 tha^{-1} $T_4 =$ 1/2 Recommended dose of N, P, S, Zn (STB) + Double recommended dose of K + Crop residue 6 tha^{-1}
Design & replication	: Design: Split plot, Replication: 3
Location(s)	: Satkhira
Unit plot & total area	: Plot Size : 3 x 4 m^2
Data to be recorded	: 1. Initial soil analysis (Total) data 2. Climate data (temp, rainfall, humidity) monthly 3. Soil water depth monitoring at 10 days interval 4. Monitoring the soil pH, EC up to 50 cm depth at 10 days interval 5. Monitoring the soil water (ground water & irrigation water) pH, EC at 10 days interval 6. Plant dry matter wt. at different growth stages (tillering stage, panicle initiation stage, booting/Milking stage and ripening stage) of rice 7. N uptake data from rice plant at different growth stage (same as 6) 8. Yield and yield parameters at harvest 9. Soil analysis data at harvest
Experiment-31	: Response of salt tolerant rice varieties to Potassium fertilizer practices at saline areas in Bangladesh
Objectives	: a. To investigate the performance of different salt tolerant rice varieties in saline area. b. To know the effect of different irrigation water sources on the growth and yield of rice
Season(s)	: Boro, Salinity level: 6-8 ds/m, 8-10 ds/m, 10-12 ds/m
Crops	: Binadhan-8,10, BRRI dhan58, 61/67
Treatments	: Main plot treatments (salt tolerant variety) $V_1 =$ BRRI-58 (control) $V_2 =$ Binadhan-8 $V_3 =$ Binadhan-10 $V_4 =$ BRRI dhan61/67 Sub-plot treatment (Fertilizer 3 Nos.) $T_1 =$ 1.5 dose of K fertilizer $T_2 =$ 2 dose of K fertilizer $T_3 =$ 2.5 dose of K fertilizer
Design & replication	: Design: Split plot, Replication: 3
Location(s)	: Satkhira
Unit plot & total area	: Plot Size: 3 x 4 m^2
Data to be recorded	: 1. Initial soil analysis (Total) data 2. Climate data (temp, rainfall, humidity) monthly 3. Soil water depth monitoring at 10 days interval 4. Monitoring the soil pH, EC up to 50 cm depth at 10 days interval 5. Monitoring the soil water (ground water & irrigation water) pH, EC at 10 days interval 6. Plant dry matter wt. at different growth stages (tillering stage, panicle initiation stage, booting/Milking stage and ripening stage) of rice 7. N uptake data from rice plant at different growth stage (same as 6) 8. Yield and yield parameters at harvest 9. Soil analysis data at harvest

Experiment-32	: Response of some sub-mergence tolerant BINA rice varieties as affected by different water sub-mergence duration in Haowr areas of Bangladesh
Objectives	: a. To investigate the performance of different sub-mergence tolerant rice varieties in Haowr area. b. To know the effect of different sub-mergence duration on the growth and yield of rice.
Season(s)	:
Crops	: Binadhan-11,12, BRRi dhan52, Binadhan-7 (control)
Treatments	: Main plot treatments (irrigation water source) S ₁ = Sub-mergence under water for 7 days S ₂ = Sub-mergence under water for 14 days S ₃ = Sub-mergence under water for 21 days Sub-plot treatment (salt tolerant variety) V ₁ = Binadhan-11 V ₂ = Binadhan-12 V ₃ = BRRi dhan-52 V ₄ = Binadhan-7 (Control)
Design & replication	: Design: Split plot, Replication: 3
Location(s)	: Sunamganj
Unit plot & total area	:
Data to be recorded	: 1. Initial soil analysis (Total) data 2. Climate data (temp, rainfall, humidity) monthly 3. Sub-mergence water depth monitoring at 10 days interval 4. Monitoring the soil water (ground water & irrigation water) pH, EC at 10 days interval 5. Plant dry matter wt. at different growth stages (tillering stage, panicle initiation stage, booting/Milking stage and ripening stage) of rice 6. N uptake data from rice plant at different growth stage 7. Yield and yield parameters at harvest 8. Soil analysis data at harvest
Project – 15	: Landscape Salinity and Water Management in Coastal region of Bangladesh for improving Agricultural productivity (FAO/ IAEA CRP / 17772)
Objectives	: i. To assess and monitor the soil water content and salinity at field and area-wide scale ii. To identify the ways of improving crop productivity / sustainability through water, nitrogen and salinity management at landscape scale. iii. To bring un-utilized land under crop year-round production (especially in dry season, salt affected situation).
Personnel assigned	: Mr. M. E. Haque (PI), PSO Dr. M. H. Ali, SSO, Agril. Eng. Division Dr. Md. Mohsin Ali, CSO and Head Mr. M. Elius Hossain, SO Mr. A. N. A. Haque, SO Mr. S. R. Ghosh, SO, Satkhira Mr. N. I. Bhuiya, SA-1 Mr. M. J. Alam, SA-1
Status	: -
Source of fund	: FAO / IAEA

