

ANNUAL RESEARCH AND DEVELOPMENT PROGRAM 2023-24

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PROJECT I: ON-FARM SOIL FERTILITY MANAGEMENT

JUSTIFICATION

The gradual degradation of soil fertility status of the country is now becoming a crucial issue for sustainable crop production. More than 50% of our cultivated soil contains organic matter below the critical level (1.5%). Annual depletion of plant nutrients in the intensively cropped area ranges from 180 to more than 250 kg ha⁻¹. High and medium highland comprises 60% of total cultivated land which is in most cases deficient in essential nutrients such as nitrogen, phosphorus, potassium and sulphur. Deficiency of different secondary and micronutrients was also observed in some parts of the country due to intensive cropping with modern varieties of crops. The low organic matter content, higher cropping intensity, improper cropping sequence and faulty management practices are the major causes for depletion of soil fertility. Addition of organic materials to soil through farmyard manure, compost and crop residues has been reduced considerably. Farmers' usually do not use any organic fertilizers. Scarcity of fuel led them to use cowdung and crop residues as domestic fuel. Imbalance use of fertilizers is another serious problem for the country. Farmers use to apply fertilizers on single crop basis without considering the whole cropping pattern. But some of the nutrients have considerable residual effect on the succeeding crops. Excessive and continuous use of chemical fertilizer is detrimental for soil health and environment. Therefore, it was felt necessary to address the problem in a comprehensive way. In this context, the On-Farm Research Division of BARI aimed to develop fertilizer management practices and increase efficiency of fertilizers by integration of organic manures, green manure, crop residues etc. along with inorganic fertilizers to stabilize and improve soil fertility and yield of different crops and cropping patterns.

Expt. 1 Development of fertilizer recommendation for onion based four crops Onion (Bulb + Leaf)-Onion (Bulb)- T. Aus rice -T. Aman rice cropping pattern.

Objectives	:	To develop an optimum fertilizer dose for higher productivity and profitability at Rajshahi region To increase total productivity and farmers income
Rationale	:	Onion is the major crop in Rajshahi district of Bangladesh. In order to produce more food from limited area, increasing the cropping intensity for producing three or more crops over the same piece of land in a year is a great option. Onion demand is increasing day by day and local market price of onion is high and very much unstable now in Bangladesh. To combat this situation, On-Farm Research Division, BARI, Shyampur, Rajshahi has developed location specific onion intensified cropping pattern Onion (Bulb+Leaf)-Onion (Bulb)- T. Aus rice -T. Aman rice against Onion-Jute-T. Aman rice during last two years. This cropping pattern is highly productive and produced two cycle onion in same season but it is needed to manage the nutrient in judiciary. For sustainable crop production and management of soil fertility, the experiment will undertake to develop the optimum fertilizer dose for higher productivity and profitability for Onion (Bulb+Leaf)-Onion (Bulb)-T. Aus rice -T. Aman rice cropping pattern in Rajshahi region.
Materials and Methods	:	
Crop/Variety Design	:	Onion: BARI Pij-1, T. Aus: BRRRI dhan98, T. Aman: BRRRI dhan75 RCBD
Treatments	:	T ₁ =STB fertilizer dose for FRG'2018 T ₂ =T ₁ + 20% NPKS of STB (IPNS) T ₃ = T ₁ + 40% NPKS of STB (IPNS) T ₄ = Conventional practice (Average of 30 farmers) Same treatment will be followed for all four crops
Replication	:	6 (dispersed)
Plot size	:	4 m x 5 m
Planting system/ spacing	:	Planting and transplanting/ as per recommendation
Fertiliser dose and methods of application	:	As per treatments and recommendation
Irrigated/ rainfed	:	Irrigated
Data to be collected	:	Initial and final soil status, dates of all operations, yield and yield attributes of all crops, pest and disease infestation, prices of inputs and outputs.
Investigator(s)	:	M. N. A. Siddique, M. S. Rahman, M. M. I. Chowdhury and M. J. Islam
Season	:	Whole year
Date of initiation	:	November 2023
Date of completion	:	November 2025
Expected output	:	Optimum fertilizer dose and 30-35% system productivity will be achieved
Location (s)	:	On-station, OFRD, ARS, Shyampur, Rajshahi
Status	:	New
Estimated cost	:	Tk. 100000/-
Source of fund	:	BARI
Priority	:	1st

Expt. 2 Effect of nutrient management on the productivity of Mustard (Canola) in Northwest Bangladesh

Objectives	: To determine optimum nutrient packages for BARI Sarisha-18
Rationale	: Rapeseed-Mustard is the most important oil crop contributing the lion share in the domestic edible oil economy of Bangladesh. Its area coverage and production are increasing gradually due to development of short duration and high yield potential varieties by BARI and Bangladesh Govt. initiatives. Bangladesh Agricultural Research Institute (BARI) has developed a high quality canola type oil-seed variety (BARI Sarisha-18). This variety has less amount of erucic acid content which is not harmful to human body and it is proved as good quality cooking oil. It is high yielding and market price is higher. The area and demand of this variety is increasing tremendously due to its potentiality of fitting in the Mustard-Boro-T. Aman rice cropping pattern. The seed yield of BARI Sarisha-18 has been fluctuated in 2022-23 season (DAE, 2023). Some farmers reported that seeds of late sown mustard show shrinkage and low or late germination tendency. This might be due to imbalanced fertilizer management practice. Additionally, the soil of AEZ-3 is characterized by low pH and deficit in micronutrient especially boron which is very crucial for seed formation. Normally, farmers apply similar dose of fertilizer as of short duration varieties. The fertilizer rate could not be fulfilled the demand of BARI Sarisha-18 for potential yield. Crop production system with high yield targets cannot be sustainable unless nutrients are judiciously supplied to soil against nutrient mining. It is utmost need to solve this problem immediately to keep up the ever increasing cultivation of BARI Sarisha-18 throughout the country for healthy oil production. Keeping these views in mind, the present study is proposed to determine optimum nutrient package for BARI Sarisha-18 in Rangpur region.
Procedure/methods	:
Crop/Variety	: Mustard/BARI Sarisha-18
Design	: RCBD
Treatment	: Nutrient package: STB, STB+25% NPKS, STB+50% NPKS and farmers' practice (average of 20 farmers)
Replications	: 6 (Disperse)
Planting system	: Line sowing, 30 cm x 5 cm
Plot size	: 4 m x 5 m
Fertilizer dose & Methods of application	: Fertilizer dose will be followed as per treatment specification ½ N and full quantity of other fertilizers will be applied as basal. Remaining N will be top dressed just before flowering stage and followed by irrigation.
Irrigated/ rainfed	: Irrigated
Data to be recorded	: Phenology, yield components, yield and cost-return analysis
Expt. output	: Optimum fertilizer package for BARI Sarisha-18 will be determined for higher productivity
Investigator(s)	: M. S. Hossain, M. S. Alam and Eakramul Haque
Date of initiation	: November, 2023
Date of completion	: March, 2025
Location	: OFRD-Barind, Bagura and Rangpur
Status	: New
Estimated cost	: 1,20,000/-
Source of fund	: BARI
Priority	: First

Expt. 3 Development of fertilizer packages for Groundnut seed production in Char land condition

Objectives	: To find out the optimum dose of fertilizer for ground nut seed production in char land. To observe the effect of gypsum fertilizer on growth and yield of groundnut in char land.
Rationale	: Groundnut (<i>Arachishypogaea</i> L) is an important warm-season oilseed crop and is one of the most important oil producing crops in Bangladesh and ranking in second position both in area and production. In Bangladesh, groundnut is grown in both the Rabi and Kharif season. In char areas of Rangpur region groundnut is one of the popular crops. At present, drought is a very common problem in northern region of Bangladesh and specially in char areas it is a serious issue. In Bangladesh, groundnuts are primarily grown in dry river beds, and drought stress seems to adversely affect groundnut yield and quality. Groundnut is frequently subjected to drought stresses of different duration and intensities (Reddy <i>et al.</i> , 2003). Drought is recognized as one of the major constraints limiting groundnut productivity. Calcium as well as gypsum fertilizer under drought stress could promote groundnut growth, increase the chlorophyll content, leaf photosynthetic rate and the root vitality, increase the recovery ability of groundnut during rewatering after drought stress, alleviate the impact of drought stress on groundnut. Applying Ca fertilizer under drought stress increased pod and kernel yields because of the increase of kernel rate and pod number per plant. It also increased the fat and protein contents of groundnut kernel, and improved kernel quality under drought stress. Considering the fact, the present study has been taken to find out the optimum dose of gypsum fertilizer in char land of Rangpur region.
Materials and Methods	:
Crop/variety	: Chinabadam/BARI Chinabadam-9
Design	: RCBD
Treatment	: T ₁ :Recommended dose of fertilizer (RDF) T ₂ : RDF + 25% higher gypsum T ₃ : RDF + 50% higher gypsum T ₄ : Farmer's practice (Average of 25 farmers used)
Replications	: 6 (dispersed)
Plot size	: 10 m × 8 m (unit plot)
Planting system/spacing	: Line sowing, 30 cm X 15 cm
Fertilizer dose and methods of application	: Cowdung-5 t/ha, Urea 115 kg/ha, TSP 30 kg/ha, MP 125 kg/ha, gypsum 25 kg/ha Zn 2 kg/ha and Boric Acid 1.5 kg/ha. Entire quantity of cowdung, P, K, S, B and half amount of urea will be applied at the time of final land preparation. Rest of urea will be applied 30-35 days after germination.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Plant height, flowering behavior, number of pods/plant, weight of pods/plant, number of seeds/plant, 100-seed weight, yield, disease and pest infestation, farmer's reaction.
Investigator (s)	: Most. Ummay Salma Khatun, SSO and scientists of OFRD, Rangpur
Season	: Rabi, 2023-24 and 2024-25
Date of Initiation	: Last week of October 2023
Date of completion	: Last week of March 2025

Expected output/benefit	: Optimum dose of gypsum fertilizer will be identified for char areas of Rangpur region. Farmers in the char areas will be benefited through the application of optimum dose of gypsum fertilizer in groundnut.
Location	Chilmary, Kurigram
Status	New
Estimated cost	Tk. 60000
Source of fund	BARI
Priority	1 st

Expt. 4 Development of Integrated nutrient management for growth and yield of BARI Begun-12

Objective (s)	: To find out the organic fertilizer dose for growth and yield of BARI Begun-12 To determine the optimum and economic dose of organic fertilizer on growth, yield and yield component of BARI Begun-12 To increase productivity as well as maximize farmers income
Rationale	: Brinjal (<i>Solanum melongena</i>) is the third most important vegetables in Bangladesh. Recently BARI developed a new varieties BARI Begun-12. It has potentiality to bump up the yield and brinjal production of the country. BARI Begun-12 is gaining popularity to the farmers all over Bangladesh for its size, color and shape. Hence, higher fertilizer dose may require for full exploitation of yield potentiality of brinjal. Most of the flowering buds are active for fruiting. Consequently, more active flowering buds produce more fruits/plant and higher yield of brinjal. Now, there is a need to resort the fertilizer requirement for BARI Begun-12. On the other hand, one of the major causes of low yield of brinjal might be due to low organic matter content as well as low nutrient status of soils those has been declined over time. Integrated plant nutrient management is the application of inorganic fertilizer in combination with organic fertilizer to maintain soil fertility and to balance nutrient supply in order to boost up the crop yield per unit area (Arif <i>et al.</i> 2014, Patra <i>et al.</i> 2000, Roberts <i>et al.</i> 2010). Organic matter in soil is an imperative indicator of soil fertility which can improve soil structure, nutrient exchange and maintain soil physical conditions. Optimum dose of fertilizer application provides better agronomic and economic benefits to vegetable growers. Therefore, the present investigation will be undertaken to determine the optimum and economic organic fertilizer dose for growth and yield of BARI Begun-12
Materials and Methods	:
Crop/variety	: Brinjal, Variety : BARI Begun-12
Design	: RCBD
Treatment	: F ₁ : Soil Test based fertilizer dose, F ₂ : Recommended fertilizer dose, F ₃ : STB + Vermicompost @ 3 t/ha, F ₄ : STB+ CD @ 10 t/ha & F ₅ : Control
Replications	: 6 (compact)
Plot size	: 5.0m x 4.8m (unit plot)
Planting system/spacing	: Line sowing (100cm x 80cm)

Fertilizer dose and methods of application : As per recommended BARC, FRG 2018/ As per treatment
 Half of organic manure will be applied at the time of final land preparation. Remaining organic manure and all of Phosphorus, Sulphur, Zinc and Boron will be applied in pit before one week of transplanting seedlings. Nitrogen and potassium will be applied in four equal splits at 20, 40, 60 and 80 DAT as ring method around the plants and mixed thoroughly with the soil.

Irrigated/rainfed : Irrigated

Data to be recorded : Initial soil status, Dates of all operations, Yield and yield attributes of all crops
 Pest and disease reaction, Cost and return analysis, Farmers' opinion and Final soil status.

Investigator (s) : Ummay Kulsum Laily, SO and scientist of OFRD, BARI, Rangpur

Season : Rabi, 2023-24

Date of Initiation : October 2023

Date of completion : March 2025

Expected output : Economic fertilizer dose for maximum yield of BARI Begun-12 will be ascertained

Location : On Station

Status : New

Estimated cost : Tk. 60000

Source of fund : BARI

Priority : 1st

Expt. 5 Effects of N fertilizer and application methods on bulb yield and post-harvest quality of onion

Objectives : To examine the influence of N levels and application methods on yield and shelf-life of onion (BARI Piaj-4)
 The onion (*Allium cepa* L.) is one of the major spice's crops in Bangladesh. However, the bulb yield and productivity of the crop has been far below standards owing to several factors - absence of location specific nitrogen (N) fertilizer recommendation, application method and time of application being the major among others. Several management practices are identified to influence yield and quality of onion bulb. Farmers in Bangladesh usually apply improper dose of N fertilizer for growing onion which helps to

Rationale : increase yield but reduces storage quality of onion and N efficiency. We hypothesized that appropriate N dose and time of N application can improve post-harvest quality especially shelf-life without compromising yield. So far, research in this area was mainly focused on the varieties of onions, but there is limited information available on the effects of nitrogen fertilizer on growth, yield and storage quality of onion. Therefore, the effect of different levels of nitrogen and application methods on bulb yield and post-harvest quality of onion would be evaluated in the proposed study.

Treatment:
 Main plot: N-levels (3)
 1. Recommended N fertilizer (240 kg/ha Urea)
 2. RF - 25 % reduced
 3. RF + 25 % increase

Materials and methods : Sub-plot: N Application methods (3)
 1. Basal (1/3)+ 1st Installment (1/3) at 25 DAS + 2nd Installment (1/3) at 50 DAS
 2. Basal (2/3)+ 1 Installment (1/3) at 50 DAS
 3. Farmer's practice

Crop/variety	: Onion
Design	: Split-plot
Plot size	: 5 x 4 m ²
Planting system/spacing	: As per recommended spacing for onion.
Intercultural operation	: As per requirement
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, Plant height, Bulb length and breadth, Individual bulb weight, Days to maturity, Bulb yield, Storage related parameters (Temp., humidity, thickness of bulb, bulb damage, storage quality %, shelf-life etc.), Pest and disease, Cost and return and Farmers opinion
Investigators	: Md. Ariful Islam, Md. Maniruzzaman, Md. Zahedul Hasan, MeheraAfrojSuborna
Season	: Rabi
Date of initiation	: December 2023
Date of completion	: April 2024
Expected output/benefit	: Optimum nitrogen levels and methodson yield and shelf-life of onion will be obtained
Locations	: On-Station, ARS, OFRD, Pabna
Status	: New
Estimated cost	: Tk. 50,000
Source of fund	: BARI
Priority	: 1 st

Expt. 6 Effect of different levels of sulphur on bolting and yield of Onion

Objectives	: To find out optimum dose of sulphur for increasing yield and minimizing bolting of onion
Rationale	: The onion (<i>Allium cepa</i> L.) is one of the most commercial vegetablescum spice crop. Onion is primarily used as a salad and cooked in various ways in curries, curries, fried, boiled, baked, and used in soup making and preparation of pickles (Jaggi, 2005). Onion is known for its flavor, pungency, which is due to sulphur-containing compound allylpropyl disulphide, and also eco-friendly stored grain protectant. Sulphur has been recognized as an important nutrient for higher yield and quality of onion bulbs. Sulphur is essential for building up sulphur-containing amino acids as well as for a good vegetative growth and bulb development in onion. Onion is a sulphur-loving plant and is required much for proper growth and yield of onion (Kumar and Singh, 1995). Therefore, the effect of different levels of sulphur on bulb yield and bolting of onion would be evaluated in the proposed study. Treatment: Levels of S (3)
Materials and methods	: 1. Recommended S fertilizer of FRG-18 (RSF) 2. 50 % of RSF 3. 150 % of RSF
Crop/variety	: Onion
Design	: RCBD
Plot size	: 5 x 4 m ²
Planting system	: As per recommended spacing for onion.
Intercultural operation	: As per requirement

Irrigated/rainfed : Irrigated
 Data to be recorded : Dates of all operations, Plant height, Bulb length and breadth, Individual bulb weight, Days to maturity, Bulb yield, Storage related parameters (shelf-life etc.), Pest and disease, Bolting (%), Cost and return and Farmers opinion
 Investigators : Md. Ariful Islam; Md. Maniruzzaman, Md. Zahedul Hasan, Mehera Afroj Suborna
 Season : Rabi
 Date of initiation : December 2023
 Date of completion : April 2024
 Expected output : Optimum sulphur levels on yield and bolting of onion will be obtained.
 Locations : On-Station, ARS, OFRD, Pabna
 Status : New
 Estimated cost : Tk. 50,000
 Source of fund : BARI
 Priority : 1st

Expt. 7 Integrated Nutrient Management of sweet gourd production

Objectives : To develop a suitable fertilizer dose for sweet gourd cultivation in rice based cropping system
 To increase crop productivity
 Rationale : Boro-Vegetables-T.Aman is one of the major existing cropping pattern in Mymensingh region of Bangladesh. In order to increase cropping intensity, production of more food from limited area i.e production of three or four crops in same piece of land in a year is a great option. The soil health status is also an important concern as the fertilizer application systems of those pattern based crops are not followed. To fulfill this requirement the study has proposed with the aim to develop a suitable fertilizer dose for sweet gourd and to minimize the fertilizer requirement for Boro-Sweet gourd-T.Aman rice cropping pattern.
 Materials and Methods :
 Crop : Boro rice-Sweet gourd-T.Aman
 Variety : BRR1 dhan28-BARI Hybrid Mistikumra-2 and BRR1 dhan75
 Seed rate (kg ha⁻¹) : Recommended as per BRR1 and BARI
 Treatments : T₁= STB fertilizer dose
 T₂= IPNS with 5 ton Cow dung ha⁻¹ as of T₁
 T₃= T₁+25% NPK and
 T₄= Farmers practice
 Design : RCBD
 Replications : 06 (six) dispersed
 Unit Plot size : 20m × 10m (bed size 1m × 1m)
 Fertilizer dose : As per FRG'2018
 Application of fertilizer : As per FRG' 2018
 Data to be collected : Dates of all operations, Record disease insect infestation, Yield and yield attributes, Economic return and Farmers' opinion

Expected output	: Suitable fertilizer dose for sweet gourd will be find out and at least 30-35% higher economic return could be possible from this practice
Status	: New
Date of initiation	: November' 2023
Date of completion	: July' 2024
Estimated cost	: Tk 60000
Source of fund	: BARI
Priority	: 1 st
Location (s)	: Gouripur upazila, Mymensingh
Investigator(s)	: Dr. N. Sultana, SSO and Dr. M. Moniruzzaman, PSO

Expt. 8 Effect of rhizobium inoculum on the yield of BARI Motorshuti-3 in the farmers field

Objectives	: To find out the infectivity of BARI rhizobium, and suitable fertilization package to produce garden pea To increase yield and economic return of the farmers
Rationale	: Garden pea (<i>Pisum sativum</i> L.) is a cash value popular vegetable crop in the world, which is rich in protein, carbohydrate, vitamin A and C (Dhall, 2016). In Bangladesh, it is grown in winter season for using fresh pods, edible green seeds, and is also used as dry seed crop. The garden pea is highly nutritious and tasty. The dry seed of garden pea contains 15-35% protein, 20-25% starch, 4-10% sugar, 0.6-1.5% fat and 2-4% minerals. Cultivation of this crop is highly profitable and preferable to the farmers for its short duration. Inclusion of garden peas helps in improvement of soil fertility by nitrogen fixation. The soils of Muktagacha region of Mymensingh district are very suitable for garden pea production and farmers of this region do not follow the balanced fertilizers and used to cultivate the locally available variety. However, using rhizobium inoculation and vermicompost instead of urea fertilizer, can improve the soil health as well as increase the yield. Therefore, the present study will undertake to find the suitable fertilization package to produce garden pea in Muktagacha, Mymensingh region of Bangladesh.
Materials and Methods	:
Crop	: Garden pea
Variety	: BARI Motorsuti-3
Seed rate (kg ha ⁻¹)	: 80
Treatments	: T ₁ : Rhizobium inoculation (BARI RPS-501, 1.5 kg/ha)+ other recommended fertilizers, T ₂ : Rhizobium inoculation (1.5 kg/ha) & vermicompost (5 t/ha) + other recommended fertilizers, T ₃ : Uninoculated/ Urea (100%) + other recommended fertilizers.
Design	: RCBD
Replications	: 06 (six) dispersed
Unit Plot size	: 7.5m × 6m
Spacing	: 30cm × 15cm

Fertilizer dose	:	48-24-30 N-P-S kg ha ⁻¹ + CD 5 t ha ⁻¹ (Recommended dose FRG' 2018) and Rhizobium 1.5 kg ha ⁻¹
Application of fertilizer	:	All organic manures, phosphorus and sulphur should be applied as basal during final land preparation. Nitrogen should be applied as side dressing in two equal splits at 15-20 and 40-45 days after emergence.
Data to be collected	:	Dates of all operations Yield and yield attributes Pest and disease reaction Cost and return analysis Farmers' opinion
Expected output	:	Farmers will be benefitted by getting a suitable variety and fertilizer dose for garden pea cultivation
Status	:	New
Date of initiation	:	November' 2023
Date of completion	:	January' 2024
Estimated cost	:	Tk 60,000/-
Source of fund	:	BARI
Location (s)	:	Muktagacha, Mymensingh
Priority	:	1 st
Investigator(s)	:	Dr. Shahana Sultana, SSO and Dr. M Moniruzzaman, PSO

Expt. 9 Integrated management of foot rot disease of groundnut with seed and soil treatments

Objective(s)	:	To develop suitable foot rot disease management technology of groundnut.
Rationale	:	Groundnut is a major legume and an important oil seed crop throughout the world as well as Bangladesh. Numerous issues are accountable for low productivity among which diseases like leaf spot, collar rot, stem rot, bud necrosis etc are very important. Out of all, foot rot caused by <i>Sclerotium rolfsii</i> is a major problem and is an economically important soil borne pathogen. The huge number of sclerotia produced by <i>S. rolfsii</i> and their ability to persist in the soil for several years, as well as the abundant growth rate of the fungus make it well matched facultative parasite and a pathogen of major importance throughout the world (Punja, 1988). Different methods for the control of foot rot of ground nut were suggested worldwide, including the use of resistant cultivars (Butzler et al., 1998), cultural practices (El-Deeb and Ibrahim, 1998), biological and chemical control (Siddiqui et al., 2002; Cilliers et al., 2003). All of these control measures is an important means in checking foot rot of groundnut (Helal et al., 1994). Therefore, an attempt will be taken to access the effect of integrated diseases management modules with chemical treatments, organic amendments, and bio control agents on diseases incidence and yield of groundnut in comparison with untreated control.
Materials and Methods	:	
Crop/variety	:	Groundnut (var. BARI Chinabadam-9)
Design	:	RCBD
Treatment	:	T ₁ = Liming (1 t/ha)

	T ₂ = Liming (1 t/ha) and seed treatment with Provex 2.5 tha ⁻¹
	T ₃ = Liming (1 t/ha) and soil treated by Trichoderma 2.5 tha ⁻¹
	T ₄ =Seed treatment with Provex 2.5 tha ⁻¹ and soil treated with Trichoderma 2.5 tha ⁻¹
	T ₅ = Farmers practice
Replications	: 6 (dispersed)
Plot size	: 4m × 5m
Planting system/spacing	: Continuous
Fertilizer dose and application methods	: Recommended dose as per FRG-2018: Groundnut: 30-24-15-26-2-1.5 (N-P-K-S-Zn-B kg acre ⁻¹)
Irrigated/rainfed	: Irrigated
Data to be recorded	: i) Dates of all operations, ii) Yield and yield attributes of crops, iii) Pest and disease reaction, iv) Cost and return analysis
Investigator (s)	: Md.Yeasinul Haque Rayhan, and Dr. M. Mohiuddin
Season	: Robi
Date of initiation	: 10 November, 2023
Date of completion	: 20 March, 2026
Expected output	: Suitable disease management practice with higher productivity will be developed
Location	: MLT site, Nikli.
Status	: New
Estimated cost	: Tk. 50,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 10 Development of Fertilizer Management package on Potato-Groundnut-Fallow Cropping Pattern in Nikli, Kishoreganj.