Experiment-33	: Effect of different irrigation management approaches on wheat production under saline using nuclear technique
Objectives	: i. To know the effect of different irrigation practices on wheat production ii. To investigate the water use efficiency for wheat production iii. To find out the effect of existing saline water on growth and yield of wheat and soil
Season(s)	: Robi (Nov 2015- Feb 2016)
Crops	: BARI gom 26
Treatments	: 6 Nos. T1 = Irrigation at 35% depletion of PASM at all growth stage T2 = Irrigation at 55% depletion of PASM at all growth stage T3 = Irrigation at 75% depletion of PASM at all growth stage T4 = Irrigation at 75% PASM at crown root initiation (CRI) and booting stage + 35% PASM at vegetative, flowering and soft dough stage T5 = Irrigation at 75% PASM at vegetative, flowering and soft dough stage+ 75% PASM at crown root initiation (CRI) and booting stage T6 = No moisture stress (around 20% depletion of PASM)
Design & replication	: Design: RCBD, Replication: 3
Location(s)	: Satkhira and Head Office
Unit plot & total area	: Plot Size : 4 x 5 m ²
Data to be recorded	: a. For isotopic analysis of ¹⁸ O and ² H water samples will be collected from different sources such as river, canal, rain and ground water. b. Soil moisture monitoring- Nuclear technique will be used i.e. use of soil moisture neutron probe. c. Same experiment will be conducted of BINA head office in pot condition.

Section 4: Soil Microbiology

Project 16	: Biological nitrogen fixation studies in soils and legume crops using ¹⁵N isotopic technique
Objectives	: (i) Improvement of BNF potentials of the symbionts at different agro-ecological zones. (ii) To study the physical, chemical and biological constraints to optimize legume – <i>Rhizobium</i> symbiosis. (iii) Collection, isolation, screening and selection of local and exotic <i>Rhizobium</i> / <i>Bradyrhizibium</i> strains highly effective for different pulses, vegetables, green manuring and oilseed crops. (iv) Screening and selection of acid and saline tolerant strains of rhizobia for biofertilizer production for different pulse and soil seed crops.
Person assigned	: Dr. Md. Zahurul Islam, SSO (PI) Dr. Md. Monowar Karim Khan, Director (Training & Planning) Dr. Md. Mohsin Ali, CSO and Head Mrs. Saiyera Chowdhury, SSO Mr. Md. Nurul Islam, SA-2
Status	: On going. Some strains were found effective in pot and field.
Source of fund	: ADP (GOB)

Experiment 34	: Isolation and characterization of <i>Rhizobium</i> and <i>Bradyrhizobium</i> strains from garden pea and french bean, and their effectiveness study on host crops
Objectives	: (i) Isolation of effective N-fixing rhizobia strains from root nodules of different pulse, french bean and green manuring crops. (ii) Screening of most effective rhizobia strains for biofertilizer production.
Method(s)	: Isolation will be done from root nodules of respective legume crops on Congo red yeast mannitol agar medium. Authentication will be done using bacterial detection system (Biolog) and effectiveness through tube and pot culture experiments.
Season	: Round the year based on crop growing.
Design & repln.	: -
Locations	: Laboratory of BINA, Mymensingh and soil and root nodules will be collected from soils of different agro-ecological regions of country.
Unit plot size	:
Data to be collected	: Data on morphological, biochemical, N-fixing hormone producing as well as serological and molecular characters of selected isolates will be recorded. Dry matter yield and yield attributes of crops, N-fixation potential will be determined using ¹⁵ N and gas chromatography.
Experiment 35	: Determination of BNF potentials of different legume cultivars (groundnut)
Objective	: To determine the nitrogen fixing ability of legume crops using ¹⁵ N technique
Season(s)	: Round the year based on crop growing.
Methods	
Treatments	: <ol style="list-style-type: none"> 1. Control (Uninoculated) 2. Inoculated 3. N @ 20 kg/ha 4. N @ 20 kg/ha + inoculant 5. N @ 40 kg/ha 6. N@ 40+inoculant <p style="margin-left: 40px;">Reference crop (Wheat/sesame/foxtail) (P, K, S, Zn will be applied as basal at recommended dose of BARC)</p>
Design & repln.	: RCBD with 4 replications
Location	: BINA, Mymensingh and Ishurdi substation
Unit plot size	: 4m x 3m
Data to be recorded	: Nodulation, plant growth, yield and yield attributes and nitrogen yield
Project 17	: Development of PGPR biofertilizer for rice, wheat and vegetable production
Objectives	: (i) Isolation, characterization and screening of <i>Azotobacter</i> , <i>Azospirillum</i> and other plant growth promoting rhizobacteria (PGPR). (ii) Evaluation of selected strains of PGPR on growth and yield of rice, wheat and vegetable crops in different AEZs. (iii) Selection of suitable carrier materials(s) for the inoculant strains for farm level use. (iv) Setting of demonstration trial for creating awareness among farmers.
Person assigned	: Dr. Md. Zahurul Islam, SSO (PI) Dr. Md. Monowar Karim Khan, Director (Training & Planning) Dr. Md. Mohsin Ali, CSO and Head Mrs. Saiyera Chowdhury, SSO Mr. Md. Nurul Islam, SA-2
Status	: On going.
Source of found	: ADP (GOB)

- Experiment 36 : Isolation of growth promoting rhizobacteria (PGPR) and their characterization**
To isolate highly efficient nitrogen fixing and growth hormone producing bacteria strains from soils of different AEZs.
- Objective :
Season(s) : Round the year based on crop growing season of 2015-2016.
Methods : Isolation of bacteria will be done from rhizosphere soils of rice, wheat and vegetables collected from different AEZs of Bangladesh. Characterization of bacteria will be performed through different cultural, microscopic, biochemical and serological tests. N-fixation will be determined through gas chromatograph and ¹⁵N technique. Hormone production will be tested by spot test and P-solubilization through spectrophotometer.
- Treatments : As per requirement
Design & repln. : CRD with six
Location(s) : BINA, Mymensingh
Unit plot size : As per requirement
Data to be collected : Data on morphological, biochemical, N-fixing, P-solubilizing and hormone producing as well as serological and molecular characterization of selected strains will be recorded and N fixation potential will be determined using ¹⁵N technique and acetylene reduction assay (ARA).
- Objectives (I)To see the effect of PGPR's on growth and yield of rice and vegetables in pot and field conditions.
(II)To see nitrogen fixation capacity of PGPR isolates in different agro-ecological regions of Bangladesh.
- Season : Kharif-1, Kharif-2 and Rabi seasons of 2015-2016.
Treatments :
1. Sixty percent (60%) N + PGPR biofertilizer
2. Eighty percent (80%) Nitrogen
3. Eighty percent (80%) N +PGPR biofertilizer
4. Full dose (100%) of nitrogen
- Design & repln. : RCBD with four replications.
Unit plot size : 4m x 3m
Location : BINA Headquarter and Ishurdi, Magura, Barisal, Gopalganj and Rangpur substations.
Data to be recorded : Growth, yield and yield contributing characters of rice, wheat and vegetables.
- Experiment 37 : Production of fluorescent antibody against different PGPR and rhizobia strains**
- Objective : To identify the specific strains rapidly in soil and mixed strains in biofertilizer.
Methodology : Standard methodology will be followed in laboratory.
Season : Round the year.
Treatments: 20 strains of PGPR and rhizobia.
Design and repln. : 2 rabbits per strain
Unit plot size :
Data to be collected : Titer of antisera.
- Experiment 38 : Survival of PGPR strains in different temperature conditions**
- Objective : i) To determine the shelf life of PGPR biofertilizer in different temperature conditions.
Treatments : Four level of temperature
1. Room temperature (25 – 38°C)
2. Refrigerator (4 – 10°C)
3. Cold store (16 – 22°C)
4. Higher temperature in incubator (40 – 45°C)

Design and repln. : CRD with four replications.
 Unit plot size :
 Location : Soil Microbiology (PGPR) Laboratory, BINA.
 Data to be collected : Bacterial population per gram biofertilizer

Project 18 : Microbiological characterization of soils of different AEZs of Bangladesh

Objectives : (i) To see the population of plant growth promoting microorganisms in soil under different environmental conditions.
 (ii) To determine the soil fertility status as affected by native microorganisms.