Objective(s)	: To develop a package for Potato-Groundnut-Fallow cropping pattern in haor area.
Rationale	: Bangladesh is one of the most densely populated countries of the world with population growth rate of 1.579%. The present cropping intensity of the country is 194%. Food requirement is estimated to be doubled in the next 25 years. Under such situations, it is very important to increase cropping intensity and productivity. Haor is bowl-shaped large tectonic depression and receive surface runoff water by rivers, Khals and consequently a haor becomes very extensive water body in monsoon period. In Bangladesh, 17% of the country's land covering by haor area. From the month of April-May haor get its sea like appearance and relief up to October. The land topography and soil characteristics of Haor is different than plain land. The haor area of Kishoreganj belongs to low pH. Soil pH of Nikli is found 4.5 to 5.3 (According to soil test result of SRDI, Kishoreganj) that's why SRDI, Kishoreganj recommended to apply 400kg Dolomite lime per acre during land preparation to increase soil pH for suitable crop cultivation. Considering the above issues, the present study will be undertaken.
Materials and Methods	:
Crop/variety	: Potato (Local variety Romana)-Groundnut (var. BARI Chinabadam-9)

Design	: RCBD
Treatment	: T ₁ = Lime (1 t/ha) with Soil test based recommended fertilizer dose. T ₂ = Lime (1 t/ha) with 120% Soil test based recommended fertilizer dose. T ₃ = Lime (1 t/ha) with 80% Soil test based recommended fertilizer dose. T ₃ = Farmers practice According to soil test result of SRDI, Kishoreganj recommended fertilizer dose is: Potato:114-24-45-11-4-2, Groundnut:30-24-15-26-2-1.5 (N-P-K-S-Zn-B kg acre ⁻¹)
Replications	: 6 (dispersed)
Plot size	: 8m X 5m
Planting system/spacing	: Line sowing- Spacing- Potato (25 X 60)cm and Groundnut (15 X 30)cm
Fertilizer dose and application methods	: Potato:114-24-45-11-4-2, Groundnut:30-24-15-26-2-1.5 (N-P-K-S-Zn-B kg acre ⁻¹)
Irrigated/rainfed	: Irrigated
Data to be recorded	: i) Dates of all operations, ii) Yield and yield attributes of crops, iii) Pest and disease reaction, iv) Cost and return analysis
Investigator (s)	: Md.Yeasinul Haque Rayhan and Dr. M. Mohiuddin
Season	: Robi
Date of initiation	: November, 2023
Date of completion	: May, 2026
Expected output	: Reduction of soil acidity and Higher crop yield will be achieved.
Location	: MLT site, Nikli, Kishoreganj
Status	: New
Estimated cost	: Tk. 50,000/-
Source of fund	: PARTNER Project, BARI Part
Priority	: 1 st

Expt. 11 Effect of seaweed liquid extract on the growth and yield of tomato

Objective(s)	: To find out the suitable dose of SLE on tomato. To popularize seaweed liquid extract.
Rationale	: Seaweeds is a good source of minerals, vitamins, free amino acids and polyunsaturated fatty acids. Recent researches findings proved that seaweed liquid extract using as foliar fertilizer to crops and performed better than other chemical fertilizers. Seaweed foliar sprays promote faster, stronger stem and leaf growth and earlier blossoming and fruit set. Therefore, this experiment is undertaken.
Materials and Methods	: From BARI Seaweed-1, SLE will be produced as per the procedure described by John Peter Paul and Shri Devi (2014). Air dried plant sample will be finely ground with mortar and pestle. By heating at 50°C for 24 h. 100 g of seaweed was used in 1 L deionized water to produce 100% seaweed extract.
Crop/variety	: Tomato
Design	: RCB
Treatments	: T ₀ = Control T ₁ = 2.5 ml/L T ₂ = 5.0 ml/L T ₃ = 7.5 ml/L

Replications	:	6 farmers
Plot size	:	300 m ² for each farmer
Planting system/spacing	:	Line sowing: 40cm × 20cm
Fertilizer dose and methods of application	:	FRG, 2018. Treatments sprays will be applied at 20, 30 and 40 DAT.
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Growth parameters Yield and yield attributes Major disease and pest incidence Economic analysis Farmers' opinion
Investigator(s)	:	Mostak Ahmed, SSO, OFRD, Cox'sbazar
Season	:	Rabi season
Date of initiation	:	November, 2023
Date of completion	:	March, 2024
Expected output/benefit	:	Improved yield of horticultural plants Development of seaweed market
Location	:	Chokoria, Ramu and Cox'sbazar sadar
Status	:	New
Estimated cost	:	Tk. 60000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 12 Development of fertilizer recommendation for bitter gourd produced in raised bed in coastal region

Objective (s)	:	To find out the optimum fertilizer doses for bitter gourd production in raised bed To reduce the cost of production
Rationale	:	Farmers' of coastal areas of Patuakhali and Borguna produce bitter gourd in raised bed. They plant bitter gourd seeds or seedlings in pit of top of the bed, but they applied fertilizer in whole bed specially urea through broadcast. Through this process enhance miss use of urea. On the other hand, in pit planting system fertilizers are used in pit so fertilizer amount may be reduced and that may reduce production cost. Considering these views, the study has been undertaken with the above objectives.
Materials and Methods	:	
Crop/variety	:	Bitter gourd
Design	:	RCB
i. Treatment	:	T ₁ = STB T ₂ = STB + 10% STB T ₃ = STB + 20% STB T ₄ = Farmers Practice
ii. Replications	:	Six (dispersed)
Plot size	:	8 m x 1m for each unit bed
Planting system/spacing	:	Plant to plant spacing 2 m

Fertilizer dose and methods of application	Treatment wise fertilizer will be applied in the bed. All fertilizers except urea will be used as basal dose and urea will be applied in three equal split.
Irrigated/rainfed	: Irrigation- as and when necessary
Data to be recorded	: Yield and yield contributing characters, disease and insect reaction, Farmer's opinion.
Investigator (s)	MM Islam and MSI Khan
Season	Rabi, 2023-24
Date of Initiation	First week of March 2024
Date of completion	September/24
Expected output/benefit	: Optimum fertilizer doses will be find out
Location	Kalapara, Patuakhali and Taltoli/Amtoli, Borguna
Status	: New
Estimated cost	: Tk. 50000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 13 Yield and quality enhancement of soybean as influenced by exogenous application of salicylic acid under rainfed condition in the coastal region

Objectives	: To find out suitable dose of SA that increase yield & quality of soybean. To find out suitable time of application
Rationale	: In Bangladesh, soybean is a promising crop. It is extensively cultivated in Noakhali and Bhola where it faces scarcity of sweet irrigation water, salinity and drought in dry season. The root system of soybean is more sensitive to adverse conditions, such as drought, which may cause yield losses ranging from 25 to 50% (Zou <i>et al.</i> , 2020). Salicylic acid (SA), a phytohormone, is a promising compound that can reduce the sensitivity of plants to environmental stresses through regulation of the antioxidant defense system, transpiration rates, stomatal movement, and photosynthetic rate (Nazaret <i>et al.</i> , 2015). Salicylic acid treatments effectively ameliorated the negative effects of drought stress through improving the photosynthetic performance, keeping membrane permeability, induction of stress proteins, and enhancing the activity of antioxidant enzymes. Exogenous application of salicylic acid (SA) at lower concentrations within the range of 0.1–0.5 mM improves photosynthesis, growth and various physiological and biochemical processes, (Hayat <i>et al.</i> 2010). Foliar application of salicylic acid decreased sodium content of soybean seeds, and increased calcium and potassium contents of seeds, seed weight, germination rate and seedling weight of soybean (Salar and Kazem 2022). Hence, the present study will be undertaken to find out appropriate dose of SA and application time that enhance yield and quality of soybean.
Materials and methods	:
Crop/variety	: BARI Soybean-5
Design	: RCB

i) Treatment	: <u>Factor-A(salicylic acid doses)</u>	<u>Factor B: (time of application)</u>
	S ₁ : 0 ppm (control)	T ₁ : vegetative stage
	S ₂ : 50 ppm	T ₂ : flowering stage
	S ₃ : 100 ppm	T ₃ : pod filling stage
	S ₄ : 150 ppm	
ii) Replication	: 3 (Dispersed)	
Plot size	: 8m X5m	
Spacing	: 30m X5cm	
Fertilizer dose	: FRG-2018/STB and recommended methods	
Irrigation/rainfed	: Rainfed	
Data to be recorded	: Dates of all operation, Yield, yield attributes and quality characters Major disease and insect incidence, Cost and return analysis. Farmers opinion	
Investigator(s)	: Md. Mominul Islam, Rashidul Hasan Anik & Gazi Nazmul Hasan	
Season	: Rabi 2023-24	
Date of initiation	: December, 2023	
Date of completion	: April 2024	
Expected output	: Soybean yield will be increased by 15-20%.	
Location	: MLT site Dawlatkhan and Bhola Sadar	
Status	: New	
Estimated cost	: Tk. 50,000/-	
Source of fund	: BARI	
Priority	: 1 st	

Expt. 14 Integrated Nutrient Management of onion in Faridpur

Objective (s)	: To find out suitable nutrient dose To increase sustainable yield and economy of onion
Rationale	: Onion is a major crop of Faridpur region. Farmers use fertilizer irrationally during onion cultivation that hampers soil health. Judicial use of fertilizer is necessary conserving soil health. In Faridpur and Rajbari, total about 52 thousand land is cultivated with Onion seedling. BARI has released BARI Piaz-4 in 2008. Farmers started to cultivate that variety as a high yielder (17-22 t/ha) than BARI Piaz-1 or Taherpuri (12-16 t/ha). Experimental evidences revealed that the crop was highly responsive to different fertilizers along with organic manure and the yield could be increased remarkably through judicious fertilization. Thus, integrated nutrient management practices applied for Onion can contributes to sustainable growth of yield and quality, influences plant health and reduces environmental risks. Use of organic manures with optimum rate of inorganic fertilizers including major and minor elements especially Zinc and Magnesium under intensive farming system increased the turnover of nutrients in the soil plant system. So, the present study has been undertaken with above objectives.
Materials and Methods	:
Crop/variety	: Onion: BARI Piaz-4
Design	: RCB
Treatments	: T ₁ : STB

	T ₂ : STB + Vermicompost 2 tha ⁻¹
	T ₃ : Farmers' practice
Replications	: 6 (dispersed)
Unit Plot size	: 5m x 3 m
Planting system/spacing	: 15 cm x 10 cm
Fertilizer dose and methods of application (kg ha ⁻¹)	All of organic fertilizer, P, S, Zn and B, and half of N and K will be applied as basal during final land preparation. Remaining N and K will be applied in two equal splits at 25-30 DAT and 40-45 DAT under moist soil condition and mixed thoroughly with the soil.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield and yield contributing characters. Farmer's opinion, pest incidence
Investigator (s)	Concerned scientists of OFRD, Faridpur
Season	Rabi
Date of Initiation	November 2023
Date of completion	March 2024
Expected output	: Suitable fertilizer dose will be found out for higher productivity and return.
Location	FSRD site, Faridpur and MLT site, Rajbari
Status	New
Estimated cost	Tk. 80,000
Source of fund	OFRD/BARI
Priority	1 st

Expt. 15 Yield assessment of Potato-Boro-T Aman rice cropping pattern using different fertilizer recommendations.

Objectives	: To find out the optimum fertilizers package for Potato-Boro-T Aman cropping pattern To increase the yield and economic return
Rationale	: Potato-Boro-T Aman cropping pattern is a popular and productive pattern in Rajshahi region. Both high yield and quality of crops are important economic considerations. Nutrient supply interacts with other management, pest, and climatic factors to affect quality and yield of crops. Appropriate crop management gives significant contributions to increase crop yields. Many reports indicate that, in Bangladesh the low productivity of crops is attributed to depleted soil fertility and poor agronomic practices such as unbalanced fertilizer application. Improper nutrient and pest management practices due to poor technical knowledge are considered as a barrier for desired yield. The optimum level of agronomic practices like plant population density, fertilizer rate and pest management can ensure better yield of crops. In this regard, a viable management package deemed necessary to increase productivity of Potato-Boro-T Aman rice cropping pattern in Rajshahi region.
Materials and Methods	:
Crop/Variety	: Crop: Potato, Boro rice, T. Aman rice, Variety: BARI Alu-62, BRRI dhan102 and BRRI dhan87
Design	: RCBD

i) Treatment(s)	T ₁ : Recommended fertilizer dose (FRG, 2018) T ₂ : Soil test based (STB) T ₃ : SRDI Recommendation T ₄ : BRRI/BARI recommendation T ₅ : Farmers' practice (Average 20-25 farmers)
ii) Replication	6 dispersed
Plot size	: 5 m × 4 m
Planting system/spacing	: Recommended spacing for every crop
Fertilizer dose and methods of application/rates	: As recommended (FRG, BARC, 2018)/Recommended methods
Irrigation/Rainfed	:
Data to be recorded	: Dates of all operations, Initial and post soil nutrient status, Yield of component crops, Incidence of disease and insect, Prices of inputs and outputs
Investigator(s)	: M. S. Rahman, M. J. Islam, M., M. M. I. Chowdhury and N. A. Siddique of OFRD, Shyampur, Rajshahi
Season	: Whole year
Date of initiation	: November, 2023
Date of completion	: February, 2025
Expected output/benefit	: At least 10-15% system yield will be increased, and additional income will be earned from pattern.
Location	: On station, Shyampur, Rajshahi
Status	: New
Estimated cost	: Tk. 100000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 16 Effect of nutrient management practices on fruit yield of BARI Brinjal-12 at farmer's field in Sylhet region

Objectives	: To select suitable organic fertilizer To popular organic fertilizer at farmers level
Rationale	: The use of synthetic fertilizers causes a great impact on the environment and the cost of these fertilizers is increasing over the years. The farmers need to raise the crops by organic farming that will reduce the costs and will decrease the impact on the environment. In addition, organic farming will reduce the additional burden of environmental pollution that is caused while manufacturing these synthetic fertilizers at the source (Rathier and Frink, 1989). Now it is a well-established fact that organic fertilizers provide enough requirements for proper growth of the crop plant and may enhance the uptake of nutrients, increase the assimilation capacity and will stimulate the hormonal activity as well (Tomati et al., 1990; Grapelli et al., 1985). Vermicompost is also useful as it increases soil porosity, aeration and water holding capacity. Vermicompost increases the surface area, provides strong absorbability and retention of nutrients as well and retain more nutrients for a longer period of time. vermicompost enhance the nutrient uptake by the plants by increasing the permeability of root

cell membrane, stimulating root growth and increasing proliferation of root hairs (Pramanik et al., 2007).

Materials and methods	:	
Crop/Variety	:	Seeds of BARI Brinjal-12
Design	:	RCBD
i) Treatment	:	T ₁ : IPNS (Vermicompost: 2-3,1.8-2.25, 1.55-2.25 %NPK) T ₂ : IPNS (FYM: 0.5, 0.2, 0.5 % NPK) T ₃ : IPNS (PM: 0.5-0.9, 0.4-0.5, 1.2-1.7 % NPK) T ₄ : STB fertilizer dose T ₅ : Farmer practice (average of 25 farmers)
ii) Replication	:	7
Plot size	:	40 m ²
Planting system/spacing	:	Row to row method
Fertilizer dose and methods of application	:	-
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Date of all operation; plant height, number of leaves, Length/width of the leaves, No. of fruits to each plant, Weight of brinjal, Fruit length and breadth, pest and disease reaction
Investigator (s)	:	MD. Zulfiqar and M. I. Nazrul
Season	:	Rabi
Date of initiation	:	November, 2023
Date of completion	:	March, 2024
Exp. output/ benefit	:	Appropriate organic fertilizer will be ascertained.
Location	:	FSR site, Kamalbazar
Status	:	New
Estimated cost	:	Tk. 40000/=
Sources of fund	:	BARI
Priority	:	1 st

Expt. 17 Effect of organic inputs on yield and quality of ginger cultivated in gunny bags

Objective	:	To select suitable bagging mixture for ginger
Rationale	:	Ginger belongs to family Zingiberaceae and is a perennial herbaceous plant. The underground rhizome, economic part of ginger is pungent, aromatic and used for culinary purposes. It has basic antiseptic properties and is used as a carminative and stimulant in Ayurveda system of medicine. At present organic farming is hot topic of Bangladesh and the immense possibility of improving the farming techniques of the rural people through organic means. Appraising the increasing demand for organic products all over the world, the ginger farmers can receive higher returns from their produce if grown organically. Microbes enriched bio fertilizers have now emerged as a promising component of nutrient supply (Singh, 2002; Nath). However, ginger being a heavy feeder and exhaustive crop requires large quantities of manures and fertilizers. Though the applications of chemicals controlled the disease and increased the ginger productivity (Poudyal, 2011) but use of chemicals to enhance the productivity as well as control the disease is criticized throughout the world due to their detrimental effects on the environment (Suthamathy and Seran, 2013). So, constructing the best dosage and mixtures for organic cultivation of ginger can be more profitable and economically viable for the ginger farmers of north east region. But there is no any scientific

intervention and comprehensive research work carried out on this aspect.

Materials and methods :

- Crop/Variety : Ginger/BARI Ada-2
Design : RCB
Treatments : T₁: Soil + 25 % FYM, T₂: Soil + 20 % FYM + 5% Ash, T₃: Soil + 25 % Vermicompost, T₄: Soil + 20 % Vermicompost + 5 % Ash
T₅: Farmer practice (average of 25 farmers)
Replication : 6 (dispersed)
Plot size : 120 m²
Planting system/spacing : 2-3 fingers/bag
Fertilizer dose and methods of application : Leaflet published by Spices Research Centre, BARI
Irrigated/rainfed : Irrigated
Data to be recorded : Date of all operation; plant height, number of leaves, Length/width of the leaves, No. of rhizome per plant, Weight of single rhizome, and pest-disease reaction
Investigator (s) : M. I. Nazrul
Season : Kharif
Date of initiation : March 2024
Date of completion : December 2024
Exp. output/ benefit : Appropriate organic inputs ratio will be ascertained.
Location : MLT site, Jagannathpur, Sunamganj
Status : New
Estimated cost : Tk. 80000/-
Sources of fund : BARI
Priority : 1st

Expt. 18 Nutrient Management for potato production in Mymensingh region

- Objectives : To develop a balanced fertilizer dose for potato cultivation
To minimize the excess use of DAP fertilizer by the farmers
To increase crop productivity and farmers income
Rationale : Potato (*Solanum tuberosum* L.) is a highly attractive crop in agricultural production system since it combines an extraordinarily high yield potential with a high nutritional value. However, the average yield of potato in our Bangladesh considerably lower leading to 20 t ha⁻¹ while countries with a high-input agriculture are higher likely 45 t ha⁻¹. Such a yield gap might be due to lack of high yielding potential variety and lack of adequate nutrient management for potato production. Although Nitrogen (N), phosphorous (P) and potassium (K) are the nutrients which are most commonly fertilized in potato production but the rate are very ambiguous as the fertilization practiced by the farmer. Concerning the fertilization practiced by the farmer, the soil health status, and yield and minimal the cost of production the experiment has proposed. Therefore, the experiment has been proposed with the aim to develop a suitable fertilizer dose for high yielding potato production.
Materials and Methods :
Variety : BARI Alu-41

Seed rate (kg ha⁻¹) : Recommended as per BARI

Treat	Approach	N	P	K	S	Mg	Zn	B	CD	
		kg ha ⁻¹								t ha ⁻¹
T ₁	Farmers practice (P from DAP and N from Urea)	74	167	111	22	1	3	1.5	10	
T ₂	Farmers practice (P from DAP and N from Urea and rest N from DAP)	141	167	111	22	1	3	1.5	10	
T ₃	Farmers practice (P from TSP and N from Urea)	74	167	111	22	1	3	1.5	10	
T ₄	Upper limit of low fertility level, FRG 2018	135	30	135	15	10	4	1.6	5	
T ₅	P from DAP and rest N from urea	150	45	135	15	10	4	1.6	5	
T ₆	Control	0	0	135	15	10	4	1.6	5	

Design : RCBD

Replications : 06 (six) dispersed

Unit Plot size : 8m × 5m

Fertilizer dose : As per FRG' 2018, farmers and developed dose

Application of fertilizer : As per FRG'2018 and farmers practice

Data to be collected : Dates of all operations, Record disease insect infestation, Yield and yield attributes, Economic return & Farmers' opinion

Expected output : Suitable fertilizer dose will be find out for potato production in Mymensingh region and at least 40-45% higher income could be possible from this practice

Status : New

Date of initiation : November' 2023

Date of completion : February' 2024

Estimated cost : Tk 50000/-

Source of fund : BARI

Priority : 1st

Location (s) : Gouripur upazila, Mymensingh

Investigator(s) : Dr. N. Sultana, SSO and Dr. M. Moniruzzaman, PSO

Expt. 19 Effect of rhizobium inoculum on the yield of BARI Motorshuti-3 in the farmers field

Objectives : To find out the infectivity of BARI rhizobium, and suitable fertilization package to produce garden pea

To increase yield and economic return of the farmers

Rationale : Garden pea (*Pisum sativum* L.) is a cash value popular vegetable crop in the world, which is rich in protein, carbohydrate, vitamin A and C (Dhall, 2016). In Bangladesh, it is grown in winter season for using fresh pods, edible green seeds, and is also used as dry seed crop. The garden pea is highly nutritious and tasty. The dry seed of garden pea contains 15-35% protein, 20-25% starch, 4-10% sugar, 0.6-1.5% fat and 2-4% minerals. Cultivation of this crop is highly profitable and preferable to the farmers for its short duration. Inclusion of garden peas helps in improvement of soil fertility by nitrogen fixation. The soils of Muktagacha region of Mymensingh district are very suitable for garden pea production and farmers of this region do not follow the balanced fertilizers and used to cultivate the locally available variety. However, using rhizobium inoculation and vermicompost instead of urea fertilizer, can improve the soil health as well as increase the yield.

Therefore, the present study will undertake to find the suitable fertilization package to produce garden pea in Muktagacha, Mymensingh region of Bangladesh.

Materials and Methods	:	
Variety	:	BARI Motorsuti-3
Seed rate (kg ha ⁻¹)	:	80
Treatments	:	T ₁ : Rhizobium inoculation (BARI RPS-501, 1.5 kg/ha)+ other recommended fertilizers, T ₂ : Rhizobium inoculation (1.5 kg/ha) & vermicompost (5 t/ha) + other recommended fertilizers, T ₃ : Uninoculated/ Urea (100%) + other recommended fertilizers.
Design	:	RCBD
Replications	:	06 (six) dispersed
Unit Plot size	:	7.5m × 6m
Spacing	:	30cm × 15cm
Fertilizer dose	:	48-24-30 N-P-S kg ha ⁻¹ + CD 5 t ha ⁻¹ (Recommended dose FRG' 2018) and Rhizobium 1.5 kg ha ⁻¹
Application of fertilizer	:	All organic manures, phosphorus and sulphur should be applied as basal during final land preparation. Nitrogen should be applied as side dressing in two equal splits at 15-20 and 40-45 days after emergence.
Data to be collected	:	Dates of all operations, Yield and yield attributes, Pest and disease reaction, Cost and return analysis & Farmers' opinion
Expected output	:	Farmers will be benefitted by getting a suitable variety and fertilizer dose for garden pea cultivation
Status	:	New
Date of initiation	:	November' 2023
Date of completion	:	January' 2024
Estimated cost	:	Tk 60,000/-
Source of fund	:	BARI
Location (s)	:	Muktagacha, Mymensingh
Priority	:	1 st
Investigator(s)	:	Dr. Shahana Sultana, SSO and Dr. M Moniruzzaman, PSO

Expt. 20 Effect of Phosphorus Levels and Planting Techniques on Mustard-Sesame-T. Aman Rice Cropping Pattern

Objective(s)	:	To optimise the suitable dose and appropriate placement technique of P fertilizer for Mustard-Sesame-T. Aman rice cropping pattern
Rationale	:	Crop phosphorus nutrition depends on the ability of the soil to replenish the soil solution with phosphorus as the crop removes it and on the ability of the plant to produce a healthy and extensive root system that has access to the maximum amount of soil phosphorus. Application of fertilizer must be done to maximize the chemical and physical availability of the phosphorus to crops while minimizing the risk that the phosphorus might be lost to the environment by runoff or erosion. Conservation best management practices are critical to good phosphorus management. Phosphorus fertilizer dose and placement affect the availability of P, consequently affecting plant growth and yield. Research on the exact placement and percentage of doses of P application has not been done much. For sustainable crop production, research on the placement and dose of P fertilization is needed in the system planting system in the field.