Person assigned : Dr. Md. Zahurul Islam, SSO (PI)
 Dr. Md. Monowar Karim Khan, Director (Training & Planning)
 Dr. Md. Mohsin Ali, CSO and Head
 Mrs. Saiyera Chowdhury, SSO
 Mr. Md. Nurul Islam, SA-2

Status : On going. Some microorganisms were isolated.

Source of fund : ADP (GOB).

Experiment 39 : Microbial population in soils of 7 new substations of BINA

Objective(s) : Determination of nitrogen fixing, P solubilizing and growth hormone producing bacteria as well as total microbial population of bacteria, fungi, nematode and earthworms in soils.

Season : Round the year.

Methods : Standard methodology for counting of bacteria will be followed.

Treatments :

Design & repln. :

Unit plot size :

Location(s) : BINA, Mymensingh

Data to be recorded : Population of different types of N fixing, P solubilizing and other beneficial microorganisms, fungi, nematodes and earth worms will be counted at different crop seasons in a year.

Project – 19 : Biofertilizer production and distribution

Objective(s) : i) To produce large amount of biofertilizer to supply among the farmers and other users.
 ii) To ensure high quality product of inoculation i.e. biofertilizers with emphasis on standardization of commercial media, carrier material, methods of production, quality control, storage duration, etc.
 iii) To train up the farmers about the collection, transportation, preservation and use of biofertilizer.
 iv) To assess the distribution and abundance of native rhizobial population in various legume growing areas of Bangladesh.

Personnel assigned : Dr. Md. Zahurul Islam, SSO (PI)
 Dr. Md. Monowar Karim Khan, Director (Training & Planning)
 Dr. Md. Mohsin Ali, CSO and Head
 Mrs. Saiyera Chowdhury, SSO
 Mr. Md. Abul Fazal, ASO
 Mr. Md. Nurul Islam, SA-2

Status : On-going
 Biofertilizers are being produced and distributed among the farmers, NGO personnel, students and other users for last several years.

Source of fund : GOB

Experiment-40	: Production of biofertilizer for lentil, chickpea, mungbean, blackgram, fallon, soybean and groundnut (Amount 3.00 tons)
Seasons	: Kharif -2, Rabi and kharif -1.
Experiment-41	: Setting of demonstration on the effect of biofertilizers on host crops at Head Quarter and different substations.
Seasons	: Kharif -2, Rabi and kharif -1.
Plot size	: 4m x 3m
Treatments	: 02 (With biofertilizer and without biofertilizer)
Experiment – 42	: Isolation and characterization of salt and acid tolerant rhizobial/bradyrhizobial strains to use as biofertilizer in the saline and acid soils of Bangladesh
Objective(s)	: i) To isolate more efficient (salinity/acid tolerant) rhizobial/bradyrhizobial strains for biofertilizer production for saline and acid soils. ii) To isolate more N fixing rhizobia in saline and stress condition.
Season(s)	: Year round.
Method	: Nodules will be collected from various legumes grown in different saline/acid soils. Rhizobial/bradyrhizobial strains will be isolated following CRYEMA. Standard methods will be followed to purify and effectiveness the isolates for nodulation in laboratory and pot environments.
Treatments	:
Design & Repln.	:
Location(s)	: BINA head quarters and different AEZs of Bangladesh.
Unit plot & total area	:
Data to be collected	: As per requirement.
Project-20	: Development of phosphatic biofertilizer for maximizing crop production using ³²P tracer techniques
Objectives	: -Isolation of indigenous phosphate solubilizing microorganisms (PSM) from different rhizosphere soils of diverse agro-ecological zones of Bangladesh. -Screening of efficient PSM on the basis of P solubilization from insoluble phosphates -Characterization and identification of the selected cultures. -To see the effect of selected PSM on wheat, rice, pulses vegetables, oil seeds and other crops -To formulate a suitable liquid or solid based phosphosphatic biofertilizer for end users.
Personnel assigned	: Dr. M. A. Haque, SSO (PI) Dr. Md. Mohsin Ali, CSO and Head Mr. M. S. H. Bhuiyan, SO & OIC, BINA substation, Magura Mr. M. T. Islam, ASO Mrs. A. Begum, SA-I
Status	: On going Experiments are being conducted to see the effects of phosphatic biofertilizer on Mustard- Summer mungbean-T. aman rice cropping pattern at BINA substation, Ishurdi and Magura during 2014-15. Mustard and summer mungbean have been harvested. This cropping pattern will be repeated in 2015-16. The isolation work and characterization of PSB cultures are being continued. Another cropping pattern Wheat –T. aus rice -T. aman will be carried out in multi-location to see the performance of phosphatic biofertilizer during 2015-16.
Source of fund	: GOB

- Experiment 43** : **Isolation of indigenous PSM from diversified agro-ecological zones.**
- Objective(s) : To get a efficient PSM isolates for further evaluation
- Seasons : Year round
- Methods : Enrichment culture techniques and serial dilution method will be followed.
- Treatments : Not applicable
- Design and repln : Scattered with three replications
- Location(s) : Rhizosphere soil samples will be collected from following areas:
i) Ishurdi, ii) Rangpur, iii) Rajshahi, iv) Mymensingh, v) Dinajpur and vi) Khagrachari
- Unit plot & total area : Not applicable
- Data to be recorded : i) Morphological (Colony shape, size, colour, Gram staining etc.) and Biochemical (Carbon utilization, gas, H₂S, and IAA production and nitrate reduction etc.) characteristics.
ii) Diameter of halo zones in solid medium.
- Experiment 44** : **Study of phosphate solubilization efficiency by PSM using ³²P tracer technique**
- Objective : To select highly efficient phosphate solubilizing PSM
- Season (s) : Year round
- Methods : -
- Treatments : Factor A: Different sources of P: ³²P labelled and unlabelled materials
- Design& repln. : Factor B: Different PSM isolates
- Location(s) : Factorial in CRD with four replications
- Unit plot & total area : Soil Microbiology Lab., BINA, Mymensingh
Not applicable
- Data to be recorded : Phosphate solubilization (µg P mL⁻¹) by different PSB cultures will be recorded.
- Project -21** : **Development of phospho-vermi compost for increased crop production using radio active and stable isotope techniques**
- Objectives : -Isolation and Characterization of earth worms from different soils.
-Screening of effective earth worms as rapid decomposer of different labelled organic materials using ³²P, ¹⁵N and ¹³C tracer techniques
-To see the effects of earth worms on quality characteristics of rock phosphate (RP) assorted compost and straight compost using tracer techniques
-To see the effects of phospho-vermicompost and straight vermicompost on crop production using nuclear techniques
- Personnel assigned : Dr. M. A. Haque, SSO (PI)
Dr. Md. Mohsin Ali, CSO and Head
Mr. M. S. H. Bhuiyan, SO & OIC, BINA substation, Magura
Mr. M. T. Islam, ASO
Mrs. A. Begum, SA-I
- Status : On going
Some earth worms have been isolated from different soils during 2014 - 15. They are being maintained on organic materials and it will be used for subsequent study during 2015-16.

Experiment 45	: Multiplication of earthworms using different labelled (³²P, ¹⁵N and ¹³C isotopes) organic materials
Objective	: To select a suitable organic materials in which earth worms can multiply profusely using radio active and stable isotope techniques.
Season(s)	: Year round
Methods	: Different methods such as i) Pits below the ground ii) Heaping above the ground iii) Tanks above the ground and iv) Cement rings will be studied.
Treatments	: Factor A: Different organic materials
Design& repln.	: Factor B: Different Earth worms
Location(s)	: CRD with four replications
Unit plot & total area	: Soil Microbiology Lab., BINA, Mymensingh Not applicable
Data to be recorded	: i) No. worms pit ⁻¹ or pot ⁻¹ .(Biomass of earthworms) ii) Weight loss of organic materials iii) Quality characteris of decomposed organic materials. iv) Different isotopic data