Materials and Methods	:	
Crop/variety	:	Mustard (var. BARI Sarisha-17)-Sesame (var. BARI Till-4)- T. Aman (var. BRRI dhan75)
Design	:	RCBD
Treatment	:	Factor A: Planting technique Factor B: Phosphorous dose
		i. Strip tillage i. 100% RD P
		ii. Conventional tillage ii. 75% RD P
		iii. 50% RD P
Replications	:	6 (dispersed)
Plot size	:	5m X 10m
Planting system/spacing	:	Mustard: 30 cm x continuous, Sesame: 30 cm x continuous and Rice: 20 cm x 20 cm
Fertilizer dose and application methods	:	Recommended dose as per FRG-2018: Mustard:90-27-40-10-0-1, Sesame: 78-18-27-20-0-0.6 and T. aman: 90-8-50-8-1.5-0 (N-P-K-S-Zn-B kg ha ⁻¹)
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	i) Dates of all operations, ii) Yield and yield attributes of crops, iii) Pest and disease reaction, iv) Cost and return analysis
Investigator (s)	:	M. A. Islam, M. S. H. Mollah, M. R. Alam, M. Maniruzzaman of OFRD, Pabna and M. F. Hossain of OFRD, Gazipur
Season	:	Year round
Date of initiation	:	5 November, 2022
Date of completion	:	30 October, 2024
Expected output	:	Sustainable resource conserving technology with higher productivity will be developed
Location	:	MLT site, Atghoria, Pabna
Status	:	2 nd Year
Estimated cost	:	Tk. 90,000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 21 Integrated Nutrient Management for Cabbage under Agroforestry System

Objective(s)	:	To compare the effect of integrated nutrient management and inorganic fertilizer on crops and fruits yield in Agro-forestry system To increase crop productivity
Rationale	:	In Bangladesh, fruit orchard especially Ber, Litchi, Guava and Mango orchard increasing considerably in last few years. A vast area is going under orchard every year so, it is possible to produce some vegetable crops such as cabbage and tomato under agroforestry system will be a good option for producing vegetable from the same land. In the tropics and sub-tropics rapid degradation of organic matter is the major problem, where through vegetable production, there has a less chance to add biomass in the soil. So, from the view of sustainable productivity of soil, addition of organic matter through integrated nutrient management system may be helpful. Trees on farms can enhance coping capacity of small farmers to risks through crop and income diversification, soil and water conservation and efficient nutrient cycling and conservation. A wide array of adaptation options is available, but more extensive adaptation than is currently occurring is required.
Materials and Methods	:	
Crop/variety	:	Cabbage var. Atlas-70

Design	: RCB
Treatment	: T ₁ = Recommended inorganic fertilizer as FRG-2018/STB T ₂ = IPNS + 5 tha ⁻¹ cow dung (CD) T ₃ = IPNS + 3 tha ⁻¹ Vermi-Compost (VC) T ₄ = Farmers practice
Replications	: 6 (dispersed)
Plot size	: 20 m X 10 m
Planting system/spacing	: 60 cm x 45 cm
Fertilizer dose and application methods	: 120-36-30-12-2.5-1 kg, N-P-K-S-Zn-B ha ⁻¹
Irrigated/rainfed	: Irrigated
Data to be recorded	: i) Dates of all operations, ii) Yield and yield attributes of tree and crops iii) Pest and disease reaction, iv) Cost and return analysis
Investigator (s)	: M. A. Islam, M. S. H. Mollah, M. R. Alam, M. Maniruzzaman of OFRD, Pabna and M. F. Hossain of OFRD, Gazipur
Season	: Rabi
Date of initiation	: 5 November, 2022
Date of completion	: 10 March, 2024
Expected output	: Higher crop equivalent yield will be achieved
Location	: FSRD site, Gongarampur, Pabna
Status	: 2 nd Year
Estimated cost	: Tk. 60000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 22 Evaluation of Soil Properties and Crop Yield in a Long-Term Conservation Agriculture

Objective(s)	: To evaluate the changes of soil properties and crop yield after 6 years old experiment
Rationale	: In rice-based system, rice is grown under puddled soil while intensive tillage along with limited crop residues is being used for growing non-rice crop in the field. Although puddling is beneficial for controlling weed, transplanting seedling and reduced deep percolation of the standing water (Ringrose-Voase et al., 2000) but it destroys soil aggregates, and degrades other soil physical properties to the detriment of the following upland crop (Sharma & De Datta, 1986). Transplanting seedlings into puddled soil is water and labour intensive which is increasingly scarce and expensive, making the production system unprofitable and unsustainable. With falling water table, constant cultivation of high-water consuming rice crop leads to decline over all system productivity and resource-use-efficiency (Parihar et al., 2016; Yadav et al., 2017b). In conventional farming system (CT), the intensive tillage along with residue removed are being used for growing the upland crop which also causes the degradation of physico-chemical and biological (Yadav et al., 2017a). The continuous cultivation of cereal crop leads to the degradation of SOM, soil structure, the depletion of plant nutrients which are also major responsible factors of yield decline in intensive cereal-based cropping systems of South Asia (Ladha et al., 2003; Mulvaney et al., 2009). Hence, some form of crop diversification is necessary to sustain the agricultural production system. There is some evidence that inclusion of leguminous

Expt. 23 Integrated Nutrient Management for Pointed Gourd

Objective (s)	: To find out a suitable combination of organic and inorganic fertilizers for pointed gourd To increase maximum yield of pointed gourd
Rationale	: Pointed gourd (<i>Trichosanthes dioica</i> R.) is one of the most nutritive vegetables in Bangladesh belongs to the family cucurbitaceae. Though pointed gourd is a summer vegetable but now its vine is transplanted in January and fruit harvesting starts from April and continued up to November-December. The farmers of Gabtoli, Bogura district are growing pointed gourd from long days. The area and production of pointed gourd was 352 ha and 3172 ton respectively, in 2015-16 (BBS, 2016). Farmer's in that area apply different doses of chemical fertilizers without following any recommended guidelines resulting poor yield and soil deterioration. In Gabtoli, vermicompost and cowdung is available in local market. So, for sustainable soil health and yield, combination of inorganic and organic nutrients should easily be applied by farmers. But the rate of organic manure is not yet developed for Gabtoli. The present study is undertaken to find out a suitable combination of organic and inorganic fertilizers and to increase maximum yield of pointed gourd. N.B.Old reference
Materials & methods	
Crop/variety	: BARI Patal-2
Design	: RCB
Treatment	: T ₁ = RFD as per FRG'2018 T ₂ = IPNS + 5 tha ¹ CD T ₃ = IPNS + 2 tha ¹ VC T ₄ = Farmers Practices i.e. Average of 10 farmers surveyed (48.5-45-75-15-1.57-1.28 kg, N-P-K-S-Zn-B ha ⁻¹).
Replication	: 6 dispersed
Plot size	: 6m x 3 m
Planting system	: Line sowing (2 m x 0.5 m)
Fertilizer dose and methods of application	: Entire amount of manure and chemical fertilizer except urea will be applied in pit 5-7 days before planting and mixed thoroughly with the soil. Entire urea will be applied in 4 equal installments at the 3 rd , 6 th , 9 th and 12 th weeks of planting around the plant as side dressing under moist soil condition and mixed thoroughly with the soil as soon as possible for better utilization.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield and yield contributing characters. Farmer's opinion and pest incidence
Investigator (s)	: M.R.A. Mollah, M.S. Alam, M. A. Islam of OFRD, Bogura and M. F. Hossain of OFRD, Gazipur.
Date of Initiation	: October 2022
Date of completion	: September 2024
Expected output	: Sustainable fertilizer dose will be find out for higher productivity and return from pointed gourd
Location (s)	: MLT site Gabtoli
Status	: 2 nd year
Estimated cost	: Tk. 60,000
Source of fund	: BARI
Priority	: 1 st

Expt. 24 Development of Fertilizer Recommendation for Foxtail Millet in Charland

Objective	: To find out the optimum and economic fertilizer dose for minor cereal millet in the char areas
Rationale	: Millet is a minor cereal crop in Bangladesh. Its cultivation now has been concentrated in the charland only. Comparatively low yield, competition from other high value as well as high yield potential crops it has been shifted from the mainstream agriculture to char areas of different rivers i.e. Padma, Jamuna, Tista etc. Char areas have been found promising for cultivation of kaon. Millet and cheena together is occupied nearly 1182 hectare land with the annual production of 1229 metric tons with average yield 1.04 t/ha (BBS, 2016). The reasons for low yield are i) lack of improved varieties, ii) inadequate and irrational use of fertilizers by the farmers and iii) depletion of native soil fertility and soil productivity specially in charland. To combat this problem, it is necessary to use optimum dose of fertilizers. Considering the above facts, the experiment has been undertaken to find out an optimum dose for the cultivation of millet in the charland condition.
Materials and Methods	:
Design	: RCB
Replication	: 6 (dispersed)
Crop/Variety	: Foxtail Millet var. BARI Kaon-2
Treatment	: T ₁ = Recommended dose as per FRG'2018/ STB T ₂ = T ₁ + 25% NPKSZn T ₃ = T ₁ + 50% NK T ₄ = T ₁ + 1.0 kg B ha ⁻¹ T ₅ = Farmers practice i.e. Average of 20 farmers Surveyed (46-15-20-13-1.58-1.28 kg, N-P-K-S-Zn-B ha ⁻¹)
Plot size	: 6m x 5m
Plant spacing	: Broadcast
Data to be collected	: Plant height, Yield and yield components, Disease and insect reaction, Farmers reaction
Expected output	: Optimum fertilizer dose will be find out for maximum yield of millet at char areas.
Status	: 2 nd year
Date of Initiation	: November 2022
Estimated cost	: Tk. 30000
Source of fund	: BARI
Locations	: Char areas of Sonatola, Bogura.
Investigator	: M.R.A. Mollah, M.S. Alam, M. A. Islam of OFRD, Bogura and M. F. Hossain of OFRD, Gazipur.

Expt. 25 Effect of Potassium Fertilizer on Groundnut in Char Land

Objective (s)	: To find out the optimum dose of K fertilizer for mitigating drought at char land condition.
Rationale	: Groundnut (<i>Arachis hypogaea</i> L.) is an important warm-season oilseed crop and ranking in second position in area and production. In Bangladesh, groundnut is grown in both the Rabi and Kharif season. In char areas of Rangpur region, groundnut is one of the popular crops. At present, drought is a very common problem in northern region of Bangladesh. Groundnuts are

primarily grown in dry river beds, and drought stress seems to adversely affect groundnut yield and quality. Groundnut is frequently subjected to drought stresses of different duration and intensities (Reddy et al., 2003). Drought is recognized as one of the major constraints limiting groundnut productivity. Considering the fact, the present study has been taken to find out the optimum dose of K fertilizer for mitigating drought stress.

Materials and Methods	:	
Crop/variety	:	Groundnut Var.
Design	:	RCB
i. Treatments	:	T ₁ = Recommended dose (RD) for groundnut as FRG,2018/STB T ₂ = RD + 25% higher MoP T ₃ = RDCF+ 50% higher MoP T ₄ = Farmers Practice
ii. Replications	:	6 (disperse)
Plot size	:	8 m × 5 m (unit plot)
Planting system/spacing	:	Line sowing, 30 cm X 15 cm
Fertilizer dose and methods of application	:	Cowdung-5 t/ha, Urea 115, TSP 30 a, MP 125 , Gypsum 25, Zn 2 and Boric Acid 1.5 kg/ha. Entire quantity of cowdung, P, K, S, B and half amount of Urea will be applied at the time of final land preparation. Rest N will be applied 30-35 days after germination.
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Plant height (cm), flowering behavior, number of fruits/plant, weight of single fruit (g), yield/plant (kg), yield (t/ha), number of seeds per fruit, 100-seed weight (g), disease and pest infestation, Farmer's opinion.
Investigator (s)	:	M.U. Salma Khatun, M.Z. Ferdous, S.M.A.H.M Kamal M.A.H. Talukder of OFRD, Rangpur and M. F. Hossain, OFRD, Gazipur
Season	:	Rabi, 2022-23
Date of Initiation	:	Last week of October 2022
Date of completion	:	Last week of March 2024
Expected output /benefit	:	Optimum dose of K fertilizer will be identified for groundnut for char area
Location	:	Chilmari, Kurigram
Status	:	2 nd year
Estimated cost	:	Tk. 60000
Source of fund	:	BARI
Priority	:	1 st

Expt. 26 Nutrient Management for Oat Production in Faridpur

Objective (s)	:	To determine suitable nutrient package for oat To increase sustainable yield of oat grain production
Rationale	:	Oats (<i>Avena sativa</i>) are a whole-grain cereal. They are a very good source of fiber, especially beta glucan, and are high in vitamins, minerals, and antioxidants. Oats have 51 grams of carbohydrate, 13 grams of protein, 5 grams of fat, and 8 grams of fiber in 1 cup with 303 calories. Oat is becoming popular in Bangladesh for health concerned person. But, experimental evidences on other crops

revealed that any crop is highly responsive to different fertilizers and the yield could be increased remarkably through judicious fertilization. Thus, nutrient management practices applied for oat can contribute to sustainable growth of yield and quality, influence plant health and reduce environmental risks. So, the present study has been undertaken with above objectives.

Materials and Methods	:	
Crop/variety	:	Oat: BARI Oat-1
Design	:	RCB
i) Treatment	:	T ₁ = Recommended dose @ 80-30-30-10-3-1 Kg, N-P-K-S-Zn-B ha ⁻¹ as per FRG, 2018 T ₂ = STB fertilizer dose T ₃ = T ₂ + 25% higher of T ₂ T ₄ = T ₂ + 50% higher of T ₂ T ₅ = Farmer's practice (Average of 10 farmers @ 92-25-25 kg, N-P-K ha ⁻¹)
ii) Replications	:	6 (dispersed)
Plot size	:	5m x 3 m
Fertilizer dose and methods of application	:	All of P, K, S, Zn, B, and half of N will be applied as basal during final land preparation. Remaining N will be applied at 25-30 and 45-50 DAS under moist soil condition and mixed thoroughly with the soil.
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Initial soil and post-harvest soil analysis, Date of all operations, yield and yield contributing characters. Farmer's opinion, pest incidence
Investigator (s)	:	S. Ahmed of OFRD, Faridpur and M.F. Hossain of OFRD, Gazipur
Season	:	Rabi 2022-23
Date of Initiation	:	November 2022
Date of completion	:	April 2024
Expected output	:	Suitable fertilizer dose will be found for oat production
Location	:	FSRD site Faridpur
Status	:	2 nd year
Estimated cost	:	Tk. 20000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 27 Fertilizer Management of Watermelon in Saline Soil

Objective (s)	:	To determine appropriate fertilizer dose for higher yield and higher economic return.
Rationale	:	Watermelon is a high-value crop which is grown mainly in Kharif season in Bangladesh. In recent years, watermelon cultivation is gaining popularity in the coastal region in the fallow lands after T. Aman harvest. About 10-12 years ago the land used to be fallow in the kharif season. Many attempts have been taken by different research organizations and NGO's to intensify crop cultivation in the coastal areas of Bangladesh. Watermelon is one of the few crops which have been sustained and gaining popularity among the farmers. Around 11000 ha of land in Bangladesh were brought under watermelon cultivation in 2019-20, from where about 274000 metric tons of watermelon was produced with an average yield of 23.33 t ha ⁻¹ (BBS, 2020). The area of cultivation is increasing in nine upazilas of Khulna district total watermelon area was 3085 ha and increases to 7512 ha (DAE, 2021). Out of total watermelon

cultivation area of Khulna district about 70% of the area belongs to Dacope upazila alone. However, there are many management issues like plant spacing, irrigation, tillage, fertilization etc. have not been optimized scientifically, which is necessary for resource saving and environmental sustainability.

Materials and Methods	:	
Crop/Variety	:	Watermelon (var. BARI Tormuj-1/ BARI Tormuj-2/Pakija)
Design	:	RCB
Treatment	:	T ₁ = Recommended dose as per FRG, 2018 T ₂ = STB fertilizer dose T ₃ = IPNS + 5 t ha ⁻¹ CD T ₄ = Farmer's practice (Average of 10 farmers)
Replication	:	6 (dispersed)
Plot size	:	6 m X 5 m
Planting system/spacing	:	1.5 m X 0.7 m (Farmer's practice)
Fertilizer dose and methods of application	:	As above treatment
Irrigated	:	As and when necessary
Data to be recorded	:	Dates of all operation, yield and yield contributing characters, disease and insect incidence, cost and return and farmers' opinion.
Investigator (s)	:	M K Shahadat, M H Rashid, M K Islam, T.S. Munmun, M Rahman of OFRD, Khulna and M.F. Hossain
Season	:	Early Kharif-1
Date of Initiation	:	February 2023
Date of completion	:	May 2025
Expected output / benefit	:	Appropriate fertilizer dose will be determined for watermelon
Location (s)	:	MLT site, Dacope and Koyra, Khulna.
Status	:	2 nd year
Estimated cost	:	Tk. 1,00,000
Source of fund	:	OFRD/BARI
Priority	:	1 st

Expt. 28 Effect of Nitrogen and Weed Management on Weed and crop yield of T. Aman rice-Wheat Cropping Pattern under Conservation Agriculture Systems

Objective(s)	:	To evaluate the effect of nitrogen and weed management on weed and yield of strip-tilled non-puddled T. Aman rice. To evaluate the effect of nitrogen and weed management on weed and yield of strip-tilled wheat.
Rationale	:	Nitrogen (N) is an essential nutrient for crop growth and yield (Xu et al., 2012). Besides having an influence on crops, nitrogen has a significant influence on weeds. Booth et al. (2003) mentioned that weed germination is triggered by various factors like soil temperature, soil moisture, light, and N. Sweeney et al. (2008) reported that N fertilizer applications increase weed growth, but the influence of N on weed emergence is dependent on the weed species, seed source, and environmental condition. Blackshaw and Brandt (2017) evaluated the effect of N fertilizer rate on the

imbibition is first step in the seed germination. But crop field may lack adequate moisture content for the same, so poor and delayed germination occurs. To combat this, farmer pre-soak the seed in plain water for a few hours. But this may cause seed damage in more than one ways. Vermi-composting is a joint action of microorganisms and earthworms for degradation or breakdown of organic materials. This process helps to produce fundamental plant nutrients viz. calcium, potassium, phosphorus, and nitrogen present as mixture into plant-available nutrients and soluble forms. Besides, it is reported that vermicompost contained growth-promoting hormones such as auxins, cytokinins, and flowering hormone gibberellins that are secreted by earthworms (Neilson 1965; Tomati et al., 1988). Therefore, this study will be carried out to find out the effectiveness of vermicomposting on the germination percentage of okra and onion seeds.

Materials and methods :

Crop/Variety	: Seeds of okra and onion
Design	: RCB
i) Treatment	: T ₁ :25 % VC, T ₂ :50 % VC , T ₃ :75 % VC & T ₄ : In fresh water
ii) Replication	: 4 (dispersed)
Plot size	: 3 m × 4 m
Planting system/spacing	: Broadcast
Fertilizer dose and methods of application	: -
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operation; percent germination; major disease and insect infestation; Farmers opinion
Investigator (s)	: M. I. Nazrul
Season	: Rabi
Date of initiation	: November 2021
Date of completion	: February 2023
Expected output/benefit	: Appropriate dose of vermicomposting leachate will be ascertained.
Location	: FSR site, Kamalbazar
Status	: 2 nd year
Estimated cost	: Tk. 30000
Sources of fund	: BARI
Priority	: 1 st

Expt. 30 Effect of potassium fertilizer on the yield of Mukhikachu

Objectives	: To develop potassium rate to produce Mukhikachu To develop a suitable variety for Mukhikachu production in Fulbaria To increase yield and economic return of the farmers
Rationale	: Mukhikachu (<i>Colocasia esculenta</i>) is an important Taro crop cultivated all over the Bangladesh particularly in high land area. It is enriched in vitamin 'A', 'C', iron and calcium (Bhuiyan and Ahmed, 2001). It plays a vital role in meet up the demand of vegetables in lag period. The average income of Mukhikachu is much below than the crop potential productivity (BBS, 2010). The crop strictly required a high balanced fertilizer for its growth and development. Among the different nutrients, potassium is an important macro nutrient for Mukhikachu production. Potassium enhances in metabolism process for crop production and quality determinant of Mukhikachu. It acted on physiological process is thus impact on photosynthesis and translocation carbohydrates from leaves to roots that can have direct

consequence on production and quality of root crops. Besides this, variety is an important key factor for higher yield. The soils of Fulbaria region of Mymensingh district are much suitable for Mukhikachu production and farmers of this region do not follow the balanced fertilizers and used to cultivate the locally available variety. However, there having few information regarding the optimum rate of potassium for sustainable Mukhikachu production in that locality. Therefore, the present study has undertaken to find out an optimum rate of potassium and a suitable variety for Mukhikachu production in Fulbaria region of Bangladesh.

Materials and Methods	:	
Crop	:	Mukhikachu
Variety	:	BARI Mukhikachu-1 and Local
Seed rate (kg ha ⁻¹)	:	600
Treatments	:	Factor 1: Potassium rate Factor 2: Variety T ₁ = RFD + 0 kg K ha ⁻¹ T ₁ = BARI Mukhikachu-1 T ₂ = RFD + 50 kg K ha ⁻¹ T ₁ = Local T ₃ = RFD + 100 kg K ha ⁻¹ T ₄ = RFD + 150 kg K ha ⁻¹ T ₅ = Farmers practice
Design	:	RCB
Replications	:	06 (six) dispersed
Unit Plot size	:	6 m × 5 m
Fertilizer dose	:	110-30-20 N-P-S Kg ha ⁻¹ + CD 5 t ha ⁻¹ (Recommended dose FRG' 2018)
Application of fertilizer	:	All organic manures, phosphorus and sulphur should be applied as basal during final land preparation. Nitrogen should be applied as side dressing in two equal splits at 15-20 and 40-45 days after emergence during ear thing up operation.
Data to be collected	:	Dates of all operations, Yield and yield attributes of all crops Pest and disease reaction, Cost an return analysis Farmers' opinion
Expected output	:	Farmers will be benefitted by getting a suitable variety and fertilizer dose for Mukhikachu cultivation
Status	:	3 rd Year
Date of initiation	:	April' 2022
Date of completion	:	October' 2022
Estimated cost	:	Tk 60,000/-
Source of fund	:	BARI
Location (s)	:	Fulbaria, Mymensingh
Investigator(s)	:	Dr. Nargis Sultana, SSO, Dr. Amraul Islam, SSO, Nasima Akter, SO and Dr. M Moniruzzaman, PSO, OFRD, Mymensingh

Expt. 31 Effect of nitrogen on crop productivity and soil health under different rice-based cropping systems

Objective	:	To study the effect of nutrient management and cropping system on the crop productivity and soil health under different rice-based cropping systems
Rationale	:	The crop production of Bangladesh encompasses several constraints including declining crop production and productivity, deterioration of soil fertility, decline in factor productivity, and low diversity of production systems and increasing cost of production. These constraints have aggravated by continuous cereal cropping without proper nutrient management and indiscriminate use of chemical fertilizers on soil and crops. Continuous cultivation of cereal cropping

system in South Asia is under threat with decline in soil fertility, total factor productivity and overall sustainability. The rice-wheat cropping system occupies huge areas and provides food for many populations in South Asia (Ladha et al., 2003). But the system has started declining crop productivity and deterioration of soil health (Timsina and Connor, 2001) due to gradual decline in the supply of soil nutrients (Shukla et al., 2004; Timsina and Connor, 2001), and compaction of subsoil layers (Ladha et al., 2003). Legume crops are known to crop diversification and improve soil quality through their unique ability of biological N₂ fixation, leaf litter fall and deep root system. We are hypothesized that inclusion of pulses in the rice-based cropping system using organic and inorganic sources of nutrients for a long period may have an impact on the crop productivity and soil fertility. Therefore, the effect of inclusion of pulses in the puddled rice system under organic and inorganic amendments on soil fertility and its management indices would be evaluated in the proposed study.

Materials and method	:	
Crop variety	:	Lentil-BARI Masur-8, Sesame-BARI Til-4, Mungbean-BARI Mug-6, and T. Aman-BRRI dhan71
Design	:	Split-plot
Treatment	:	Main plot: Cropping Pattern <ol style="list-style-type: none"> 1. Lentil – Mung bean – T.Aman 2. Wheat – Sesame– T.Aman Sub-plot: Nitrogen management <ol style="list-style-type: none"> 1. 0 % 2. 50 % of Recommended N fertilizer 3. 100 % of Recommended N fertilizer 4. 150 % of Recommended N fertilizer
Replication	:	3
Unit plot size	:	5 m X 4 m
Planting system/spacing	:	For lentil, mustard and mungbean broadcasting method will be followed. For rice crop 20 cm x15 cm spacing will be maintained
Fertilizer dose and methods of application	:	Fertilizer dose and methods of application will be followed as per FRG' 2018
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Plant population at germination and harvest, Nodule number counting, Date of maturity, Weed identification and biomass, Yield and yield contributing characters, Root and shoot growth, Disease and insect reaction Soil analysis (base line and after crop cycle) Economic analysis
Investigators	:	M. Ariful Islam; Dr. Md. RobiulAlam, OFRD, Pabna and Dr. Md. Faruque Hossain, Joydebpur, Gazipur
Season	:	Rabi
Date of initiation	:	October, 2021
Date of Completion	:	March, 2023
Expected output	:	Optimum nitrogen management of different cropping pattern will be determined for sustainable production and economic return
Location	:	On-Station, ARS, OFRD, Pabna
Status	:	3 rd Year
Estimated cost	:	Tk. 40000/=
Source of fund	:	OFRD, BARI

Expt. 32 Effect of vermicompost on irrigation management, growth, yield and fruit quality of watermelon in coastal saline Soil

Objectives	: To reduce irrigation frequency in watermelon field. To know the effect of vermicompost on growth and yield of watermelon To enhance fruit quality (sweetness & color) of watermelon
Rationale	: Watermelon (<i>Citrulluslanatus</i>) is a dominant fruit crop in coastal region. It needs frequent watering and continues nutrient supply for plant growth and fruit development. Traditionally it is cultivating by coastal farmers using inorganic fertilizers only. They do not use any organic fertilizer. But it is reported that organic manures having humic substances not only improve soil fertility by modifying soil physical and chemical properties (Asiket <i>al.</i> , 2009), (Heitkampet <i>al.</i> ,2011) but also improves the moisture holding capacity of the soil. Organic fertilizers are mineralized slowly and nutrients become available for a longer period of time and reduce irrigation frequency. Therefore, the trial was designed with the above objectives.
Materials & Methods	:
Crop/ Varieties	: Watermelon (BARI Tormuj-01)
Design	: RCB
Treatments	: - 03 T ₁ : 1 t/ha vermicompost T ₂ : 2 t/ha vermicompost T ₃ : 3 ton/ha vermicompost
Replication	: 06 (dispersed)
Plot size	: 8m x 5m
Planting system	Line sowing
Fertilizer	The chemical fertilizers @ 150-50-125-40-05-04 kg ha ⁻¹ N, P, K, S, Zn B, respectively along with vermicompost doses will be used in the trial. One-third MoP, full doses of all other fertilizers except urea will be applied during final land preparation. Remaining MoP and urea will be divided into three split and applied at 20 DAP, at flowering and fruiting stage.
Irrigation/ rainfed	: Irrigated
Data to be recorded	: Dates of all operation, frequency of irrigation, yield and yield contributing characters, major disease and insect incidence, qualitative characters of the fruits (Size, texture, colour, TSS), cost and returns analysis, farmers opinion.
Investigators	: MM Islam, SO & MSI Khan, PSO
Season	Robi 2021-22
Initiation	: 1st week of December 2021
Completed	Last week of June 2022
Expected output	: An optimum vermicompost dose will be find out for watermelon production
Location	: Amtoli, Borguna & Kuakata, Patuakhali
Status	: 3 rd Year
Estimated cost	: Tk. 80000/-
Source of fund	: BARI
Priority	1 st

Expt. 33 Fertilizer recommendation for Sunflower-T. Aus- T. Aman cropping Pattern in coastal saline soil.

- Objectives : To develop pattern-based fertilizer recommendation for Sunflower – Aus - Aman rice
To reduce production cost minimizing fertilizer doses of the crops of the pattern.
To conserve soil health through optimum use of fertilizers.
- Rationale : Coastal districts of Bangladesh are characterized by heavy clay soil, heavy rainfall from March to November, cyclone, tidally flooded twice a day during wet season, high soil salinity and scarcity of sweet water for irrigation in the dry season, shorter winter that starts late, late harvesting of T. Aman rice etc. So, cropping diversity is very low in the region in Rabi season. T. Aman is the only crop in Kharif-2 that harvested with in December. By this time sowing time of the most Rabi crops passed away. In late Rabi season two crops mungbean and sunflower has been emerged as well adapted crops in southern region. Sunflower is such a crop which can tolerate salinity to some extent. After harvesting sunflower T. Aus rice could be transplant there in time. So, day by day sunflower production increased in coastal region. In all the three season farmers are using improve varieties and fertilize single crop basis that leads misuse of fertilizer specially Phosphorus and Potassium. Considering the above views the trial has been designed with the above objectives.

Materials and methods:

Crop/ Varieties: BARI Surjomukhi-2, BRRI dhan-48 and BRRI dhan-76

Treatments	Sunflower	T. Aus	T. Aman
:	T ₁ - STB	T ₁ - STB	T ₁ - STB
	T ₂ - RFD	T ₂ -RFD	T ₂ -RFD
		T ₃ -RFD but excluding residual P and K of sunflower	T ₃ -RFD but excluding residual P and K of Aus
Design	RCB		
Replication	06 (dispersed)		
Plot size	: 8m x 5m		
Planting system	: Line sowing		
Fertilizer	: Fertilizer will be applied as per treatment based on FRG'18		
Irrigation/ rainfed	: Irrigated		
Data to be recorded	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Residual P and K after sunflower and T. Aus harvest, Cost and returns analysis, Farmers opinion		
Investigators	: MM Islam, SO & MSI Khan, PSO		
Season	: Rabi,2021-22		
Initiation	: 1 st week of December 2021		
Completed	: Last week of December 2022		
Expected output	: Pattern based fertilizer dose will be find out.		
Location	: Kalapara, Dumki, Patuakhali and Amtoli, Barguna		
Status	: 3 rd Year		
Estimated cost	: Tk. 80,000/-		
Source of fund	: BARI		
Priority	: 1 st		

Expt. 34 Effect of boron on the growth and seed yield of sunflower in acidic soil of Sylhet region

Objective	: To find out the suitable dose of boron for sunflower cultivation in acidic soil.
Rationale	: Soils in Sylhet regions are mostly acidic in nature, having a pH of 4.5-5.5. In this region sunflower cultivation is increasing day by day but in some cases un-fill grains are found in harvest. It might be due to the boron deficiency. As because, boron availability to plants decreases with increasing soil pH, especially above pH 6.5. However, strongly acid soils (pH less than 5.0) also tend to be low in available boron because of boron adsorption to iron and aluminum oxide surfaces of soil minerals. Boron also plays important role in carbohydrate, phenol, auxin metabolism; transport of sugar, cell wall structure and membrane associated reactions, tissue development, pollen tube growth, nitrogen fixation and also causes flower shedding in chick pea and male sterility in wheat. Considering the importance of boron to grain crop production in acidic soil. The experiment has been designed to determine the optimum dose of boron fertilizer in order to achieve better growth and yield of sunflower in the Sylhet region.
Materials and methods	:
Crop/Variety	: Sunflower
Design	: RCB
i) Treatment	: Five levels of boron: 0, 1.0, 1.5, 2.0 & 2.5 kg ha ⁻¹
ii) Replication	: 6 disperse
Plot size	: 12 m × 10 m
Planting system/spacing	: Line sowing; 30 cm × 15 cm
Fertilizer dose and methods of application	: As per FRG, 2018
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, yield and yield contributing characters, fill and un-fill grain, disease and insect infestation, cost and return, farmers' opinion
Investigator (s)	: M. I. Nazrul
Season	: Rabi
Date of initiation	: November 2021
Date of completion	: March/April 2023
Expected output/benefit	: Suitable boron doses for sunflower cultivation in acidic soil will be determined.
Location	: FSRD site, Kamal Bazar and MLT site, Moulvibazar
Status	: 3 rd Year
Estimated cost	: Tk. 80,000
Sources of fund	: BARI
Priority	: 1 st

Expt. 35 Effect of lime on the growth and seed yield of sunflower in acidic soil of Sylhet region

Objective	:	To find out the suitable lime dose for production of sunflower in acidic soil.
Rationale	:	Sunflower (<i>Helianthus annus</i> L) is a popular oilseed crop in Bangladesh. Cultivation of sunflower gradually increasing in Sylhet region but at field level various problems facing with the growth and yield which might be due to the acidic soil. Soils in Sylhet regions are mostly acidic in nature, having a pH of 4.5-5.5. Though liming is an important practice for the crop production under acidic soil but farmers rarely use lime in their fields. Earlier on-farm trials in the Sylhet region showed that liming @ 1-1.5 t/ha had a profound effect on the growth and yield of Wheat, Cabbage, cauliflower and other vegetables (Nazrul and Shaheb, 2016). Souza et al (1997) reported that the application of lime enhanced the available N, P, Ca, Mg, S, and Zn content in soils, which was reflected in their uptake by sunflower. So, soil amendment with appropriate doses of dolomitic lime will enhance the growth and yield of sunflower. Therefore trial has been undertaken to determine the optimum dose of lime to achieve better growth and yield of sunflower under acidic soil condition.
Materials and methods	:	
Crop/Variety	:	Sunflower
Design	:	RCB
i) Treatment	:	Six levels of lime: 0, 0.5, 1.0, 1.5, 2.0 & 2.5 t ha ⁻¹
ii) Replication	:	6 disperse
Plot size	:	12 m × 10 m
Planting system/spacing	:	Line sowing; 30 cm × 15 cm
Fertilizer dose and methods of application	:	As per FRG, 2018
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Dates of all operations, yield and yield contributing characters, fill and un-fill grains per head, disease and insect infestation, cost and return, farmers' opinion
Investigator (s)	:	M. I. Nazrul
Season	:	Rabi
Date of initiation	:	November 2021
Date of completion	:	March/April 2023
Expected output/benefit	:	Suitable lime doses for cultivation under in acidic soil will be determined.
Location	:	FSRD site, Kamal Bazar and MLT site, Moulvibazar
Status	:	3 rd Year
Estimated cost	:	Tk. 80,000
Sources of fund	:	BARI
Priority	:	1 st

PROJECT II: IMPROVEMENT OF CROPPING SYSTEMS

JUSTIFICATION

Farmers in different parts of the country are following cropping pattern and management practices based on the land and soil characteristics, climatic conditions and other resources. With the use of advanced technologies developed by different research institutes and with proper use of farmers' resources it is possible to increase the farm production. This hypothesis is being tested at FSRD and MLT sites of OFRD, BARI. At all these sites testing of cropping patterns designed to improve farmers existing pattern is being done for few years. Component technologies are also designed and tested for possible improvement of different crops and cropping patterns. It is therefore necessary to continue this effort for development and improvement of alternative cropping patterns/ rotations and related component technologies for increased productivity and income.

Expt. 36 Improvement of existing cropping pattern Potato-Boro-T Aman rice through inclusion of new varieties

Objectives	: To increase system productivity and economic return of popular existing pattern. To improve the existing cropping pattern by inclusion of new crop variety
Rationale	: Potato-Boro-T Aman rice is the popular cropping pattern in Rajshahi region covering about 7000 ha of land in Rajshahi district (DAE,2023). But the productivity of this pattern is decreasing day by day due to the use of old crop varieties. Farmers usually grow local Aman rice variety named `Shorna` in T Aman season, BRRI dhan28/29/Jirasail in Boro season and BARI Alu-7 which were popular but the yield potentiality is lower than modern varieties. BARI developed high yielding potato variety BARI Alu-62, BRRI release BRRI Dhan 102(Boro rice) and BRRI Dhan-87 (T Aman rice) as high yield potential modern varieties. So, it is expected that the inclusion of those modern varieties in popular pattern can boost up the total system productivity and income of farmers. Considering the above facts, the present trial was undertaken with the above objectives.
Materials and Methods	:
Crop/Variety	Potato (BARI Alu-62)- Boro (BRRI dhan102)- T Aman (BRRI dhan87).
Design	: RCBD
Treatment	1. AP: Potato (BARI Alu-62)- Boro (BRRI dhan102)- T Aman (BRRI dhan87). 2. EP: Potato (BARI Alu-7)- Boro (BRRI dhan28/29/Jirasail)- T Aman (Shorna)
Replication	: 6 (dispersed)
Plot size	: 10 × 8 m
Planting system	: Planting/transplanting
Fertilizer dose and methods of application	: As recommended (FRG, BARC, 2018)
Irrigation/Rainfed	: Irrigated
Data to be recorded	: Dates of all operations, Yield and yield attributes, Pest and disease incidence, Prices of inputs and outputs, Farmers' opinion
Investigator(s)	: M. M. I. Chowdhury, M. N. A. Siddquie, M. S. Rahman and M. J. Islam
Season	: Whole year
Date of initiation	: November, 2023
Date of completion	: November, 2025
Expected output	: Farmers' yield and income will be increased at least by 20-25 %
Location	: Paba, Rajshahi
Status	: New
Estimated cost	: Tk 100000/ -
Source of fund	: BARI
Priority	: 1 st

Expt. 37 Effect of tillage and mulch on the yield performance of potato in AEZ-11

Objective	: To see the performance of potato variety under different mulches in Strip planting system.
Rationale	: Potato is one of most important food crops in the world. It is also best vegetable crop in Bangladesh in terms of area and production. Potato was grown in winter season mostly after preceding T. Aman rice. In conventional tillage, soil moisture goes up rapidly during land preparation that hinders proper germination of crops. On the other hand, Strip planting (SP) can reduce turn-around time, less disturbance of soil and ensure seed placement in proper soil moisture depth. That is why, SP need to be introduced for initial establishment of crops without providing extra irrigation. With these points of view, positive results in terms of increased yield, productivity, economic return, and resource efficiency have been increased using SP. Crop residues are important natural resource for the stability of agricultural ecosystems. Huge amounts of crop residue from intensive rice-based systems were produced in BD. Due to the lack of efficient crop residue management practices, crop residue is most frequently removed or burned in this region. As a result, soil organic matter levels are declining in these cropping systems which can have serious implications for soil health. Under such condition, mulching under SP may be a good practice for potato production, which usually reduce the turnaround time, production cost and increases the yield. However, very little information is available regarding the influence of different mulches on yield of potato. Therefore, it is necessary to see the effect of different mulches on potato production.
Materials and Methods	:
Crop/Variety	Potato, BARI Alu-62
Design	: RCBD
Treatments	1. Conventional 2. Strip planting + Straw mulch 3. Strip planting + Irish polythene mulch
Replication	: 6 (dispersed)
Plot size	: 8 m × 5 m
Planting system	: Line sowing, spacing: 60 cm × 20 cm
Fertilizer dose and methods of application/rates	: As per recommendation by FRG, 2018
Irrigation/Rainfed	: Irrigated
Data to be recorded	: Dates of all operations, yield and yield contributing characters, disease and insect interaction, Prices of inputs and outputs and Farmers Opinion
Investigator(s)	: M. J. Islam, M. S. Rahman, M. N. A. Siddique, and M. M. I. Chowdhury of OFRD, Shyampur, Rajshahi
Season	: Rabi
Date of initiation	: October 2023
Date of completion	: March 2025
Expected output	: Most effective mulch material for better yield and economics
Location	: On station and MLT site Paba
Status	: New
Estimated cost	: Tk. 60,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 38 Effect of sowing date on the productivity of Mustard (Canola) in Northwest Bangladesh

Objective	: To select suitable sowing window of canola for Barind areas
Rationale	: Mustard is one of the most important oil seed crops in Bangladesh. Its area coverage and production are increasing gradually due to development of short duration and high yield potential varieties by BARI and Bangladesh Govt. initiatives. BARI has now released canola type healthy oil-seed variety (BARI Sarisha-18). The BARI Sarisha-18 has higher yield potentiality over the existing varieties. But it is long duration variety. In 2022-23, DAE of Northern Bangladesh reported that the seed yield of BARI Sarisha-18 has been fluctuated (DAE, 2023). Delayed planting is one of the main reasons for that. Delayed planting encourages for forced maturity because of terminal heat. As a result, seed yield of mustard goes down, small sized seed produced and oil content also reduced. Normally, farmers plant mustard after harvest of long duration T. aman rice (Swarna) and mostly during late November to Mid-December. As BARI Sarisha-18 is a long duration variety, timely sowing is one of the alternatives for higher canola seed yield escaping terminal heat. Considering the fact, the experiment is proposed to find out optimum sowing window for BARI Sarisha-18 at North-West Bangladesh.
Procedure/methods	:
Crop/Variety	: Mustard/BARI Sarisha-18
Design	: RCBD
Treatment	: Sowing date:25 October, 05 November, 15 November, 25 November and 05 December
Replications	: 6(dispersed)
Planting system	: Line sowing, 30 cm x 5 cm
Plot size	: 4 m x 5 m
Fertilizer dose & Methods of application	: Fertilizer dose will be calculated on the basis of test following Fertilizer Recommendation Guide 2018 (BARI, 2018). ½ N and full quantity of other fertilizers will be applied as basal. Remaining N will be top dressed at flowering stage and by irrigation.
Irrigated/ rainfed	: Irrigated
Data to be recorded	: Phenology, yield components, yield and cost-return analysis
Investigator(s)	: M. S. Hossain, M. S. Alam and Eakramul Haque
Season	: Rabi
Date of initiation	: October, 2023
Date of completion	: March, 2025
Expt. output	: Suitable sowing window for BARI Sarisha-18 will be find out for higher productivity
Location	: OFRD-Barind, Bagura and Rangpur
Status	: New
Estimated cost	: Tk. 1,20,000/-
Source of fund	: BARI
Priority	: First

Expt. 39 Development of nutrition enrich cropping pattern in High Barind Tract

Objectives	: To find out suitable cropping pattern for higher nutritional yield To increase productivity and cropping intensity
Rationale	: South Asia's predominantly rice-based farming systems span Bangladesh while crucial to food security and political and economic stability. Although agriculturally focused nutrition interventions are frequently proposed to improve diets in rural communities, causal linkages between farm production and nutrition are not always direct, underscoring the need for integrated approaches considering household food production alongside market purchase. In addition, poor nutrition awareness among rural households, low affordability of nutritious diets and limitations to women's empowerment interact to prevent progress. Barind tract is a drought prone and nutrition deficit area as vegetables is comparatively less grown. These obstacles must be overcome through coordinated efforts to transform agrifood systems in ways that ensure that people can equitably access and consume healthy diets produced within environmental boundaries, while also securing livelihoods and reducing poverty. These objectives – which are also governmental priorities in Bangladesh. These difficulties can be solved through crop diversification, biofortification and animal components be managed to increase production of nutritious foods and improve women's and men's livelihoods while conserving resource. Considering these facts, the program will be conducted to develop nutrition based cropping pattern at the farm level.
Procedure/methods	:
Crop/Variety	: Lentil: BARI Masur-8; Mustard-BARI Sarisha-14 & 18; Maize-Commercial variety; Sorghum-BARI Sorghum-1; Cowpea-BARI Felon-1, Sweet Corn-Commercial variety, T. Aman rice-Binadhan-20
Design	: RCBD
Treatments	: 1) Lentil-Sweet corn-T. Aman rice; 2) Maize+Red amaranth- Sorghum-T. Aman rice; 3) Mustard (BARI Sarisha-14)-Sorghum+Cowpea--T. Aman rice; 4) Mustard (BARI Sarisha-18)-Fallow-T. Aman rice
Replications	: 6 (dispersed)
Planting system	: Broadcast and line sowing as per crops
Plot size	: 10 m x 10 m
Fertilizer dose & Methods of application	: Recommended doses for all crops
Irrigated/ rainfed	: Irrigated
Data to be recorded	: Phenology, yield components, yield and cost-return analysis
Investigator(s)	: M. S. Hossain and M. E. A. Pramanik
Season	: Starting from Rabi and continued to round the year
Date of initiation	: November, 2023
Date of completion	: November, 2025
Expt. Output	: Nutritional cropping system will be developed for higher productivity and cropping intensity
Location	: High Barind area
Status	: New
Estimated cost	: Tk. 80,000/-
Source of fund	: BARI
Priority	: First

Expt. 40 Development of Blackgram- Boro-T.Aus rice cropping pattern against Fallow- Boro-T.Aus rice in Barind area

Objectives	: To compare the recommended pattern's productivity to the existing one in order to assess its effectiveness
Rationale	: Fallow-Boro-T.Aus is one of the major cropping patterns in north-western part of Chapainawabganj district, which is under High Barind Tract (AEZ-26). As a part of Barind tract, it is supposed to prevail underground water scarcity. So, it needs to discourage for cultivating the huge water required crop like rice. Besides of food security, nutritional security is also desirable. Moreover, cropping intensity and productivity needs to increase for more sustainability in the limited land holder but overpopulated country. On the basis of the preceding findings, blackgram could be an appropriate alternative to fallow. The production of blackgram, on the other hand, will provide a chance to grow rich in nutrients crops with reduced production cost. However, the present cropping intensity of the country is 214%. In the next 25 years, the world's food demand is predicted to double. Under such situation, it is very important to increase cropping intensity and for this more suitable crop(s) should be accommodated in the existing cropping pattern. Hence, Blackgram is a crop with a 69–73-day maturation period. They can thus be cultivated in the area left fallow between T. Aus and Boro rice. The current study is being conducted with the aforementioned considerations in mind in order to optimize cropping patterns and boost productivity and profitability.
Procedure/methods :	
Crop/Variety	: Blackgram: BARI Maskalai-3, Boro rice: BRRRI dhan81, T.Aus: BRRRI dhan98
Design	: RCBD
Treatments	: T ₁ : Blackgram- Boro-T.Aus rice T ₂ : Fallow- Boro-T.Aus (check)
Replications	: 6 (dispersed)
Planting system	: As per recommended
Plot size	: 10 m x 10 m
Fertilizer dose & Methods of application	: Recommended doses for all crops. When the final field preparation is complete, all inorganic fertilizers will be applied and combined with the soil for rice varieties Boro and T. Aus . After 10, 25 and 40 days have passed since transplantation, the urea will be top-dressed. For Blackgram : At the time of final land preparation, full applications of all inorganic fertilizers will be made according to each individual plot.
Irrigated/ rainfed	: Irrigated
Data to be recorded	: Dates of all operations, crop duration, yield and yield attributes, Cost and return, farmers opinion.
Investigator(s)	: MEA Pramanik and M. S. Hossain
Season	: 2023-2024
Date of initiation	: September, 2023
Date of completion	: August, 2026
Expt. Output	: Suitable three crops-based cropping pattern will be developed
Location	: MLT Site Chapainawabganj
Status	: New
Estimated cost	: Tk. 60,000/-
Source of fund	: BARI
Priority	: First

Expt. 41 Development of alternate cropping pattern (Mustard-Tomato- T. Aman) against existing cropping pattern (Fallow-Late Tomato-T. Aman) in Dinajpur

Objectives	:	To increase cropping intensity and productivity through improve cropping pattern against farmers existing practice To increase crop yield and farmer's income
Rationale	:	The cultivable land in Bangladesh is decreasing at the rate of about 0.80% year ⁻¹ . There are some scopes of increasing cropping intensity by improving the present cropping pattern in the rice based cropping pattern. On the other hand, to produce more food with this limited area, three or more crops to be cultivated in the same piece of land in a year or to be increase the production efficiency of the individual crop by using optimum management practices. But so far little attention has been paid on oilseeds, pulses, spices etc. and the country is facing huge shortage in all these crop areas. Some farmers of Dinajpur districts are cultivating local Tomato varieties in late condition. After harvesting of tomato farmers keep their land fallow and wait for T. Aman rice (Aromatic rice). The pattern covers around 975 hectares of the total cultivated land of the locality (DAE, Dinajpur, 2023). So, there is a great opportunity to increase cropping intensity and productivity by replacing local variety with Hybrid Tomato variety and high yielding T. Aus rice (BRRI dhan 75) and including short duration mustard (BARI Sarisha-14) in the fallow period. With this point of view the present study was undertaken to evaluate the alternate cropping pattern and to increase system productivity.
Materials and methods	:	
Crop/Variety	:	Tomato (BARI Hybrid Tomato-11), T. Aman rice (BRRI dhan75) and Mustard (BARI Sarisha -14)
Design	:	RCBD
Treatments	:	EP = Fallow - Tomato (Bipul/Rani)-T.Aman rice (BRRI dhan34) AP = Mustard (BARI Sarisha-14)- Tomato (BARI Hybrid Tomato-11) -T.Aman rice (BRRI dhan75)
Replication	:	6
Plot size	:	5 m ×4 m
Planting system/spacing	:	Mustard: 30 cm × continuous; Tomato: 60 cm × 40 cm; T. Aman rice: 20 cm ×15 cm
Fertilizer dose and methods of application	:	Tomato: 150-45-60-30-2-1 NPKSZnB Kg/ha + Cowdung 3tha ⁻¹ All of Cowdung, P, S, Zn and B and half of N and K should be applied as basal during final land preparation. Remaining N and K should be applied in 2 equal splits at 25 and 50 DAP T. Aman: 85-15-70-10-2 NPKSZn (FRG, 2018). All of P, K, S, Zn, B of should be applied as basal during final land preparation. N should be applied 3 equal splits at seedling establishment stage, at early tillering stage and before panicle initiation stage. Mustard: 90-27-60-15-5-1NPKSZnB (FRG, 2018). All of P, K, S, Zn, B of should be applied as basal during final land preparation. N should be applied 2 equal splits at basal during final land and at early flowering stage.
Irrigated/ rainfed	:	Irrigated
Data to be recorded	:	Initial soil nutrient status, Dates of all operations, Yield and yield components, Economic analysis, Final soil nutrient status and nutrient balance

Investigator (s)	: M.S. Huda, M. M. Khanum and MR Sarker
Season	: <i>Rabi</i>
Date of initiation	: November, 2023
Date of completion	: October, 2026
Expt. Output	: Cropping intensity and productivity will be increased
Location	: KishanBazar, Sadar and Birgonj, Dinajpur
Status	: New
Estimated cost	: Tk. 100,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 42 Determination optimum Seed rate of proso millet in the charland

Objectives	: To findout the optimum seed rate of proso millet in the char land of Bogura. To disseminate and popularize BARI Cheena varieties to the farmers of Char land areas.
Rationale	: Proso millet is one of the important minor cereal crop in Bangladesh. It belongs to the family poaceae and used in various forms such as grain for human consumption, fodder for cattle, green manure, cover crop and short-lived forage. Proso millet is a fast growing, short season, drought tolerant, low input crop (Gowda and Kaul 1982). It is a promising crop for south East Asia and its ecological suitability is wide. The national average yield of Proso millet in Bangladesh is low. This low yield may be due to the cultivation of the low yielding local varieties, used high seed rate and lack of technical know-how etc. BARI has developed some high yielding Proso millet variety such as BARI Cheena-1 with several high quality parameters. This variety have potential to help generate farmers' income in very short period of time. The present study was undertaken to evaluate the performance of different seed rate under farmer's field condition and popularize them among the farmers to promote their adoption in char land of Bogura.
Materials & methods	:
Crop/variety	: BARI Cheena-1
Seed rate (kg ha ⁻¹)	: S ₁ : 25 (BARI rec. dose), S ₂ : 50, S ₃ : 75 and S ₄ : Farmer's practice 100.
Design & replication	: 6 (dispersed)
Plot size	: 40 m ²
Planting Method	: Broadcasting
Fertilizer dose & application method	: 60-21-42-8-0.75 kg of NPKSZn ha ⁻¹ . Total TSP, MOP, Gypsum, Zinc sulphate & half of urea as basal and rest half Urea were applied after seedling establishment followed by irrigation.
Irrigated/rainfed	: Rainfed
Data to be recorded	: Days to maturity, plant height, panicle length, 1000 seed weight, grain yield/plot, grain yield (t ha ⁻¹), lodging (%), disease insect reaction and farmer's opinion.
Investigators	: M.S. Alam, M.R.A. Mollah, & T. Hasan
Season	: Rabi
Date of initiation	: November 2023
Date of completion	: April 2025

Expected output : BARI Cheena variety would be disseminated to the respective areas and Farmers will be benefited.
 Location : Charland of Sonatola, Bogura.
 Status : New
 Estimated cost : Tk. 40,000/-
 Source of fund : BARI
 Priority : First

Expt. 43 Integrated management approach of thrips, white fly and jessid complex in chilli at Bogra region

Objective : To evaluate the effectiveness of IPM approach for controlling white fly, aphid, jessid and thrips in chilli
 Rationale : Chilli is one of the most important spice crops in Bangladesh. The crop is commercially cultivated in Bogura districts. But unfortunately, the crop is attacked by white fly, aphid, jessid and thrips. The pests attacking the crop in leaves, flower, fruits and causing considerable losses. But in Bangladesh very little information is available about their incidence. So, it is necessary to document the pests for developing appropriate management strategies. The present study was undertaken to observe the performance of this approach in a large scale among the farm community.