Project 22 : Development of bio-fertilizers for lentil production

Objectives	:
Person assigned	: Dr. M. Harun-or Rashid, SSO, (PI) Dr. M. M, Ali, CSO & Head
Status	: On going A number of strains belong to <i>Rhizobium sp</i> , have been isolated from lentil nodules from all over Bangladesh. These strains showed significant positive effect on growth of lentils at glass house conditions. Therefore it is necessary to evaluate their performance at field level at different geographical locations in Bangladesh. Using these strains, an experiment was conducted Magura sub-station in 2013-2014 and found better effect on growth and yield of lentil. Hence, this experiment will be conducted at Ishordi and Rangpur sub-stations in 2015-2016
Source of fund	: GOB

Experiment 46 : Evaluation the influence of rhizobial strains on growth and yield of lentils at different regions

Objective	: i) To evaluate the effect of Rhizobium sp on lentil growth and yield ii) To see the nodulation efficiency at field condition iii) To see the nitrogen fixation efficiency of lentil influenced by Rhizobium sp. iv) To find effective strains for better Bio-fertilizer production
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Experiment 47 : Effect of different Rhizobium strains on growth and yield of lentils at different sub-stations

Objective(s)	: i) To investigate the effect of Rhizobium sp on growth and yield of lentil ii) To see the nodulation efficiency at field condition iii) To see nitrogen fixation efficiency
Season(s)	:
Methods	:
Treatments	: A. Variety: Two varieties from BINA. B. Bio-fertilizer: Bio-fertilizer from BINA, three strains and a mixed culture from own collection. C. Nitrogen: Recommended dose of urea and one control.

- Design & repln. : RCBD with four replications
- Location(s) : BINA substations at Ishordi and Rangpur
- Unit plot size : 2.5 X 4 =10 m² and 56 plots for each area.
- Data to be recorded : i) Soil nitrogen, rhizobial population at field conditions.
 ii) Different growth t parameter likes shoot weight, yield and nitrogen content.
 iii) Nodule numbers and weight.
 iv) Nodulation efficiency will be evaluated by ERIC–PCR analysis of isolated strains.

Project 23 : Development of bio-fertilizers for pea cultivation

- Objectives : i) To evaluate the effect of Rhizobium sp on pea growth and yield
 ii) To see the nodulation efficiency at field condition
 iii) To see the nitrogen fixation efficiency of pea influenced by Rhizobium sp.
 iv) To find effective strains for bio-fertilizer production
- Person assigned : Dr. Harun-or Rashid, SSO, (PI)
 Dr. M. M, Ali, CSO & Head
 Dr. Imtiaz Uddin, SSO
- Status : New
 A number of strains belong to *Rhizobium bangladeshense*, *Rhizobium binae* and *Rhizobium lentis* were isolated from different part of Bangladesh. These strains showed significant positive effect on growth of pea at glass house and pot conditions. Therefore, it is necessary to evaluate their performance at field level at different geographical locations in Bangladesh for the production of bio-fertilizer.
- Source of fund : GOB

Experiment 48 : Effect of different Rhizobium strains on growth and yield of pea

- Objective : i) To investigate the effect of Rhizobium sp on growth and yield of pea
 ii) To see the nodulation efficiency at field condition
 iii) To see nitrogen fixation efficiency
- Season(s) :
- Methods :
- Treatments : A. Variety: Two varieties from BARI.
 B. Bio-fertilizer: Three strains and their mixed culture.
 C. Nitrogen: Recommended dose of urea and one control.
- Design & repln. : RCBD with four replications
- Location(s) : BINA substations at Ishordi and Jessore
- Unit plot size : 2.5 X 4 =10 m² and 56 plots for each area
- Data to be recorded : i) Soil nitrogen, rhizobial population at field conditions.
 ii) Different growth t parameter likes shoot weight, yield and nitrogen content.
 iii) Nodule numbers and weight.
 iv) Nodulation efficiency will be evaluated by ERIC–PCR analysis of isolated strains.