Treatments : T₁: Blue sticky trap + Use of pheromone mask trap + Bioclean/Biotrin/ Kmite/Success (spinoced)
 T₂: Cover the crops (60 mesh net)
 T₃: Farmers practice (spraying of insecticide)

Crop/variety : BARI Chilli-2
 Replication : 6 (dispersed)
 Unit Plot size : 20 decimal
 Planting system : The experiment will conducted on farmers established chilli fields
 Data to be recorded : Infested plant (%), Infested fruit (%), Plant height, fruits/plant, fruit length, fruit wt./plant, fruits yield (t ha⁻¹), disease insect reaction and farmer's opinion.

Investigators : T. Hasan, M.S. Alam and Z.H. Prodhan
 Season : Cropping season 2023-24 and 2024-25
 Expected output : Cost effective and environmentally safer suitable management tactic(s) for white fly, aphid, jessid and thrips may come out from the study

Location : Charland of Sariakandi, Bogura.
 Status : New
 Estimated cost : Tk. 40,000/-
 Source of fund : BARI
 Priority : First

Expt. 44 Development of alternate cropping Pattern Carrot-Groundnut-T. Aman instead of Potato-Groundnut – T. Aman in Charland area

- Objectives : To increase cropping intensity and productivity in Charland
To increase farmers income
- Rationale : Carrot is an important vegetable because of its large yield per unit area and its increasing importance as human food. It is orange-yellow in colour, which adds attractiveness to foods on a plate, and makes it rich in carotene; a precursor of vitamin A. It contains abundant amounts of nutrients such as protein, carbohydrate, fibre, vitamin A, potassium, and sodium (Ahmad et al., 2004). Carrot, like other vegetables, is a short duration crop and the farming community earns enormous profits through its cultivation. It has got some important medicinal values (Sadhu, 1993). It is believed that eating carrots improves night vision. It is used as salad and as cooked vegetable in soups, stews, and curries etc. and also used for the preparation of pickles, jam, and sweet dishes (Kabir et al., 2000). The popularity of carrot is increasing day by day and very much confined in urban area of Bangladesh. Bangladesh is one of the most densely populated countries of the world with population growth rate of 1.579%. The present cropping intensity of the country is 175.97%. Food requirement is estimated to be doubled in the next 25 years. Under such a situation, it is very important to increase cropping intensity and for this more suitable crop(s) should be accommodated in the existing cropping pattern for sustainable nutritional security. Stable char lands of the northern region of Bangladesh is now a promising area for root crop production. This crop is also suitable for nutritional purpose. The practice of carrot production instead of potato production is a promising technology in some areas which need to fit in cropping patterns under char land situations. The present study will be taken to achieve the aforesaid objectives.
- Materials and methods :
- Crop : Potato, Carrot, Groundnut and T. Aman
- Design : RCBD
- Treatments : T₁ (Alternate pattern): Carrot (Shidur) - Groundnut (BARI Chinabadam-9)-T. Aman (BRRI dhan87)
T₂ (Farmer's pattern): Potato (BARI Alu-25)-Groundnut (BARI Chinabadam-9) – T. Aman (Shawrna)
- Replication : 6 (dispersed)
- Plot size : 1320 m²
- Planting system/spacing : As per recommendation
- Fertilizer dose and methods of application : As per recommendation
- Irrigated/rainfed : Irrigated
- Data to be recorded : Dates of all operations, crop duration, yield and yield attributes, Cost and return, farmers' opinion.
- Investigators : M.Z. Ferdous
- Season : Rabi 2023-24
- Date of initiation : October, 2023
- Date of completion : October, 2026
- Expected output : Nutritional security and productivity would be increased.

Location : Char Gonai, kaunia and RajpurLalmonirhat
 Status : New
 Estimated cost : Tk. 90,000/-
 Source of fund : BARI
 Priority : 1st

Expt. 45 Effect of different mulching materials on yield of Brinjal

Objective (s) : To select suitable mulch for Eggplant production
 To control the weed in the eggplant field
 To increase the yield and income of farmer

Rationale : Brinjal or Eggplant (*Solanum melongena L.*) is one of the most popular vegetable crop grown in Bangladesh and other part of the world. It belongs to the family Solanaceae. It is widely cultivated in both subtropical and tropical regions of the globe mainly for its immature fruits as vegetables. Brinjal is grown throughout the year in Bangladesh. The unripe fruit is primarily used as a cooked vegetable for the preparation of various dishes in different regions of the world. It has potential as a raw material in pickle making and in dehydration industries. It is one of the most important indigenous vegetables in Bangladesh (Saifullah *et al.* 2012). In term of consumption, brinjal ranks third after potato and onion. Mulching is one of important techniques or practices of covering the soil to make more favorable conditions for plant growth, development and efficient crop production and reduces the weed population. It also improves the microbial activity of the soil by improving the environment around the root zone. Organic mulches add nutrients to the soil when decomposed by microbes and help in addition to soil organic carbon and nitrogen. Favorable soil edaphic environment under mulch improves crop productivity, enhances input-use efficiency and checks environmental pollution. Mulched and irrigated treatments have been shown to induce higher root growth in comparison with un mulched and rain fed treatments (Kumara *et al.* 2011). Water is the single factor which directly affects the brinjal yield because it required especially at flowering, fruit set, and enlargement stage. But irrigation facilities are not sufficient in all the regions of the country. In Bangladesh, mulching was evaluated to many vegetables like tomato, onion, garlic but there was no record of research work on brinjal. The objective of this study was to investigate the suitable mulch on growth and yield of Brinjal.

Crop/variety : BARI Begun-12
 Design : RCBD
 Treatment : T₁: Polythene mulch
 T₂: Straw mulch
 T₃: No mulch (Control)

Replications : 6 (compact)
 Plot size : 5.0m x 4.8m (unit plot)
 Planting system/spacing : Line sowing (100cm x 80cm)

Fertilizer dose and methods of application	As per recommended BARC, FRG/ 2018. Half of organic manure will be applied at the time of final land preparation. Remaining organic manure and all of Phosphorus, Sulphur, Zinc and Boron will be applied in pit before one week of transplanting seedlings. Nitrogen and potassium will be applied in four equal splits at 20, 40, 60 and 80 DAT as ring method around the plants and mixed thoroughly with the soil.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Initial soil status, Dates of all operations, Yield and yield attributes of all crops, Pest and disease reaction, Cost and return analysis, Farmers' opinion and Final soil status.
Investigator (s)	: Ummay Kulsum Laily, SO and scientist of OFRD, BARI, Rangpur
Season	: Rabi, 2023-24
Date of Initiation	: October 2023
Date of completion	: March 2025
Expected output	: Suitable mulch for maximum yield of Brinjal will be ascertained Yield and reduction of production cost will be increased by at least 20-25 %
Location	: On Station
Status	: New
Estimated cost	: Tk. 80000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 46 Seed Quality Improvement of Minor Grains (Foftail millet) in the Char Area of Gaibandha Through "Seed Plot Technique"

Objective	: To increase the availability of high-quality seed at farmers doorsteps and To buildup awareness of using quality seed for crop production for agricultural development
Rationale	: Gaibandha, is a district in northern Bangladesh with various char areas along the rivers of Brahmaputra and the Teesta which covers about 33,000 hectares of land, mostly in Fulchari, Saghata and Sundargonj upazilla. The people living in these char areas face numerous challenges, including poverty, lack of infrastructure, isolation from the mainlands and natural calamities. Foxtail millet may have some importance in char areas of Gaibandha because it can grow well in char areas during the dry seasons and can provide nutrition and food security for the inhabitants. Foxtail millet can also help improve soil fertility and prevent soil erosion by its extensive root system. The seed plot technique is a way of producing healthy, disease-free seed. The seed plot technique is important for minor cereals (foxtail millet) improvement in char areas of Bangladesh because it can help produce healthy and pure seeds that can withstand the severe environment of char areas. By using the seed plot technique, farmers can produce good quality seeds of foxtail millet in their local conditions and preferences while maintaining genetic purity and vigor over time. This can boost the productivity and profitability of foxtail millet farming in char areas, as well as improve farmers' food security and livelihoods.
Materials and methods:	: Activities (Select suitable location, Quality seed sowing, Seed treatment, Timely sowing, clean cultivation, Proper management practices, Rouging, Timely harvest, Threshing, cleaning and storing)

Crop/variety	: BARI Kaon-2
Design:	: RCBD
ii)Replications	: 6 (dispersed)
Plot size	: 200 m ²
Planting system	: Broadcasting
Fertilizer dose application	: As per FRG, 2018
Irrigated/rainfed	: Irrigated
Data to be recorded	: Yield, Incidence of disease, and Insect, economics and farmers opinion.
Investigator(s)	: Abdullah-Al-Mahmud, PSO, Md. Jahangir Alam, SSO, Mohammad Shohel Rana, SO and Concerned Scientist of Seed Technology Division, BARI
Season	: Rabi
Date of initiation	: November 2023
Date of compilation	: October 2025
Expected output	: Farmers in the char areas will be capable to produce quality seeds
Location	: MLT site, Fulchari/Saghata, Gaibandha
Status	: New
Estimated cost	: Tk. 80000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 47 Mixed Cropping of maize with leafy vegetables in Char Areas of Gaibandha

Objectives	: To get more yield from a single plot of land To ensure the nutritional security of char dwellers
Rationale	: Mixed cropping is a farming practice that involves planting two or more crops at the same time on the same plot of land. It helps to increase crop production more efficiently. Mixed cropping can reduce the risk of crop failure, increase soil fertility, reduced pest pressure, improved nutrient uptake, reduced weed pressure, and increased biodiversity as well as enhance the food and nutrition security of the farmers and consumers by providing a diverse range of crops that have different nutritional values and health benefits. Maize can attract beneficial insects that can control pests on spinach, radish and coriander, while these vegetables can reduce the incidence of fungal diseases on maize. Farmers in the Char area usually grow maize as a single crop. The combination of maize with spinach, radish and coriander can also help to reduce soil erosion by increasing soil cover. Therefore, mixed cropping of fast-growing vegetables spinach, radish and coriander with maize will increase production as well as meet the nutritional needs of farmers.
Materials and methods:	
Design:	: RCBD
Treatments	T ₁ : Sole Maize (BARI Hybrid Maize-16) T ₂ : Maize+Napashak (Local) T ₃ : Maize+Radish (BARI Mula-1) T ₄ : Maize+Coriander (BARI Dhanian-1)
Replications	: 6 (dispersed)
Plot size	: 4.5 m × 5 m

Plant spacing	: 75 cm × 25 cm
Fertilizer dose application	: As per FRG, 2018
Irrigated/rainfed	: Irrigated
Data to be recorded	: Yield, Incidence of disease, and Insect, economics and farmers opinion.
Investigator(s)	: Md. Jahangir Alam, SSO, Abdullah-Al-Mahmud, PSO, and Mohammad Shohel Rana, SO
Season	: Rabi
Date of initiation	: November 2023
Date of compilation	: October 2025
Expected output	: Productivity will be increased by 10-15%
Location	: MLT site, Saghata, Gaibandha
Status	: New
Estimated cost	: Tk. 60000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 48 Assessment of onion growing area in charland of Gaibandha through Geo Spatial technique.

Objectives	: To identify the onion growing area in the study area To estimate the onion production trends in the study area To validate the accuracy of remote sensing derived results with the field
Rationale	: Geo Spatial technique is a term that refers to the use of geospatial technologies, such as remote sensing (RS), geographic information systems (GIS), global positioning systems (GPS), and spatial statistics, to collect, analyze, and display spatial data related to crops and soils. This can help improve the management and planning of onion cultivation in these areas, as well as enhance the food security and livelihoods of the farmers.
Materials and methods:	: The methodology of the study will include RS and GIS assisted spatial modeling, regression model and validation of the methods which used to determine the feasibility of RS and GIS for mapping onion growing area in charland area. Datasets will be collected and prepared using Sentinel-2 satellite imagery (10 m) of scenes. The imagery will be freely downloaded from USGS website. The entire laboratory works e.g. image geo-referencing, processing and classification; validation etc. will be conducted in collaboration of BARI ICT Lab. Extensive field works will be done in different onion growing areas of charland in the Rabi season for identifying the training sites (field) with the help of GPS data. The onion growing area identification and estimation will be derived from Normalized Difference Vegetation Index (NDVI), Soil Adjusted Vegetation Index (SAVI), Atmospherically Resistant Vegetation Index (ARVI) and Enhanced Vegetation Index (EVI) calculated from band 2, 3, 4 and band 8 of the satellite imagery datasets. All spatial analysis and digitization works will be carried out using ArcGIS 10.7 software. Then, the onion growing area will be estimated in the GIS environment. Finally, the onion growing area will be estimated in the GIS environment for the year 2023-2024.

Fertilizer dose application : As per FRG, 2018
 Irrigated/rainfed : Irrigated
 Data to be recorded :
 Investigator(s) : Abdullah-Al-Mahmud, PSO, Md. Abdul Mottalib, SO, Md. Jahangir Alam, SSO, Mohammad Shohel Rana, SO
 Season : Rabi
 Date of initiation : November 2023
 Date of compilation : October 2025
 Expected output : Onion cultivated area in char areas of Gaibandha will be identified
 Location : Char areas of Gaibandha
 Status : New
 Estimated cost : Tk. 80000/-
 Source of fund : BARI
 Priority : 1st

Expt. 49 Performance of different mustard varieties in char land of Pabna

Objectives : To find out the suitable mustard varieties for char land condition. To popularize mustard varieties among the farmers and increase their income.

Rationale : The crop productivity of char lands is poor. The crop production can be increased by inclusion of high yielding. Farmers of char land generally grow local variety of crops. In some char land of Pabna after drop down of flood water farmers usually broadcast mustard on moist soil. But the farmers harvest poor yield from Tori-7 that can be increased manifold by introducing HYB mustard variety viz. BARI Sarisha-14, BARI Sarisha-15, BARI Sarisha-16 and BARI Sarisha-17 developed by Bangladesh Agricultural Research Institute. So, growing those high yielding varieties is only the way to increase productivity in this char land of Pabna.

Treatment:

	Set-A	Set-B
	T ₁ = BARI Sarisha-14	T ₁ = BARI Sarisha-11 T ₂ =
	T ₂ = BARI Sarisha-17	BARI Sarisha-16
	T ₃ = BARI Sarisha-19	T ₃ = BARI Sarisha-18
	T ₄ = BARI Sarisha-20	
	T ₅ = BINA Sarisha-9	
	T ₆ = Local (Tori-7)	

Materials and methods :
 Crop/variety : Mustard
 Design : RCBD
 Plot size : 5 x 4 m²
 Planting system/spacing : Broadcast
 Fertilizer dose and methods of application : Recommended fertilizer will be applied as basal and respective growth stages of mustard.
 Irrigated/rainfed : Irrigated
 Data to be recorded : Dates of all operations, Yield and yield attributes, Pest and disease reaction, Cost and return analysis and Farmers' opinion.
 Investigators : Md. Maniruzzaman, Md. Ariful Islam, Md. Zahedul Hasan and Mehera Afroz Suborna of OFRD, Pabna
 Season : Rabi
 Date of initiation : 1st week of November 2023

Date of completion	: 30 March 2024
Expected output	: Total productivity of the system will be increased.
Locations	: MLT site, Sujanagar
Status	: New
Estimated cost	: Tk. 40,000
Source of fund	: BARI
Priority	: 1 st

Expt. 50 Inter-space utilization through Drum stick and vegetables in mango-based Agroforestry systems

Objectives	: To introduce drum stick in agroforestry systems To increase productivity and income of the agro-forestry systems
Rationale	: In Pabna district, different fruits orchard has been established at the farmers' field. Farmers get economic return from guava, mango and litchi orchards only during the fruiting seasons. The remaining period they grow some vegetables in association with trees or remain fallow. Up to 6-7 years of fruits orchard the ground land can be utilized but thereafter the growing tree canopy make substantial shading on the ground. In these circumstances the ground land is remain totally unutilized or partially utilized with traditional spice crops. So, drum stick cultivation in agroforestry system may be good option for the farmers to generate additional income from these old fruit gardens. Treatment:
Materials and methods	: Factor A: Orchard Factor B: Vegetable i. Sole mango orchard ii. Mango orchard with drum stick i. Broccoli ii. Cauliflower iii. Cabbage iv. Tomato
Crop/variety	: BARI developed high yielding varieties of all the component crops.
Design	: Split plot
Plot size	: 5 x 8 m ²
Planting system/spacing	: Recommended spacing for all the component crops.
Fertilizer dose and methods of application	: Recommended fertilizer will be applied as basal and respective growth stages of crops.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Initial nutrient status of soil, Dates of all operations, Yield and yield attributes, Pest and disease reaction, Cost and return analysis
Investigators	: Md. Maniruzzaman, Dr. Ariful Islam, Md. Zahedul Hasan and MeheraAfrozSubornaof OFRD, Pabna and Dr. Robiul Alam, OFRD, Gazipur
Season	: Year round
Date of initiation	: 1 st week of October 2023
Date of completion	: 30 June 2025
Expected output	: Total productivity of the system will be increased.

Locations : FSRD site Gangarampur, Pabna
 Status : New
 Estimated cost : Tk. 50,000
 Source of fund : BARI
 Priority : 1st

Expt. 51 Development of vegetable based cropping pattern using summer tomato trellis

Objectives : To ensure proper utilization of summer tomato trellis.
 To increase productivity and income of the farmers

Rationale : In Pabna district, the cultivation of summer tomato is increasing day by day. The farmers have to establish bamboo trellis for summer tomato cultivation which is very costly. Farmers get economic return from tomato only during the fruiting seasons. The remaining period they have to remove those trellis for cultivating other crops which is time consuming and costly. There are some vegetables which can be easily grown on those trellis and some vegetables can be grown on the ground land of trellis. So, vegetable cultivation in summer tomato trellis may be good option for the farmers to generate additional income from these trellis and minimize their cost for trellis.

Treatment

Materials and methods : EP: Blackgram-Mustard/Lentil-Sesame/Jute
 IP: i) Summer tomato-Yearlong bean/Sweet gourd-Cucumber
 ii) Summer tomato- Sponge gourd/Long coriander- Cucumber

Crop/variety : BARI developed high yielding varieties of all the component crops.

Design : RCBD

Plot size : 5 x 12 m²

Planting system/spacing : Recommended spacing for all the component crops.

Fertilizer dose and methods of application : Recommended fertilizer will be applied as basal and respective growth stages of crops.

Irrigated/rainfed : Irrigated

Data to be recorded : Initial nutrient status of soil, Dates of all operations, Yield and yield attributes, Pest and disease reaction, Cost and return analysis

Investigators : Md. Maniruzzaman, Dr. Ariful Islam, Md. Zahedul Hasan and Mehera Afroz Suborna of OFRD, Pabna and Dr Quamrun-Naherm PSO, Gazipur

Season : Year round

Date of initiation : 1st week of October 2023

Date of completion : 30 June 2025

Expected output : Total productivity of the system will be increased.

Locations : FSRD site Gangarampur, Pabna

Status : New

Estimated cost : Tk. 60,000

Source of fund : BARI

Priority : 1st

Expt. 52 Evaluation of mechanized crop production packages for rice-based cropping pattern

Objectives	: To use BARI developed machinery in the agricultural operations. To compare the farmers' practice with the mechanized cultivation
Rationale	: In order to achieve the sustainable development goals (SDG) farm mechanization has been accepted as a frontier tool by the government. In the national agricultural mechanization policy of Bangladesh, it is acknowledged that mechanized agriculture is the future of Bangladesh agriculture. Rahman <i>et al.</i> (2021) reported that among the operations related to crop establishment, our country has attained sufficiency in land preparation, irrigation and spraying. Among the postharvest activities, threshing and processing are also mechanized. However, in other crucial operations like planting, weeding, fertilization and harvesting, the percentage of mechanization is negligible. In order to fulfil the targets of mechanization in the coming years, it is necessary to apply machines in every agricultural operation. BARI had developed power tiller operated seeder, bed planter, weeder, reaper etc. Development of mechanized crop production packages for different cropping systems is necessary for advocating the best combinations to the farmers. BARI seeder, upland weeder, reaper will be used in the rice based cropping patterns in Pabna. Farmers' practice will be compared with the mechanized operations. Opinions of the farmers will be collected to assess the impact of the machines.
Materials and methods	: the mechanized operations. Opinions of the farmers will be collected to assess the impact of the machines.
Crop/variety	: Mustard, sesame, black gram, rice
Design	: T-test Treatment: 1. Sowing, weeding and harvesting by BARI machines, 2. Conventional practice (manual) Replication: 06
Plot size	: N/A
Planting system/spacing	: Line sowing
Fertilizer dose and methods of application	: N/A
Irrigated/rainfed	: Irrigated
Data to be recorded	: Field Efficiency, Total Cost, BCR
Investigators	: M. Z. Hasan, M. Maniruzzaman, M. A. Suborna and M. A. Islam
Season	: Rabi and Kharif-1
Date of initiation	: 1 st week of October 2023
Date of completion	: 30 June 2025
Expected output	: Drudgery and costs related to manual practices will be reduced.
Locations	: PabnaSadar, Atghoria, Gangarampur
Status	: New (2-year experiment)
Estimated cost	: Tk. 40,000
Source of fund	: BARI
Priority	: 1 st

Expt. 53 Performance evaluation of a modified power weeder for narrow-row crops

Objectives	:	To modify a petrol engine powered light weight weeder for crops sown in rows at 15-30 cm apart To evaluate performance of the weeder in the experimental fields On-farm evaluation and fine tuning of the weeder based on field performance
Rationale	:	Weeds remain one of the most significant agronomic problems associated with arable crop production. Weeds can significantly reduce crop yield and quality in conventional and organic crops alike. Competition between crops and weeds is a serious challenge to crop production; weeds compete with crops for nutrients, light, space and water, therefore weed control between rows is necessary and important to achieve maximum productivity. Mechanical weed control is effective in controlling weeds as well as it benefits the crop by breaking up the surface crust, aeration of soil, stimulating the activity of soil microflora, reducing the evaporation of soil moisture and facilitating the infiltration of rainwater. To address the weeding problem, BARI developed manual and mechanical weeders for upland crops. But the BARI power weeder is suitable only for wide-row (60-70 cm) crops. Therefore, a power weeder is required for narrow-row crops (15-30 cm) to reduce drudgery of manual weeding and reducing the use of chemicals for weed control. A petrol engine operated brush cutter will be procured from the market. Brush cutters can accommodate different attachments on its end. Among these there is a weeding attachment (25 cm wide) consisting of 16 tines.
Materials and methods	:	
Crop/variety	:	Pulses (lentil, mungbean, black gram), mustard, onion, garlic RCBD
Design	:	Treatment: 1. Weeding by modified weeder, 2. Manual weeder, 3. Conventional weeding (by hand) Replication: 04
Plot size	:	N/A
Planting system/spacing	:	N/A
Fertilizer dose and methods of application	:	N/A
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Field Capacity, Weeding Efficiency, Plant Damage, Performance Index
Investigators	:	M. Z. Hasan, M. Maniruzzaman, M. A. Suborna and M. A. Islam
Season	:	Rabi and Kharif-1
Date of initiation	:	1 st week of October 2023
Date of completion	:	30 June 2025
Expected output	:	Drudgery and costs related to manual weeding will be reduced.
Locations	:	PabnaSadar, Atghoria and Ishurdi
Status	:	New
Estimated cost	:	Tk. 60,000
Source of fund	:	BARI
Priority	:	1 st

Expt. 54 Performance evaluation of an inflatable solar dryer for pulse and oilseed crops

Objectives	: To use the solar bubble dryer for drying plant and grain samples To compare the conventional practice with the solar bubble dryer The Solar Bubble Dryer (SBD) is the latest low-cost drying technology developed by IRRI, Hohenheim University and GrainPro. The SBD is mobile and is completely independent from fuel or the power grid, and therefore has very low operating cost. The first version of the Solar Bubble Dryer was commercialized in September 2014. It comes in two sizes with 1t and 0.5t capacity. IRRI used this dryer for mainly drying paddy. However, it can be used for drying other crops also. In Bangladesh use of dryers cannot be found among the farmers. Farmers
Rationale	: spread the grains or plants (pulses and oilseeds) in the open fields, roads, roofs or yards of their houses for sun drying which causes loss or deterioration of the grain's quality by means of animals, dust, re-wetting by rainwater etc. Commercially available dryers are bulky, costly and require fuels to operate. Solar bubble dryer is free from these drawbacks and actually improves the drying method of the farmers. Therefore, performance evaluation of a solar bubble dryer should be done to assess its efficiency and suitability for different plant and grain samples. A solar bubble dryer will be procured or fabricated to test for paddy,
Materials and methods	: oilseeds, pulses, oilseeds and plant samples. This dryer will be compared with the open sun drying method.
Crop/variety	: Paddy, pulses, oilseeds T-test
Design	: Treatment: 1. Solar bubble dryer, 2. Conventional practice (open sun drying) Replication: 06
Plot size	: N/A
Planting system/spacing	: N/A
Fertilizer dose and methods of application	: N/A
Irrigated/rainfed	: N/A
Data to be recorded	: Solar Radiation, Temperature, Relative Humidity, BCR
Investigators	: M. Z. Hasan, M. Maniruzzaman, M. A. Suborna and M. A. Islam
Season	: Rabi and Kharif-1
Date of initiation	: 1 st week of October 2023
Date of completion	: 30 June 2025
Expected output	: Post harvest losses in open sun drying will be eliminated.
Locations	: Pabna
Status	: New
Estimated cost	: Tk. 50,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 55 Effects of chemical and mechanical weed control on productivity and economic performance of garlic in Chalan Beal area

Objectives	:	To assess the effects of integrated weed management for economic weed control in zero tillage garlic To evaluate the comparative effectiveness of herbicide and in combination with hand weeding
Rationale	:	Garlic botanically known as <i>Allium sativum</i> is an important spice ranking the second both in acreage and production among the spices in Bangladesh. Being a commercial crop, farmers invest more money through costly inputs like seeds, fertilizers, plant protection measures and irrigation for achieving higher yield. Garlic is generally cultivated through conventional methods of land preparation with irrigation. But farmers of Chalan bill area cultivate garlic with rice straw mulch just after the harvest of T-aman rice for avoiding late planting which may cause considerable yield reduction. Under conventional system, tillage affects weeds by uprooting, dismembering, and burying them to depths too deep for emergence. Tillage changes the soil environment and inhibits weed seed germination and establishment. On the other hand, mulched condition of garlic preserves adequate moisture which may favor weed seed germination and growth. Weed infestation is the major factor responsible for reduction in bulb yield up to 30-60% (Lawandeet <i>al.</i> 2009). Garlic is a long duration crop and a single hand weeding is not sufficient to control weeds in garlic. This necessitates the reliance on herbicides for an effective and timely control of weeds in garlic (Kumar <i>et al.</i> 2013). However, continuous and intensive use of herbicide over a period of time leads to development of resistant biotypes within the weed community (Shibayama 2001). In this respect, integrated weed management practices may control weeds economically. Therefore, this study has been undertaken to find out an integrated weed management practice to control weeds under zero tillage mulched condition.
Materials and methods	:	Treatments: <ol style="list-style-type: none"> 1. Pendimethalin alone (will be sprayed pre-emergence 2 days after first irrigation in moist condition) @ 0.80 kg a.i. ha⁻¹ 2. Pendimethalin + 1 Hand Weeding (HW) 3. Oxadiazon alone (will be sprayed pre-emergence 2 days after first irrigation in moist condition) @ 0.25 kg a.i. ha⁻¹ 4. Oxadiazon + 1 HW 5. Metribuzin alone (will be sprayed pre-emergence 2 days after first irrigation in moist condition) @ 0.45 kg a.i. ha⁻¹ 6. Metribuzin + 1 HW 7. Farmers' practice (2-3 HW) 8. Weed free 9. Control (no weeding)
Crop/variety	:	Garlic
Design	:	RCBD
Plot size	:	4 m X 3 m
Planting system/spacing	:	As per recommended spacing for onion.
Fertilizer dose and methods of application	:	All fertilizer dose and methods of application will be followed as per FRG' 2018
Irrigated/rainfed	:	Irrigated

Data to be recorded	: Germination (%), weed density, absolute density, relative density and intensity of weed infestation, phytotoxicity, weed index, weed control efficiency, yield and yield contributing character
Investigators	: Mehera Afroj Suborna, Md. Zahedul Hasan, Md. Maniruzzaman, Md. Ariful Islam and Dr. Quamrun-Naher, Gazipur
Season	: Rabi
Date of initiation	: November, 2023
Date of completion	: March, 2026
Expected output	: An integrated weed management practice will be determined for controlling weeds
Locations	: MLT site, Atghoria, Pabna
Status	: New
Estimated cost	: Tk. 40,000
Source of fund	: BARI
Priority	: 1 st

Expt. 56 Intercropping of Tomato + Sweet gourd with Cauliflower

Objectives	: To increase production efficiency To minimize production cost and maximize farmers income
Rationale	: Relay cropping is a method of multiple cropping where one crop is seeded into standing second crop well before harvesting of second crop. In this practice, vertical expansion of crop production is possible that increase total productivity per unit area than sole cropping. Climate change, soil degradation, and natural resource depletion are emerging as the most significant obstacles to agricultural yield and environmental sustainability in modern agriculture. There are few options for dealing with these difficulties in the context of the conventional farming system. So, relay cropping has a chance to resolve a number of issues, including inefficient use of existing resources, conflicts over planting timing, fertilizer use, and degradation of the soil. Boror char, Mymensingh has a large vegetable growing area where many sorts of winter vegetables were grown. Among them tomato, cabbage, cauliflower, chilli, brinjal, bottle gourd, country bean are more potential. Farmers of this area have limited time to grow vegetable in short winter because of submerged the area in summer by flood. Therefore, in this fertile char land has an ample scope to rapid utilize the land through relay cropping system. Because relay cropping is a complicated set of different resource-efficient technologies, which possesses the capability to improve soil quality, increase net return, increase land equivalent ratio, and control the weeds and pest infestation. Therefore, the experiment will be conducted for increasing production efficiency and environmental sustainability with special focus on land utilization at Boror char, Mymensingh.
Materials and Methods	: Planting material (Tomato, Sweet gourd and Cabbage)
Crop/ Variety	: Tomato, Sweet gourd and Cabbage
Design	: RCBD
Treatments	: T ₁ = Cauliflower + Toamto + Sweet gourd T ₂ = Cauliflower + Toamto T ₃ = Cauliflower + Sweet gourd T ₄ = Sole Cauliflower 06 (dispersed)
Replications	:

Plot size	:	1.0 m × 10 m
Planting system/spacing	:	Transplanting date of Cabbage: 1 st week of September, Spacing: 60cm × 50 cm Transplanting date of Tomato: 1 st week of October, Spacing: 60cm × 50 cm Transplanting date of Sweet gourd: 1 st week of November, Spacing: 2m × 2 m
Fertilizer dose and method of application	:	As per FRG' 2018, Full dose for cabbage, ½ dose for tomato and 1/3 dose for Sweet gourd
Irrigated/rainfed	:	Irrigated
Data to be collected	:	Dates of all operations, Yield and yield attributes of all crops Pest and disease reaction, Cost and return analysis, Farmers' opinion
Season	:	Kharif-II to rabi
Date of initiation	:	August' 2023
Date of completion	:	April, 2024
Expected output	:	Suitable relay cropping option will be selected and at least 50-55% higher economic return could be possible than sole crop.
Location (s)	:	Mymensingh sadar, Mymensingh
Status	:	New
Estimated cost	:	Tk. 50000
Source of fund	:	BARI
Priority	:	1 st
Investigator(s)	:	Dr. M. A. Islam and Dr. M. M. Zaman

Expt. 57 Intercropping of yard long bean with brinjal

Objectives	:	To determine the feasibility of intercropping of yard long bean with brinjal. To increase yield and economic return of the farmers.
Rationale	:	Intercropping is one of the most important practices used in sustainable agriculture having role in increasing the total productivity. One of the advantages of this system is that it gives an assurance against crop failure which is common in developing countries. The value of intercropping system has been gaining recognition because of its ability to reduce damage caused by pest and diseases, ensure greater yield stability by producing some yield even though some of the component crops failed. It increases total productivity per unit area through maximum utilization of land, labor and growth resources (Craufard, 2000; Marshal and Willey, 1983). Brinjal is an important vegetable crop in Bangladesh, which can be grown throughout the year. Inclusion of legumes enhances crop and nitrogen yields of the non-legumes (Wood and Mayers, 1987). It is grown with wider spacing. So, in the inter-row space of brinjal with yard long bean can be grown in summer as intercrop for higher economic return as well as soil nutrient status can be improved. Hence, this study is undertaken to assess the feasibility of intercropping of yard long bean with brinjal.
Materials and Methods	:	
Crop	:	Brinjal and Yard long bean
Variety	:	BARI Begun-8 and BARI Borboti-2
Spacing	:	Brinjal: 75cm × 50cm; Yard long bean: 30cm × 20cm
Seed rate (ha ⁻¹)	:	20-25 kg and 200-250 g
Treatments	:	T ₁ = Brinjal + One row yard long bean T ₂ = Brinjal + Two row yard long bean T ₃ = Yard long bean (Sole)

	T ₄ = Brinjal (Sole)
Design	: RCBD
Replications	: 06 (six) dispersed
Unit Plot size	: 8m x 5m
Fertilizer dose	: 172-30-125 N-P-K kg ha ⁻¹ + CD 5 t ha ⁻¹ (Recommended dose FRG' 2018)
Application of fertilizer	: Half of cow dung will be applied during final land preparation. The remaining half of the cow dung and the entire amount of TSP and one third of MOP will be applied during pit preparation. The rest of MOP and urea will be applied in two equal splits at 21 and 35 days after Transplanting.
Data to be collected	: Dates of all operations Yield and yield attributes of all crops Disease and insect infestation Farmers' opinion
Expected output	: At least 20% higher economic return could be possible than sole crop
Status	: New
Date of initiation	: February' 2024
Date of completion	: June' 2024
Estimated cost	: Tk. 50000
Source of fund	: BARI
Location (s)	: Trishal, Mymensingh
Investigator(s)	: Shammi Akhtar, SSO and Dr. M. Moniruzzaman, PSO

Expt. 58 Development of alternate cropping pattern Maize - T. Aus rice - T. Aman rice against farmers existing Boro rice–Fallow–T. Aman rice at Manikganj

Objectives	: To introduce a new rice variety in the fallow period during T. Aus season. To introduce a high yielding rice variety during T. Aman season. To introduce hybrid maize replacing Boro rice. To increase cropping intensity and economic return of farmers
Rationale	: Seasonal flooding is a common phenomenon in the low lying areas of Manikganj district. Now a day the pattern of flooding has been changed due to the low rainfall and medium high lands do not inundated by flood water. During to fallow period, T. Aus rice could be grown. Farmers those who are not interested to grow mustard, high yielding T. Aman rice during Kharif-II season and Boro rice during Rabi season could be replaced by cultivating hybrid maize which is more profitable than Boro rice. Thus, introduction of high yielding T. Aman and winter hybrid maize could increase total productivity and profitability over farmers existing cropping pattern.
Materials and Methods	:
Crop	: Winter Hybrid maize, T. Aus rice and T. Aman rice
Varieties	: Maize : BARI Hybrid Maize=16, T. Aus rice : BRRI dhan98 and T. Aman rice : BINA dhan-17
Design	: RCBD
Treatments	: Improved pattern : Hybrid maize (BARI Hybrid Maize-16) – T. Aus rice (BRRI dhan98)–T. Aman rice (BINA dhan-17) Existing Pattern : Boro rice (BRRI dhan29) – Fallow – T. Aman (BRRI dhan49)
Replication	: 06 (dispersed)
Area	: 5 decimal for each unit plot
Fertilizer	: As recommended (FRG Guide BARC, 2018)

Data to be recorded	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost and returns analysis and Farmers opinion
Investigators	: Concern scientists Dr. Md. Ruhul Amin and Md. Emdadul Haque of OFRD, Manikganj
Expected output	: New cropping pattern will be developed
Status	: New
Initiation	: July, 2023
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Location	: Katigram, Sadar Manikganj

Expt. 59 Performance of early bulking potato varieties as intercrop with winter hybrid maize at Manikganj

Objective(s)	: To increase the cultivation area under potato intercropped with hybrid maize. To get higher productivity and farmers income.
Rationale	: Intercropping is a traditional practice for marginal farmers of developing countries. It increases total productivity through better utilization of land, labor and growth resources (Ahmed <i>et al.</i> , 2006). Greater productivity in intercropping system is commonly achieved by minimizing inter-specific competition and maximizing complementary use of growth resources (Islam, 2002). Inter-specific competition may be minimized through judicious choice of crops (Santalla <i>et al.</i> , 2001). Some of the progressive farmers of Manikganj district cultivate potato as intercrop with Rabi maize while most of the farmers at Manikganj generally grow winter hybrid maize as a sole crop during Rabi season and it required longer field duration (about 5-6 months). The space in between two rows of maize could be used for growing other potato as intercrop. Tuber Crop Research Centre (TCRC) of BARI has developed some early bulking varieties of potato those can be harvested within 70 to 80 days. Thus farmers can get quick return from potato. On the other hand, winter hybrid maize provides higher grain yield with higher market price. Thus, cultivation of short duration potato as intercrop with winter hybrid maize may increase total productivity as well as farmers' income. The experiment was therefore undertaken to popularize this technology among the farmers and to increase area and production under this intercrop systems.
Materials and method	:
Crop/variety	: Potato: BARI Alu-79 Maize: BARI Hybrid Maize-16
Design	: RCBD
Treatment	: T ₁ = Maize (75cm x 25cm) + 1 rows of potato (60cm x 25cm for cut tuber) T ₂ = Sole maize (75cm x 25cm)
Replications	: 6 (dispersed)
Plot size	: 10m x 10m
Planting system/spacing	: Line sowing as per treatments. Three rows of potato will be planted in between two rows of maize.
Fertilizer dose and methods of application	: Hybrid maize will be fertilized with 250-60-100-30-5-1 kg, N-P-K-S-Zn-B ha ⁻¹ respectively along with 5.0 t ha ⁻¹ of cow dung in the form of urea, triples super phosphate (TSP), muriate of potash (MOP), gypsum, zinc sulphate and boric acid. One third of urea and all other fertilizers to be applied as basal at final land preparation. The rest of the urea to be applied

	in two equal splits at 30 and 60 days after emergence. No extra fertilizer will be given on potato.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operation, Plant population/m ² , Yield and yield, contributing characters, LER, Chilli equivalent yield, Major disease and pest incidence, Economic analysis and Farmers opinion
Investigator(s)	: Concern scientists Dr. Md. Ruhul Amin and Md. Emdadul Haque of OFRD, Manikganj
Season	: Rabi-2023
Date of initiation	: Mid November, 2023
Date of completion	: Mid May, 2024
Expected output	: Area under potato-hybrid maize intercropping systems will be increased and farmers will benefit.
Location	: Sadar Manikganj
Status	: New
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 60 Development of alternate cropping pattern Mustard-Danta-T.Aus-T.Aman rice against Boro-Fallow-T. Aman rice cropping pattern in Narsingdi

Objectives	: To improve the existing cropping pattern To increase economic return of farmers To increase productivity of oil seed crop and cropping intensity To increase T.Aus rice areas in Narsingdi
Rationale	: Boro-Fallow-T.Aman cropping pattern is one of the major cropping pattern in Narsingdi district. The pattern covers around 14520 ha of the total cultivated area of the Narsingdi (DAE, Narsingdi 2018). Some pocket area is comparatively possessing scarcity of irrigation water to cultivate Boro rice. Where mustard can be grown easily with low inputs. It can play partial role in fulfill the oil crisis of Bangladesh. On the other hand vegetable cultivation is increasing day by day in Narsingdi. There is a scope of introduce any T.Aus rice in the cropping pattern during fallow period. BRRI has developed high yielding modern T.Aus varieties, which may be introduced in the cropping pattern. In order to produce more food within a limited area. To increase the cropping intensity, producing four or more crops on the same land around the area. After harvesting the vegetable (danta) land remained fallow in some days before sowing of T. Aman rice which can be grown T. Aus rice. Then the alternate cropping pattern Mustard-Danta-T. Aus-T. Aman rice is done properly.
Materials and Methods	:
Crop	: Sarisha, Danta, Rice
Variety	: BARI sarisha-18, BARI danta-2, T.Aus: BRRI dhan98, T.Aman: BRRI dhan71
Date of sowing	: Mustard-November/2023, Danta-February/2024, T.Aus-May/2024, T.Aman-August/2024
Design	: RCBD
Treatment	: (a) Existing cropping pattern: Boro-Fallow-T.Aman rice (b) Alternate cropping pattern: Mustard-Danta-T.Aus-T.Aman rice
Fertilizer dose	: STB dose of fertilizers following FRG 2018
Replication	: 6 dispersed
Unit plot size	: 1200 sq. m
Data to be recorded	: Dates of all operation Yield and yield contributing characters and equivalent yield

	Major disease and insect incidence
	Farmers' opinion
Investigator(s)	Dr. Md. Asaduzzaman, PSO, Dr. Md. Hafizur Rahman, SSO of OFRD, Shibpur, Narsingdi
Spacing	: 20cm × 15cm
Expected output	: Cropping intensity will be high.
Locations	: MLT sites of Narsingdi
Status	: New
Source of fund	: Tk. 40,000/-
Priority	: First

Expt. 61 Improvement of Potato/ Sweet gourd/ Brinjal/Creeper vegetables against existing cropping pattern Potato/ Cucumber- T. Aman rice

Objective(s)	: To improve the existing cropping pattern and increase cropping intensity. To increase yield and economic return of farmers
Rationale	: Potato – Cucumber - T. Aman is the major existing cropping pattern at the MLT site, Madhupur (Dhanbari), Tangail. This pattern covered 1.13% (2742 ha) of the total cultivable land (242079 ha) of Tangail district (DAE, Tangail, 2021). After T. Aman harvests the farmers normally cultivate potato and after potato harvest they cultivate cucumber (ash gourd/sweet gourd/bitter gourd/sponge gourd/ snake gourd). Now a days some innovative farmers planted brinjal seedling at 30-35 days after potato harvest in between cucumber rows to get more benefit. At the last stage of brinjal they can easily cultivate different creeper vegetables as relay crop on brinjal plant to get support as trails. Under this situation, BARI released high yielding new variety of potato, sweet gourd, drinjal and creeper vegetable will be cultivate. Thus this improve cropping is undoubtedly be highly productive and economically profitable than the existing cropping pattern. Hence, the trial may be conducted to improve the existing cropping pattern, increase cropping intensity, higher yield and economic return of the farmers.
Materials and Methods	:
Treatments	: Existing CP: Potato (BARI Alu-7)/ Cucumber (Bitter gourd/ sponge gourd/snake gourd) -T. Aman (Pajam/BRRI dhan49) Improve CP: 1) Potato (BARI Alu-41/44) +Sweet gourd (BARI Mistikumra-2/ BARI Hybrid Mistikumra-2)- T. Aman (BRRI dhan75) 2) Potato (BARI Alu-41)/ Sweet gourd (BARI Mistikumra-2/ BARI Hybrid Mistikumra-2)/ Brinjal (BARI Begun-8/ BARI Begun-10)/ Creeper vegetables (Cucumber, Bitter gourd, Yard long bean)
Planting system	: Seeding/Transplanting
Design	: RCBD
Replications	: 6 (dispersed)
Plot size	: 400 m ²
Fertilizer dose/rates	: As recommended (FRG Guide BARC, 2018)
Irrigation/Rainfed	: Irrigated (As and when necessary)
Data to be recorded	: Dates of all operations, Yield and yield attributes of crops, Pest and disease reaction, Cost and return analysis, Farmers' opinion
Investigator(s)	: M. A. Rahaman, SSO; S. Roy, SO; T. Tasmima, SO; K. Roy, SSO; and G Paul, SO, OFRD, BARI, Tangail
Season	: Rabi, 2023-24
Date of initiation	: November, 2023
Date of completion	: 2025-26

Expected output	: At least 20-25 % higher economic return could be possible than existing pattern
Location	: MLT site, Dhanbari, Tangail
Status	: New
Estimated cost	: Tk. 90000/ -
Source of fund	: BARI
Priority	: 1 st

Expt. 62 Mixed cropping of lentil with groundnut varying different plant population at the charland of Tangail

Objectives	: To verify the agronomic and economic performance of mixed cropping of lentil with groundnut To ensure the maximum utilization of the land for higher yield and income.
Rationale	: Lentil is the most popular pulse crop in Bangladesh. The area of lentil cultivation in the country is decreasing day by day because of poor yield. In the charland of Bhuapur, Tangail most of the farmer cultivate local lentil variety and get poor yield. In this char area local groundnut (napus) also grown scatte redly. Both Groundnut and Lentil are cultivated as sole crop throughout the country in <i>rabi</i> season and sometimes as mixed crop in farmer's field. It is observed that, some farmers of Bhuapur char area cultivate lentil as a mixed crop with groundnut without determining benefit, cost and return and land use efficiency. The Farmers do not maintain proper seeding ratio, planting time and other management practices. Mixed cropping reduces the risk of total crop failure as two or more different crops are cultivated simultaneously in the same field. Therefore the present study is proposed to verify the agronomic and economic performance of mixed cropping of lentil with groundnut and also ensure the maximum utilization of the land for higher yield and income.
Materials & Methods	:
Design	: RCBD
Replication	: 6 (dispersed)
Crops	Groundnut: BARI Chinabadam-9; Lentil: BARI Masur-6 and Local
Treatments	: T ₁ = Sole groundnut (100%) T ₂ = Sole groundnut (100%) + 20% lentil T ₃ = Sole groundnut (100%) + 30% lentil T ₄ = Sole groundnut (100%) + 40% lentil
Plot size	: 10 m x 8 m
Fertilizer dose	: As per recommendation of FRG, 2018
Irrigation/rainfed	: Irrigated/ Rainfed
Data to be recorded	: Date of all operations, Yield and yield contributing characters & equivalent yield, Major disease and insect incidence, Cost and return analysis and Farmers' opinion
Investigators	: T. Tasmima, SO; M. A. Rahaman, SSO; S. Roy, SO; K. Roy, SSO; and G Paul, SO OFRD, BARI, Tangail
Expt. Output	: Increase the total productivity and increase economic return at least (30-40%) by growing lentil and groundnut as mixed cropping
Location	: MLT site Bhuapur, Tangail
Season	: Rabi 2023-24
Date of initiation	: November, 2023
Status	: New
Estimated cost	: Tk. 90000 /-
Source of fund	: BARI
Priority	: 1 st