Project 24	:	Molecular characterization of rhizobia from country bean
Objectives	:	i) To see the genetic diversity of country bean nodulating rhizobia ii) To determine their taxonomic position in rhizobial taxonomy iii) Find effective strains for better bio-fertilizer production
Person assigned	:	Dr. Harun-or Rashid, SSO, (PI) Dr. M. M, Ali, CSO & Head Dr. Imtiaz Uddin, SSO
Status	:	New Country bean is a very popular winter vegetables in Bangladesh and have been grown in Bangladesh since ancient time. As a nodule forming legumes, the growth and development of country bean is significantly influenced by rhizobia. There is no study on country bean rhizobia in Bangladesh and very few studies around the world to know their genetic diversity and taxonomic position. Therefore, it is interesting to know the genetic diversity ad taxonomic position of rhizobia associated with country bean. Isolation and screening of infective and effective strains are very important for bio-fertilizer development for this crop.
Source of fund	:	GOB
Experiment 49	:	Isolation of country bean nodulating rhizobia from different districts of Bangladesh
Objective	:	i) To study genetic diversity and taxonomy ii) To see the nodulation efficiency at glass house conditions iii) To see symbiotic efficiency at glass house condition
Season(s)	:	
Methods	:	Nodules will be collected from different parts of Bangladesh following standard protocols and will be preserved on silica until isolation. From collected nodules, rhizobia will be isolated following standard protocols. Isolated strains will be characterized based on morpho-physiological properties. Symbiotic properties will be evaluated at glass house conditions.
Treatments	:	
Design & repln.	:	
Locatioin(s)	:	
Unit plot size	:	
Data to be recorded	:	Soil nitrogen, rhizobial population at field conditions. ii) Different growth t parameter likes shoot weight, yield and nitrogen content. iii) Nodule numbers and weight. iv) Nodulation efficiency will be evaluated by ERIC–PCR analysis of isolated strains.

Head of Soil Science Division

CSO (RC)

Director (Research)

Budget for Annual Research Programme 2015-2016

Project No.	Name of Project	Source of fund	Annual budget Lac Tk.
1	Soil characterization and land degradation assessment using tracer technique	GOB	5.00
2	Determination of the critical limit of plant nutrients for different soils and crops using tracer technique	GOB	1.00
3	Integrated Plant Nutrition System (IPNS) for soil fertility management and increased crop production	GOB	1.50
4	Isotopic studies of organic carbon management	GOB	3.00
5	Fertilizer recommendation for elite mutants/varieties developed by BINA	GOB	2.00
6	Evaluation of soil-plant health monitoring kit for fertilizer recommendation practices	GOB	1.50
7	Studies on adsorption and desorption capacities of 10 selected AEZs soils	GOB	1.50
8	Fallout Radionuclide (FRN) studies	GOB	3.00
9	Agricultural land management for improving soil fertility and irrigation efficiency	AFACI	4.00
10	Studies on micronutrients in soils and crops	GOB	2.00
11	Delineation of Soil Micronutrients Status in Major AEZs of Bangladesh	GOB	2.00
12	Requirement of zinc and boron application for different croppingng patterns	GOB	1.50
13.	Assessment of arsenic and heavy metal contamination in soils, crops and water in selected areas	GOB	3.00
14	Supporting climate proofing rice production system (CRiPS) based on nuclear application in Bangladesh (FAO/IAEA Project - RAS / 5065)	FAO/ IAEA Project - RAS/5065	2.00
15	Landscape Salinity and Water Management in Coastal region of Bangladesh for improving Agricultural productivity (FAO/ IAEA CRP / 17772)	FAO/IAEA CRP/17772	2.50
16	Biological nitrogen fixation studies in soils and legume crops using ¹⁵ N isotopic technique	GOB	3.00
17	Development of PGPR biofertilizer for rice, wheat and vegetable production	GOB	2.50
18	Microbiological characterization of soils of different AEZs of Bangladesh	GOB	2.50
19	Biofertilizer production and distribution	GOB	3.00
20	Development of phosphatic biofertilizer for maximizing crop production using ³² P tracer techniques	GOB	3.00
21	Development of phospho-vermi compost for increased crop production using radio active and stable isotope techniques	GOB	3.00
22	Development of bio-fertilizers for lentil production	GOB	2.00
23	Development of bio-fertilizers for pea cultivation	GOB	2.00
24	Molecular characterization of rhizobia from country bean	GOB	2.00
		Grand Total	58.50

Head of Soil Science Division

CSO (RC)

Director (Research)