Expt. 63 Effect of sowing time on yield of capsicum in Tangail

Objective	:	To find out suitable sowing time on yield and yield attributes of Capsicum in Tangail
Rationale	:	Sweet pepper (<i>Capsicum annuum</i> var. <i>grossum</i> L.) belongs to the family Solanaceae under the genus Capsicum. Sweet pepper is used either green or red, and may be eaten as cooked or raw, as well as in salad. It is also used for pickling in brine, baking and stuffing. The leaves are also consumed as salad, soup or eaten with rice. The nutritive value of sweet pepper is high as it contains 1.29 mg protein, 11 mg calcium, 870 I.U vitamins-A, 175 mg ascorbic acid, 0.06 mg thiamine, 0.03 mg riboflavin and 0.55 mg niacin per 100g edible fruit. The vitamin C content was found as high as 321 mg. Meanwhile, Sweet pepper is a minor vegetable in Bangladesh and its production statistics is not available. The crop has got high export potentiality. Considering its high nutritive value and export potentiality, it is imperative to take attempts for its successful cultivation in the country. Successful cultivation of any crop depends on several factors. Sowing date is one of the important aspects for production system of different crops. Optimum sowing or planting time ensures proper growth and development of plant resulting maximum yield of crop and economic use of land. Capsicum is very sensitive to water logging. Unfortunately, due to heavy rainfall every year farmers facing a huge problem in sowing for this crop in Tangail region. They are unable to take capsicum crop in the field before the last week of October. In this reason, it needs to adjust sowing time for avoiding heavy rainfall and getting higher yield. So, the present study was carried out to clarify the optimum sowing/planting time for capsicum in Tangail region.
Materials and Methods	:	
Crops/variety	:	Sweet pepper (BARI Mistimorich-1 & BARI Mistimorich-2)
Design	:	RCBD
Replication	:	03
Treatment	:	Treatments: 4 sowing time viz. i) 01 October ii) 15 October iii) 01 November iv) 15 November
Plot Size	:	20 m ²
Spacing	:	45 cm × 45 cm
Fertilizer dose	:	As recommended by FRG, 2018
Irrigated/rainfed	:	Irrigation-as and when necessary
Data to be recorded	:	Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost and return analysis and Farmers' opinion
Investigators	:	T. Tasmima, SO; M. A. Rahaman, SSO; S. Roy, SO, K. Roy, SSO; and G Paul, SO, OFRD, BARI, Tangail
Season	:	2023-24
Date of initiation	:	2023
Expected output	:	Optimum sowing time will be identified
Locations	:	FSRD site, Atia, Delduar and MLT site, Dhonbari, Tangail
Status	:	New
Estimated cost	:	Tk. 60000
Source of fund	:	BARI
Priority	:	1 st

Expt. 64 Effect of planting time on yield of BARI Begun-12 in Tangail

Objective	:	To find out suitable sowing time on yield and yield attributes of BARI Begun-12 in Tangail
Rationale	:	Eggplant (<i>Solanum melongena</i>) is widely cultivated in Bangladesh and is considered as the second major important vegetable crop after potato in relation to its total production. It's grown widely round the year throughout the country. Considering its high nutritive value and export potentiality, it is imperative to take attempts for its successful cultivation in the country. We know that successful cultivation of any crop depends on several factors. Sowing date is one of the important aspects for production system of different crops. Optimum sowing or planting time ensures proper growth and development of plant resulting maximum yield of crop and economic use of land. During the recent years Horticulture Research Centre (HRC) of BARI has developed some brinjal varieties among them the latest one is BARI Begun-12 which is high yielding and tolerant to pest and diseases. In Tangail region farmers facing a huge problem in sowing this crop. They are unable to grow brinjal before the last week of October due to heavy rainfall every year. In this reason, it needs to adjust sowing time for avoiding heavy rainfall and getting higher yield. So, the present study was carried out to clarify the optimum sowing/planting time for BARI Begun-12 in Tangail region.
Materials and Methods	:	
Crops/variety	:	BARI Begun-12
Design	:	RCBD
Treatment	:	Treatments-5 sowing time viz. i) 01 October, ii) 15 October iii) 01 November iv) 15 November v) 01 December
Replication	:	06
Plot Size	:	20 m ²
Spacing	:	100 cm × 70 cm
Fertilizer dose	:	As recommended by FRG, 2018
Irrigated/rainfed	:	Irrigation-as and when necessary
Data to be recorded	:	Dates of all operations, Yield and yield contributing characters, Major disease and insect incidence, Cost and return analysis and Farmers' opinion
Investigators	:	S. Roy, SO; M. A. Rahaman, SSO; T. Tasmima, SO; K. Roy, SSO; and G Paul, SO, OFRD, BARI, Tangail
Season	:	Rabi
Date of initiation	:	Mid-October, 2023
Expected output	:	Optimum sowing time will be identified
Locations	:	FSRD site, Atia, Delduar; MLT site, Bhuapur, and MLT site, Dhonbari, Tangail
Status	:	New
Estimated cost	:	Tk. 60000
Source of fund	:	BARI
Priority	:	1 st

Expt. 65 Improvement of Existing Cropping Pattern Mustard- Kenaf-T. Aman rice

Objective(s)	: To introduce BARI Sarisha-18 in the study area : To increase productivity and farmers income.
Rationale	: Now Mustard-Kenaf-T.Aman cropping pattern is a popular and important cropping pattern in Kishoreganj. This cropping pattern acquires more than 500 ha of land. In this cropping pattern farmers use BARI Sarisha-14 and 17 varieties whose are short duration but low yielder than BARI Sarisha-18. After harvesting BARI Sarisha-14, the land is fallow for a short period of time to go for next crop Kenaf. If long duration and high yielding BARI variety (BARI Sharisa-18) inserted in these area, fallow period will be properly used as well as crop productivity and farmers' income may increase which ultimately reduce oil scarcity of the country. So the present program has been taken for proper use of fallow period to increase land use efficiency, crop productivity as well as economic return of farmers.
Materials and Methods	:
Crop/variety	: Mustard: BARI Sarisha-18, Jute: Kenaf (HC-95), T. Aman: Binadhan-17
Design	: RCBD
Treatment	: Improved CP: Mustard (BARI Sarisha-18)- Kenaf (HC-95)-T. Aman (Binadhan-17) Farmers CP: Mustard (BARI Sarisha-14)- Kenaf (HC-95)-T. Aman (BRRIdhan49)
Replications	: 6 (dispersed)
Plot size	: 10 decimal
Planting system/spacing	: All crops planted in line sowing method by BARI PTOS
Fertilizer dose and application methods	: Recommended dose as per FRG-2018
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, Yield and yield attributes of crops, Pest and disease reaction, Cost and return analysis
Investigator (s)	: Dr. M. Mohiuddin and Md.Yeasinul Haque Rayhan,
Season	: Robi
Date of initiation	: November 2023
Date of completion	: October, 2026
Expected output	: Productivity and oilseed production may increase and reduce import of oil as well as save foreign currency
Location	: MLT site, Karimganj and Kishoreganj Sadar.
Status	: New
Estimated cost	: Tk. 80000
Source of fund	: BARI
Priority	: 1 st

Expt. 66 Development of alternative cropping pattern mustard- sesame- T. Aman rice against mustard-fallow- T. Aman cropping pattern in Hobiganj

Objective	: To increase cropping intensity, productivity and income of farmers in AEZ-20
Rationale	: The cropping pattern is an important indicator of agricultural land use. It has implications for agricultural growth in general and livelihood improvement of the millions of farmers. Environmental or Agro-ecological conditions, and related risks or relative advantages are the main determinants of cropping pattern along with several socioeconomic factors (Mandal and Bezbaruah, 2013). T. Aman rice followed by mustard or land remains fallow after harvest of T. Aman rice. Sesame can be a suitable crop in between mustard and T. Aman rice to utilize fallow land. Sylhet agricultural region is a complex region with a multitude of diverse micro-environments (FAO, 1988) with variable landscape ranged from hills to very lowlands. This region is consisting of six dominant agroecological zones namely, Old Meghna Estuarine Floodplain, Eastern surmakusiyara Floodplain, Sylhet Basin, Northern and Eastern Piedmont Plains, Northern and Eastern Hills and Akhaura Terrace (FAO, 1988). Besides, BARI Til-5 is a new variety which field/crop duration only 90-100 days.
Materials and methods	:
Crop/Variety	: BARI Sarisha-18, BARI Til-4/5, Binadhan-16/17, BARI Sarisha-18, BRRI dhan75
Design	: RCBD
Treatment	: Alternate cropping pattern: Mustard (BARI Sarisha-18)- Sesame (BARI Til-4/5)-T. Aman (Binadhan-16/17) Existing cropping pattern: Mustard (BARI Sarisha-18)-Sesame (Local)-T. Aman (BRRI dhan75)
Replication	: 6 (dispersed)
Plot size	: 20 m ²
Planting system/spacing	: Mustard, Sesame (Broadcast), T. Aman (Line)
Fertilizer dose and methods of application	:
Irrigated/rainfed	: Rainfed
Data to be recorded	: All dates of sowing and transplanting, yields and yield contributing characters, date of harvesting, disease and pest reactions
Investigator (s)	: M. I. Nazrul
Season	: Rabi
Date of initiation	: November 2023
Date of completion	: November 2024
Exp. output	: Viable cropping pattern will be achieved
Location	: MLT site, Sayestaganj, Hobiganj, AEZ 20, 22
Status	: New
Estimated cost	: Tk. 40,000
Sources of fund	: BARI
Priority	: 1 st

Expt. 67 Effect of spacing on the yield and yield attributes of dwarf sunflower in northeastern part of Bangladesh

Objectives	: To accommodate the optimum number of plants in a unit area for maximum yield To see pest and disease reaction
Rationale	: Sunflower is one of the important oil seed crops grown through the world for various purposes. As Sunflower oil is free of cholesterol, health benefit of consuming sunflower oil is better than traditional oils in the market. At present sunflower are growing popularity in sylhet region. But their yield is not up to the mark due to some constrains like irrigation, fertilizer along with proper spacing and other intercultural operations. So, it is the appropriate time to find out suitable spacing for increasing yield of sunflower in north eastern region. For better yield spacing and fertilizer of variety is very important. Proper spacing also facilitates inter-cultural operations. Again, farmers apply huge amount of fertilizer especially N and P in the form of DAP. The present study will be undertaken to find out appropriate spacing with increased fertilizer dose for higher productivity of BARI Sunflower-3 in north-eastern area.
Materials and methods	:
Crop/Variety	: BARI Sunflower-3
Design	: RCBD
i) Treatment	: S ₁ = 50 cm x 15 cm, S ₂ = 50 cm x 20 cm, S ₃ = 50 cm x 25 cm S ₄ = 50 cm x 30 cm and S ₅ = 50 cm x 35 cm
ii) Replication	: 7
Plot size	: 40 m ²
Planting system/spacing	: Sowing of seeds in bed planting method
Fertilizer dose and methods of application	: As per recommendation (FRG 2018)
Irrigated/rainfed	: Both irrigated and rinfed
Data to be recorded	: Date of all operation; leaves/plant, Plant height, Stem diameter, Seeds per head, wt. of filled seeds and unfilled seeds, Single head wt. yield/plant, yield/ha, major disease, and insect infestation; farmers opinion and weather data.
Investigator (s)	: Md. Zulfiqar and M. I. Nazrul
Season	: Robi
Date of initiation	: November 2023
Date of completion	: March 2024
Expected output	: Optimum number of plant population will be ascertain for the better growth and yield of sunflower
Location	: FSR site, Kamalbazar and all MLT sites
Status	: New
Estimated cost	: Tk. 20000/-
Sources of fund	: BARI
Priority	: 1 st

Expt. 68 Performance of some selected cole crops under mixed fruit orchard

Objectives	: To select suitable cole crop for mixed fruit agroforestry system. To increase yield and productivity.
Rationale	: In Bangladesh, the present population growth rate is 1.37%, if it continues; the population will reach 180 million by the year 2025, therefore steadily declining the land: man ratio (BBS, 2018; Hossain and Bari, 1996). A country needs 25% of forest, unfortunately, Bangladesh is possessed with only 17% of unevenly distributed forests. It's clear that the country has no scope to expand forest and crop areas (BFD, 2011). In these circumstances, the agroforestry to be an authentic solution for maximizing productivity with maintaining friendly environment (Nair, 1990). The per capita vegetable consumption is only 53 g, against the daily requirement of 200 g/head/day. The low consumption creates a tremendous pressure over cereals, and it leads malnutrition. The demand of vegetables is increasing but unfortunately the production area is decreasing due to increasing the area of cereal crops. on the contrary, agricultural land shifting to other purposes. During the establishment of mixed fruit saplings (3-4 years) vegetables can easily grow in same orchard. At the early establishment period of tree, the competition for growth resources (water, nutrients and light) between tree and associated crop is perhaps absent or minimum. Hence, it would be wise attempt to conduct experiments during the early period of the tree plantation in association with different vegetables in terms of growth and yield performance for identifying best fruit tree-vegetables combination.
Materials and methods:	
Crop/Variety	: Cole crops and fruit seedlings
Design	: RCB
i) Treatment	: C ₁ = Lemon-guava+cabbage, C ₂ = Lemon-guava+cauliflower, C ₃ = Lemon-guava+Broccoli, C ₄ = Lemon-guava+read cabbage/napa cabbage
ii) Replication	: 6 dispersed
Plot size	: 400 m ²
Planting system/spacing	: Row method (as per recommendation)
Fertilizer dose and methods of application	: Krishi Projukti Hand Book (Azad <i>et al.</i> , 2020)
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield and yield contributing characters of fruits and vegetables, pest and diseases infestation and farmers reactions.
Investigator (s)	: M. I. Nazrul
Season	: Rabi-Kharif-1 and Kharif-2
Date of initiation	: August 2023
Date of completion	: October 2024
Exp. outcome	: Proper combinations of fruit trees and vegetables will be selected, this technology would be stable and beneficial for fruit tree growers undoubtedly.
Location	: MLT site, Sayestaganj
Status	: New
Estimated cost	: Tk. 40,000/-
Sources of fund	: BARI
Priority	: 1 st

Expt. 69 Development of improved cropping pattern potato/sweet gourd-T. Aus-T. Aman rice against potato-Fallow-T. Aman in Cumilla

Objectives	: To find out the suitable and profitable cropping pattern in the selected areas in Cumilla region To popularize the best cropping pattern for raising farmers income.
Rationale	: There is a direction from the government to increase the productivity and intensity of crops to ensure food and nutrition security. There are clear guidelines for doubling crop productivity to achieve SDG targets by 2030. By increasing cropping intensity, overall food production can be increased. There is an opportunity to convert one-crop land into two-crop land, two-crop land into three-crop land in different areas of the country. Debidwar Upazila of Comilla is also a potential area where there is scope for introduction of improved cropping pattern. Incorporation of high yielding varieties into the existing cropping pattern will increase the overall productivity of the crop and increase the farmer's income; hence this experiment has been undertaken.
Materials and methods	:
Crop/variety	: Potato, Sweet gourd, Rice
Design	: RCBD
Treatment	: Existing Pattern: Potato (BARI Alu-7)-Sweet gourd (Hybrid SG Asha)-Fallow-T. Aman (BRRI Dhan-48) Improved Pattern: Potato (BARI Alu-40)-Sweet gourd (BARI Misty komra-2)-T. Aus (BRRI dhan98)-T. Aman (Binadhan-17)
Replication	: 6 (dispersed)
Plot size	: 10 decimal
Planting system/spacing	: As per design
Fertilizer dose and method of application	: As per recommended dose
irrigation/rainfed	: Both
Data to be recorded	: Crop management practices and yield of respective crops, insect and disease incidence, production cost and return and farmers feedback
Investigator (s)	: M. Jamal Uddin and R. Islam & M. M. Anowar
Season	: Rabi & Kharif 1&2
Date of initiation	: November, 2023
Date of completion	: October 2023
Expected output	: Economically profitable cropping pattern will be developed
Location	: Debidwar MLT site areas in Cumilla
Status	: New
Estimated cost	: Tk. 30000/-
Source of fund	: BARI
Priority	: 1st

Expt. 70 Development of improved cropping pattern Tomato-T.Aus against Tomato-Fallow-T. Aman in Cumilla

Objectives	: To find out the suitable and profitable pattern in selected areas in Cumilla region To popularize the best cropping pattern for raising farmers income
Rationale	: In Debidwar Upazila of Comilla District, a significant number of farmers practice the existing cropping pattern i.e Tomato-Fallow-T.Aman. In one season the land is fallow. Improved cropping pattern i.e Tomato-T. Aus- T.Aman has been proposed to bring fallow land under cultivation and increase cropping intensity. The introduction of this cropping pattern will increase overall production and farmers'

income. Hence, the experiment is undertaken in-order to popularize the best cropping pattern for the selected areas in Cumilla.

Materials and methods	:	
Crop/variety	:	Tomato, Rice
Design	:	RCBD
Treatment	:	Existing Pattern: Tomato (Mongol Raza)-Fallow-T. Aman (BRRI dhan32) Improved Pattern: Tomato (BARI Tomato-17)-T. Aus (BRRI dhan98)- T. Aman (Binadhan-17)
Replication	:	6 (dispersed)
Plot size	:	10 decimal s
Planting system/spacing	:	As per design
Fertilizer dose and method of application	:	As per recommended dose
irrigation/rainfed	:	Both
Data to be recorded	:	Crop management practices and yield of respective crops, insect and disease incidence, production cost and return and farmers feedback
Investigator (s)	:	M. Jamal Uddin and M. R. Islam & M. Anwar
Season	:	Rabi & Kharif 1&2
Date of initiation	:	November, 2023
Date of completion	:	October 2023
Expected output	:	A viable and profitable cropping pattern will be developed
Location	:	Debidwar MLT site areas in Cumilla
Status	:	New
Estimated cost	:	Tk. 30000/-
Source of fund	:	BARI
Priority	:	1st

Expt. 71 Intercropping of Hybrid Maize with short Duration Vegetables in Cumilla Region

Objectives	:	To find out the suitable and profitable intercropping systems in Cumilla region To increase farmers income
Rationale	:	Increasing intercropping is essential to increase overall food production and ensure optimum utilization of land. Farmers in Chandina area of Comilla have various opportunities for inter-cropping. Increasing intercropping of maize with high yielding short duration vegetable/spice crop varieties like BARI Motorshuti-3, BARI Dhania-2, BARI Jharseem-2 etc. will increase farmer's income, increase overall production and ensure nutritional security will be helpful. So this experiment is undertaken with the specific purpose for that areas in Cumilla.
Materials and methods	:	Five variety including one check will be used
Crop/variety	:	Maize (BARI Hybrid Maize-9, Garden pea (BARI Garden pea-3; Coriander (BARI Dhania-2; Red amaranth (BARI Red amaranth-1) and BARI Jarsheem-2
Design	:	RCBD
Treatments	:	T ₁ = Sole Maize (BARI Hybrid Maize-9 or 16) T ₂ = BARI Garden pea-3 T ₃ = BARI Dhania-2 T ₄ = BARI Red amaranth-1 T ₅ = BARI Jharsheem2
Replication	:	05 (dispersed)
Plot size	:	20m ²

Planting system/spacing	: As per design
Fertilizer dose and method of application	: As per recommended dose
irrigation/rainfed	: Rainfed
Data to be recorded	: Yield and yield contributing character of respective crops, insect and disease incidence, production cost and return and farmers feedback
Investigator (s)	: M. Jamal Uddin and M. R. Islam & M. Anwar
Season	: Rabi, 2023
Date of initiation	: November, 2023
Date of completion	: May 2024
Expected output	: A suitable intercrop combination will be identified
Location	: Chandina MLT site in Cumilla
Status	: New
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1st

Expt. 72 Performance of mixed vegetables in newly established mango orchard in Cumilla

Objectives	: To find out the suitable and profitable mixed vegetable To increase the additional farmers income
Rationale	: Fruit production in the country is increasing gradually. Due to the development of high-yielding varieties, people's interest in creating fruit gardens is increasing. Fruit orchards on the one hand increase the farmer's income, on the other hand ensure family nutritional security. In many areas of Comilla district, there is ample opportunity to create fruit orchards at the marginal farmer level. Utilizing these opportunities, 5 new fruit gardens have been established at different MLT sites in Comilla this year by On-Farm Research Division. In order to sustain the gardens and to ensure the best utilization of the vacant space of the garden till the harvest and to increase the additional income of the farmer, the adaptive trial of various winter vegetables has been taken up in the 5 gardens in the style of agro-forestry in the current rabi season. As a result, the farmer will benefit financially and the orchard will also receive regular maintenance.
Materials and methods	: Five variety including one check will be used
Crop/variety	: Mango variety includes BARI Aam-3, BARI Aam-4 and BARI Aam-11; Vegetables includes Cabbage, Cauliflower, S. gourd, Tomato (BARI Tomato-17), Garden Pea (BARI Garden pea-2)
Design	: RCBD
Treatments	: T ₁ = Mango + Cabbage T ₂ = Mango + Cauliflower T ₃ = Mango + S. gourd T ₄ = Mango + Tomato T ₅ = Mango + Garden Pea T ₆ = Sole mango (Control)
Replication	: 6 (dispersed)
Plot size	: 20m ²
Planting system/spacing	: As per design
Fertilizer dose and method of application	: As per recommended dose
irrigation/rainfed	: Rainfed
Data to be recorded	: Yield and yield contributing character of respective crops, insect and disease incidence, production cost and return and farmers feedback
Investigator (s)	: M. Jamal Uddin and M. R. Islam & M. Anwar

Season	: Rabi, 2023
Date of initiation	: November, 2023
Date of completion	: May 2024
Expected output	: A suitable mango based agroforestry system will be developed
Location	: Barura, Chandina, Sadar Dakkin, Burirchang, Debidwar under MLT sites in Cumilla
Status	: New
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1st

Expt. 73 Development of Watermelon-Vegetables-T.Aman Rice Cropping Pattern against Watermelon-Fallow-T.Aman Rice

Objectives	: To select suitable cropping pattern to increase cropping intensity To increase farmers' income
Rationale	: Coastal area of Noakhali especially riverine charland is probably the most vulnerable area in context of agriculture. In this area total agricultural production as well as crops/varieties is limited due to various causes, like varying degree of soil and water salinity, unavailability of irrigation water in the dry season, cultivation of long duration of local T. aman rice, cyclone, tidal inundation, shorter winter period etc. are most common. T. aman rice is the major crop in this region. Rabi crops are cultivated according to farmers' choice. About 84% of the cultivable land is medium highland in this area. In the rabi season farmers grow grass pea, soybean, watermelon, groundnut, winter vegetables and boro rice mostly. Seven to eight thousand hectare land is occupied under watermelon cultivation in rabi season. Watermelon harvesting started at mid-March and ended at mid-April. After harvest of watermelon the land remains fallow up to T. Aman rice transplant in kharif-I. There is a scope to use time and space of watermelon harvested fallow land by vegetables cultivation. With this point of view the experiment was undertaken to select suitable cropping pattern to increase cropping intensity and farmers' income.
Materials & Methods Crop/variety	: Watermelon: Big family, T.Aman: BRRI dhan52, Indian spinach: BARI puishak-1, Amaranth: BARI Data-1, Kangkong: BARI Gimakalmi-1, Bitter gourd: Tia (hybrid), Cucumber: Thailand 1
Design Treatments	: AP ₁ : Watermelon-Indian spinach-T.Aman AP ₂ : Watermelon-Amaranth-T.Aman AP ₃ : Watermelon-Kangkong-T.Aman AP ₄ : Watermelon-Bitter gourd-T.Aman AP ₅ : Watermelon-Cucumber-T.Aman EP: Watermelon-Fallow-T.Aman
Replications	: Six (dispersed)
Plot size	: 40 m ² per plot
Planting system/Spacing	: Recommended planting system and spacing for respective crop
Fertilizer dose and method of application	: As recommended (FRG Guide BARC, 2018)
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operation, yield and yield contributing characters, major disease and insect incidence, cost and returns, farmers opinion
Investigator(s)	: Scientists of OFRD, BARI, Noakhali

Season	: Round the year
Date of initiation	: December 2023
Date of completion	: December 2024
Expected output	: New cropping pattern(s) will be developed
Location	: Sadar and Subarnachar, Noakhali
Status	: New
Estimated cost	: Tk.580000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 74 Effect of ethrel application time for off-season pineapple production in Bandarban

Objective	: To find out the suitable time of ethrel application for off-season pineapple production.
Rationale	: The total area of the Chittagong Hill Tracts is estimated to be around 13,237 sq. km, which is about one tenth of the country (Brammer, 1997). The Hill Tracts becoming a fruit basket of our country; farmers producing fruits round the year from different orchard viz. mango, pineapple, banana, jackfruit, papaya, lemon, and orange etc. Pineapple (<i>Ananas comusus L.</i>) cultivation is a long-standing practice of hill peoples. The farmers of Rangamati and Khagrachhari districts are producing early and off-season pineapple by applying ethephon (Ethrel) and calcium carbide as growth regulator (Uddin, et al., 1998; Bose et al., 1983). But, Bandarban area is lagging behind. So, proper time or date of ethrel application in pineapple for duly off-season marketing in Chattogram and Bandarban areas.
Materials and Methods	:
Crop	: Pineapple
Variety	: Giant Kew
Design	: RCBD
Replications	: 6 (dispersed)
Treatments	: a. 1 st September b. 1 st October c. 1 st November and d. Control (No hormone/Farmer's practice)
Plot size	: 8 m x 5 m
Planting system/spacing	: Line sowing with 40 cm x 50 cm spacing
Fertilizer dose and methods of application	: Fertilizers @ 55 kg (total) at 1:1:1 NPK/1000 plants. Fertilizers will be applied two times at mid-June and 1 st week of October (Farmers practice).
Irrigated/rainfed	: Rainfed
Data to be recorded	: Date of all operations, yield and yield contributing characters. Farmer's opinion, pest incidence
Investigator(s)	: Mohammad Tanharul Islam and Md. Imam Hossain
Season	: Kharif 2024
Date of initiation	: September 2023
Date of completion	: March 2025
Expected output	: Farmers will be benefited by off-season pineapple
Location	: Bandarban Sadar
Status	: New
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 75 Effect of Variety and Sowing Dates on Sunflower in Southern Region

Objective	: To find out the yield potentiality of different sunflower varieties under different environmental conditions
Rationale	: Sunflower is one of the major oilseed crops in south central coastal region of Bangladesh. Traditionally, farmers prefer hybrid sunflower varieties <i>e.g.</i> Hysun-33 for its large head and higher productivity. Hybrid variety seed cost is comparatively higher than BARI developed composite varieties. Therefore, input cost for cultivation of hybrids minimizes the cost benefit ratio. Moreover, the performance of BARI developed composite varieties in different sowing dates yet not justified. Therefore, a comparative study on performance of BARI developed sunflower with the commercial one (Hysun-33) under different sowing dates is time demanding. Therefore, the study will be undertaken to evaluate the performance of sunflower varieties/cultivar influenced by different date of sowing
Materials and methods	:
Crop	: Sunflower
Design	: RCBD
Treatments	: Variety: BARI Surjamukhi-2, BARI Surjamukhi-3 and Hysun-33 Date of Sowing: 10 December, 20 December, 30 December and 10 January
Replication	: 6 (Dispersed). Four farmers will be selected for four different time sowing. Each farmer will have sunflower varieties 3 × 3 replications = 9 plots. Total number of plots 4 × 9 = 36 plots
Plot size	: 8 m × 5 m
Spacing	: 50 cm × 25 cm
Fertilizer dose and methods of application	: FRG-2018 and recommended methods
Irrigation/rainfed	: Irrigated
Data to be recorded	: Dates of all operation, Yield and yield attributes, Major disease and insect incidence, Cost and return analysis and Farmers opinion
Investigator(s)	: MSI Khan, PSO; OFRD, Patuakhali; M. M. Howlader, SSO; OFRD, Gopalganj, R. Uddin, SO, OFRD, Barisal
Season	: Rabi 2023-24
Date of initiation	: November, 2023
Date of completion	: June, 2024
Expected output	: Optimum sowing time for BARI sunflower varieties will be find out
Location	: RARS, Rahmatpur, Barishal; Rajapur, Jhalokathi; Kalapara, Patuakhali; Amtoli, Barguna; Nazirpur, Pirojpur and Gopalganj
Status	: New
Estimated cost	: Tk. 1,50,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 76 Development of cropping pattern Spinach - Bitter gourd - T. Aman rice against Fallow-Fallow-T.Aman rice cropping pattern in coastal region

Objectives	:	To develop new cropping pattern for coastal region To utilize fallow lands during Rabi and Kharif-1 season To increase farmers income
Rationale	:	In coastal region usually single crop of T. Aman is cultivated in a year. After T. Aman harvest the land remain fallow during Rabi and Kharif-1 season. Soil salinity and irrigation water scarcity are two big constrains to cultivate crop in coastal region. It is noticed by the researcher that raised bed helps to escape salinity preventing capillary upward movement of ground saline water and low water required crop selection may minimize irrigation scarcity in coastal saline soil. Considering these views the present study has been undertaken with the above mention objectives.
Materials and methods	:	
Crop/variety	:	Coriander/spinach (BARI Dhonia-1/BARI Palong shak-1) – Bitter gourd (BARI Karola-1) – Aman rice (BRRRI dhan87)
Design	:	RCBD
Treatments	:	Existing CP: Fallow-Fallow-T. Aman rice Alternate CP: Leafy vegetable - Bitter gourd - T. Aman rice
Replication	:	6 (dispersed)
Plot size	:	10 decimals
Spacing	:	As recommended
Fertilizer dose and methods of application	:	As recommended in FRG-2018
Irrigation/rainfed	:	Irrigated
Data to be recorded	:	Dates of all operation, Yield and yield attributes, Major disease and insect incidence, Cost and return analysis. Farmers opinion
Investigator(s)	:	MSI Khan and MM Islam
Season	:	Rabi – Kharif-1 - Kharif-2
Date of initiation	:	September/23
Date of completion	:	August/24
Expected output	:	New cropping pattern will be found out for costal region.
Location	:	Kalapara, Patuakhali
Status	:	New
Estimated cost	:	Tk. 60000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 77 Effect of sowing window on mungbean in coastal saline soils of Bangladesh

Objectives	:	To find out mungbean growth and yield with sowing dates To introduce mungbean in saline soil
Rationale	:	Mungbean an establish pulse crop in nonsaline soil of coastal region. But its performance is very low in saline soil. It is assumed that salinity hamper its growth and yield. In coastal region mungbean usually sown in min January to mid February. At this time exposed salinity of the saline soil hamper germination or prevent early growth of mungbean. So, to escape salinity effect optimum sowing dates of mungbean in saline soil should be find out. Considering these views, the study has been undertaken with the above objectives.

Materials and methods	:	
Crop/variety	:	Mungbean (BARI Mung-6)
Design	:	RCB
i) Treatment	:	Sowing Dates: 15 Dec, 22 Dec, 29 Dec, 05 Jan, 12 Jan and 19 Jan
ii) Replication	:	6 (Dispersed)
Plot size	:	05 decimal
Spacing	:	As recommended
Fertilizer dose and methods of application	:	As per FRG-2018
Irrigation/rainfed	:	Rainfed
Data to be recorded	:	Dates of all operation, Yield and yield attributeds, Major disease and insect incidence, Cost and return analysis. Farmers opinion
Investigator(s)	:	MSI Khan and MM Islam
Season	:	Rabi 2023-24
Date of initiation	:	December, 23
Date of completion	:	March, 2024
Expected output	:	Optimum sowing dates of mungbean for saline soil will be find out
Location	:	Kalapara, Patuakhali and Taltoli/Amtoli, Borguna
Status	:	New
Estimated cost	:	Tk. 50,000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 78 Performance of sweet potato as intercropped with Golden apple based established sorjan in Barishal

Objective	:	To identify the best location specific sweet potato variety/s as intercropped with coconut/hog plum based established sorjan system
Rationale	:	Sorjan cultivation practice is a popular farming system in submergence ecosystem in south central coastal region of Bangladesh. Traditional sorjan system in AEZ-13 included farming of big fruit trees like coconut and hog plum. The area underneath remains fallow throughout the year. If the fallow land can be utilized by low cost suitable crops like sweet potato, crop productivity and nutritional demand can be fulfilled. BARI has developed HYV sweet potato varieties that can be transferred to established sorjan system in Barishal region. Therefore, the program will be undertaken to evaluate the performance of sweet potato varieties as intercropped with coconut/hog plum based established sorjan in Barishal.
Materials and methods	:	
Crop	:	Sweet potato
Design	:	RCBD
Treatments	:	Sweet potato varieties: BARI Mistialu-8, BARI Mistialu-12, BARI Mistialu-16 and BARI Mistialu-17
Replication	:	6 (Dispersed)
Plot size	:	8m × 5m
Spacing	:	Not specific
Fertilizer dose and methods of application	:	FRG, 2018 and Recommended doses
Irrigation/rainfed	:	Irrigated
Data to be recorded	:	Dates of all operation, Yield and yield attributes, Major disease and insect incidence, Cost and return analysis and Farmers opinion
Investigator(s)	:	R. Uddin, SO, M.S. Islam, PSO and B. C. Kundu, CSO
Season	:	Rabi 2023-24
Date of initiation	:	November, 2023
Date of completion	:	June, 2024

Expected output	: Fallow land will be utilized Additional income will be generated
Location	: MLTs, Banaripara, Barishal
Status	: New
Estimated cost	: Tk. 40,000/-
Source of fund	: BARI
Priority	: 1st

Expt. 79 Development of Four crops based Cropping pattern Mustard-Mungbean-T. aus-T. aman against Mustard-D. Aus-T. aman rice cropping pattern in Bhola

Objectives	: To study the comparative agro-economic performance of improved pattern and farmers' existing pattern. To increase cropping intensity and productivity
Rationale	: Mustard - D. Aus - T. aman rice is one of the important cropping pattern covers 8035 ha of land in Bhola. After mustard harvest land remain fallow for a period of 65-75 days. Here there is a scope to incorporate a short duration crop like mungbean. If four crop based cropping pattern, Mustard-Mung-T. aus-T. aman is done properly farmer will get more benefit increasing total income of the pattern. With these views the present study has been undertaken with the above objectives.
Materials and Methods	
Treatment	: Alternate Cropping pattern: Mustard (BARI Sorisha-14) - Mung (BARI Mung-8) - T. Aus (BRRI dhan-82/48) T. Aman (BRRI dhan-72/87) Existing Cropping pattern: Mustard (Local) - D. Aus (BRRI dhan-48) - T. Aman (Sarna/BRRI dhan-23/52)
Planting system	: The experiment will be conducted on farmers' fields of Bhola
Replication	: 06
Design	: RCB
Investigators	: Concerned scientists of OFRD, Bhola
Data to be collected	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost and return and Farmers' opinion
Spacing	: Mustard: Broadcast, Mungbean: 30cmx8cm, Rice: 20cmx15cm
Unit plot size	: 01 bigha
Season	: 2023-24
Date of initiation	: April 2023
Expected output	: Total productivity as well as profitability will be increased.
Location	: Dawlatkhan and Bhola Sadar
Status	: New
Estimated cost	: Tk. 80000/-
Source of Fund	: BARI

Expt. 80 Performance of Intercropping Groundnut with Cowpea

Objective	: To find out the suitable intercrop combination of groundnut with cowpea for higher productivity and profitability
Rationale	: The farmers of Bhola region are used to cultivate groundnut and cowpea in separate fields. Both crops are economically very important for farmers in Bhola. Winter is the best period to cultivate charland because in total kahrif time the land remains under water. So farmers have very limited access to the field with many crops in the season. Groundnut is one of the most important oil seed crops but recently the area of groundnut is being

decreased due to the competition with rabi crops (Alomet. *al.*, 2009). Adverse weather conditions result in economic losses to the farmers due to the partial or total failure of groundnut crop. To overcome this situation there is need to adopt or follow groundnut based cropping systems like intercropping or mixed cropping in rain fed groundnut growing areas. Cowpea (*Vigna unguiculata*) annual plant within the pea family (Fabaceae) grown for its edible legumes locally called as plain dal in southern region. The dry beans are used as dal curry and vorta. Farmers of bhola used to grow cowpea as a border crop or they broadcast very small amount of cowpea seeds in others crop field as mixed cropping. In this context, the experiment was conducted to find out the suitable intercrop combination of cowpea with groundnut for higher productivity and profitability.

Materials and methods	:	
Crop/Variety	:	Ground nut and Cowpea
Design	:	RCB
i) Treatment	:	T ₁ = Sole groundnut T ₂ = Sole cowpea T ₃ = Two rows of groundnut in between paired rows of cowpea T ₄ = Three rows of groundnut in between paired rows of cowpea
ii) Replication	:	6 (dispersed)
Plot size	:	8 m × 5m
Planting system/spacing	:	Row method with 30 cm × 15 cm and paired row with 20 cm x 10 cm
Fertilizer dose and methods of application	:	As per FRG' 2018
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Date of all operation; yield and yield contributing characters; Major disease and insect infestation; Cost and return; Farmers opinion
Investigator (s)	:	R. H. Anik, Md. M. Islam & G. N. Hasan
Season	:	Rabi
Date of initiation	:	December, 2023
Date of completion	:	April, 2024
Expected output	:	Appropriate intercropping systems will be ascertained.
Location	:	MLT sites Doulatkhan and Bhola sadar
Status	:	New
Estimated cost	:	Tk. 60000/-
Sources of fund	:	BARI
Priority	:	1 st

Expt. 81 Mixed cropping of Lentil, Fennel and Radhuni in riverine island of Rajbari

Objective	:	To increase yield and production of pulse and spice crops in charlands of Rajbari
Rationale	:	Mixed cropping is an age-old but effective practice of growing two or more crops simultaneously on the same piece of land for getting higher productivity per unit area by intensifying the use of land particularly in densely populated countries like Bangladesh. Rajbari had cropping intensity of 215% in 2019-20 (BBS Yearbook-2021). Bangladesh has about 0.83 million hectares charland of which about 0.52 - 0.79 million hectares are cultivable. Rajbari has about 14 thousand hectares of charlands. Generally, charland farmers cultivate local variety of different crops following indigenous crop production practices. As a result, crop yield in

charland areas is low. But we have great opportunity to enhance crop production in charland areas through the replacement of local varieties by modern varieties as well as adoption of suitable management practices including mixed cropping systems. Farmers in charland of Rajbari had a common practice of sowing lentil, radhuni and fennel in same field at the same time as mixed cropping after the flood water removal in month of October. They harvest lentil in February-March, fennel in March-April and radhuni in June. They use the local varieties with less amount of fertilizer, thus the yield is lower. So, this experiment will be taken to introduce BARI released modern varieties with proper fertilizer doses.

Materials and Methods :	
Crop/variety	: Local varieties, BARI Mosur-8, BARI Mouri-1, BARI Radhuni-1
Design	: RCBD
i. Treatment	: T ₁ = Local varieties T ₂ = BARI Mosur-8, BARI Mouri-1, BARI Radhuni-1
ii. Replications	: 6 (dispersed)
Plot size	: 10 decimals
Planting system/spacing	: Broadcasting method of sowing with the seed rate of 4-1-1 kg bigha ⁻¹ for lentil, fennel and radhuni, respectively.
Fertilizer dose and methods of application (kg ha ⁻¹)	: Recommended fertilizer dose as per crop
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost and return, Farmers' opinion
Investigator (s)	: Concerned scientists of OFRD, Faridpur
Season	: <i>Kharif 2</i>
Date of Initiation	: October 2023
Date of completion	: June 2024
Expected benefit	: Total production and income will increase by at least 20%
Location	: Moukuri char, Rajbari
Status	: 1 st
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 82 Improvement of Grasspea (Zero tillage)-Jute- T. Aman cropping pattern in Madaripur

Objectives	: To increase the crops yield To improve existing cropping pattern
Rationale	: One of the major cropping patterns practiced by the farmers of medium low land of Rajoir upazila under Madaripur district is grass pea- jute- T. aman, which covers 4410 ha of land that is 25% of total cropping pattern. After harvest of T. aman there remains 2 to 3 inch of standing water. At this time the farmers sow grass pea seed (local variety) in zero tillage condition. BARI Khasari-2 is the high yielding variety than the local variety. Hence, this program will be conducted to address the current situation and increase yield.
Materials and Methods :	
Crop	: Grass pea, Jute and T. Aman
Design	: RCB
i) Treatment	: T ₁ : Existing Cropping pattern: Grass pea (Local)-Jute (JRO-254)-T. aman (BINA Dhan-7) T ₂ : Improved Cropping pattern: Grass pea (BARI Khasari-2)-Jute (BJRI Toshapat-8)-T. aman (BRRi dhan75)

ii) Replications	: 5 (Five)
Unit Plot size	: 33 dec.
Planting system/spacing	: Grass pea: Broadcast, Jute: Broadcast & T. aman: Line sowing Grass pea seed will be sown at 20-25 Nov. and will be harvested at 20 march. Seed to seed duration of grass pea will be 120 days. Jute seed will be sown 10 days after harvesting of grass pea. T. aman will be transplanted 7 days after harvesting of Jute (1 April -30 July). T. aman will be harvested 10 November. Next year grass pea seed will be sown 10 days after harvesting of T. aman.
Fertilizer dose and methods of application	: Grass pea: N ₂₀ P ₂₀ K ₁₂ S ₉ kg ha ⁻¹ . Jute: N ₅₀ P ₃₀ K ₅₀ kg ha ⁻¹ T. aman: N ₈₀ P ₁₆ K ₄₀ S ₉ Zn _{1.2} B ₀ kg ha ⁻¹
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield and yield contributing characters, pest incidence, REY, Farmer's opinion
Investigator (s)	: Concerned scientists of OFRD, Faridpur
Season	: Rabi, 2023
Date of Initiation	: November, 2023
Date of completion	: November, 2025
Expected output	: Improved cropping pattern will provide higher productivity and return.
Location	: MLT Site, Madaripur
Status	: New
Estimated cost	: Tk.80000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 83 Intercropping chilli with sweet gourd.

Objectives	: To find out suitable intercropping combination To increase total productivity and cropping intensity
Rationale	: Farmers grow sweet gourd during rabi season after harvesting T. aman rice. Sweet gourds are planted with a wide spacing and it takes more times to cover the space around it. Chilli is also a rabi crop. So chilli seedlings can be transplanted in sweet gourd beds. Before covering the whole space by sweet gourd, chilli plants will be able to complete its vegetative growth. Thus, chilli with sweet gourd intercropping may be an option to increase total productivity with increased income. Keeping these views in mind, the trial has been undertaken with the above objectives.
Materials and Methods	:
Crop/varieties	: Sweet gourd (BARI Hybrid Mistikumra-2) and chilli (BARI Morich-1)
Design	: RCB
i) Treatments	T ₁ - Sole sweet gourd T ₂ - Two row chilli in sweet gourd bed T ₃ - Four row chilli in sweet gourd bed
ii) Replication	: 6 (dispersed)
Plot size	: 8m × 2.5m
Planting system	: Sweet gourd in pit; spacing 2.5m × 2.5m Chilli in line: spacing 60cm × 40cm
Fertilizer dose and application method	: Fertilizers for each crop will be applied as recommended in FRG 2018. Required amount of fertilizers except urea and MoP for chilli will be applied as basal dose in the field. Urea and MoP will be applied in 3 equal splits in pit for sweet gourd and in line for chilli.
Irrigation/ rainfed	: Irrigated
Data to be recorded	: Dates of all operations, Yield and yield contributing characters, Major disease and insect incidence, cost and returns analysis, farmers opinion.

Investigators : M H Rahman and K U Ahammad
 Season : Rabi
 Date of initiation : October 2023
 Date of completion : July 2024
 Expected output : Sweet gourd and chilli intercropping system will be find out
 Location : MLT site, Monirampur and Jhenaidah
 Status : New
 Estimated cost : Tk. 60000/-
 Source of fund : BARI
 Priority : 1st

Expt. 84 Development of Garlic-T.Aus-T. Aman cropping pattern against Boro-Fallow- T. Aman cropping pattern

Objectives : To improve the existing cropping pattern
 To increase crop yields and economic return of farmers
 Rationale : Boro-T. Aman-Fallow is an important existing cropping pattern at MLT site, Jhikargacha, Jashore. This cropping pattern acquires 5010 ha area of total cultivable land. In this cropping pattern farmers use old crop varieties whose are poor yielding and susceptible to different pest. If this pattern is replaced by Garlic-T. aus-T. aman cropping pattern and introduce modern varieties of the crops then it will be profitable to the farmers. After harvesting of T. aman rice, garlic clove can be sown in zero tillage condition. Due to above reasons we want to introduce high yielding crop varieties in Boro-T. aman-Fallow cropping pattern. Therefore, a trial may be conducted for the improvement of the existing cropping pattern and for higher yield and economic return.

Materials and Methods :
 Crop/varieties : Rice (BRRI dhan28, Swarna, BRRI dhan48, BRRI dhan75) and Garlic (BARI Rashun-2)
 Design : RCB
 Treatments : Existing pattern: Boro (BRRI dhan28) Fallow-T. aman (Swarna)
 Alternate pattern: Garlic (BARI Rashun-2)- T.aus (BRRI dhan92)-T. aman (BRRI dhan75)
 Replication : 6 (dispersed)
 Plot size : 800 m² per farmer
 Planting system : Seed rate and spacing: As per recommended for the crops
 Fertilizer dose and application method : FRG, 2018
 Irrigation/ rainfed : Irrigated
 Data to be recorded : Dates of all operation, yield and yield contributing characters & equivalent yield, major disease and insect incidence, cost and return analysis, farmers' opinion

Investigators : M H Rahman and K U Ahammad
 Season : Round the year
 Date of initiation : October 2022
 Date of completion : November 2024
 Expected output : Crop yields will be increased and thus the higher economic return will be achieved over the existing practice
 Location : MLT site, Monirampur
 Status : New
 Estimated cost : Tk. 90000/-
 Source of fund : BARI
 Priority : 1st

Expt. 85 Development of alternate cropping pattern Mustard - Jute - T. Aman against Fallow-Boro- T. Aman

Objectives	: To improve the existing cropping pattern by inclusion of modern crop varieties To increase crop yield and farmers' income
Rationale	: About 160 million people are in Bangladesh now with the growth rate of 1.37% (BBS, 2011). While the cultivable land in Bangladesh is decreasing at the rate of about 0.80% year ⁻¹ . To produce more food with this limited area, improvement of existing cropping pattern is urgent by using optimum management practices and incorporation of modern varieties. In Bangladesh, area of mustard is increasing day by day for its higher demand. So, farmers of Narail district are interested to grow mustard in their field and they think Mustard-Jute-T. aman cropping pattern will be more profitable than Fallow-Boro-T. aman. With this point of view the present study was undertaken to evaluate the alternate cropping pattern and to increase system productivity.
Materials and Methods	:
Crop/varieties	: Mustard (BARI Sarisha-14/18),Jute (BJRI Tosha pat-8),T. Aman rice (BRRI dhan87 and BRRI dhan75) and Boro (BRRI dhan63)
Design	: RCB
Treatments	: Existing cropping pattern: Fallow –Boro (BRRI dhan63)–T. aman (BRRI dhan87) Alternate cropping pattern: Mustard (BARI Sarisha-14/18)- Jute (BJRI Tosha pat-8)–T. aman (BRRI dhan75/87)
Replication	: 4
Plot size	: 800 m ² per farmer
Planting system	: Seed rate and spacing: As per recommended for the crops
Fertilizer dose and application method	: FRG, 2018
Irrigation/ rainfed	: Irrigated
Data to be recorded	: Dates of all operation, yield and yield contributing characters & equivalent yield, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigators	: M H Rahman and K U Ahammad
Season	: Round the year
Date of initiation	: Rabi 2023
Date of completion	: November 2025
Expected output	: Total production and farmers income will be increased
Location	: MLT site, Monirampur, Jhenaidah and Narail
Status	: New
Estimated cost	: Tk. 1,00,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 86 Intercropping of garlic with pointed gourd

Objectives	: To find out the performance of garlic as intercrop with pointed gourd To increase total productivity and economic return.
Rationale	: Pointed gourd is one of the major vegetable crops in Bangladesh grown round the year. The main growing season of this crop is winter and the farmers of Jashore cultivate it as a sole crop. BARI has released some garlic varieties- BARI Rosun-1, BARI Rosun-2, BARI Rosun-3 and BARI Rosun-4. Among the varieties BARI Rosun-2 is cultivated by some farmers of Monirampur and Jhikargacha in winter season. If garlic is transplanted in between two rows of

pointed gourd then the total productivity and economic return of farmers will be increased. But no scientific study has been done in this regard earlier. Therefore, the present experiment will be conducted to find out the performance of garlic as intercrop with pointed gourd in Monirampur and Jhikargacha.

Materials and Methods	:	
Crop/varieties	:	Pointed gourd (BARI Potol-2) and garlic (BARI Rosun-2)
Design	:	RCB
Treatments	:	T ₁ : 1 row garlic between 2 rows of pointed gourd T ₂ : 2 row garlic between 2 rows of pointed gourd T ₃ : 3 row garlic between 2 rows of pointed gourd T ₄ : Sole pointed gourd
Replication	:	6 (dispersed)
Plot size	:	20m × 10m
Planting system	:	Pointed gourd : 2m × 2m, garlic: 20cm × 10cm
Fertilizer dose and application method	:	FRG, 2018. Entire amount of cowdung, TSP, gypsum and half amount of MoP will be applied at final land preparation. Urea will be applied into three equal installments at 15 DAT, fruiting stage and mid time of harvesting. Rest amount of MoP will be applied at fruiting stage.
Irrigation/ rainfed	:	Irrigated
Data to be recorded	:	Dates of all operation, yield and yield contributing characters, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigators	:	M H Rahman, K U Ahammad, OFRD, Jahore and Concern Scientists of Tangail.
Season	:	<u>Rabi</u>
Date of initiation	:	October 2023
Date of completion	:	July 2024
Expected output	:	Total productivity and economic return will be increased
Location	:	MLT site, Monirampur (Jashore) and Dhonbari (Tangail)
Status	:	<u>New</u>
Estimated cost	:	Tk. 50,000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 87 Intercropping of mustard with pointed gourd

Objectives	:	To find out the performance of mustard as intercrop with pointed gourd To increase total productivity and economic return
Rationale	:	Pointed gourd is one of the major vegetable crops in Bangladesh grown round the year. The main growing season of this crop is winter and the farmers of Jashore cultivate it as a sole crop. BARI has released twenty mustard varieties. Among the varieties BARI Sarisha-14 is more popular and high yielding variety cultivated in all over the country in winter season. When pointed gourd is transplanted then mustard is sown simultaneously by broadcast and line in mid November. But no scientific study has been done in this regard earlier. Therefore, the present experiment will be conducted to find out the performance of mustard as intercrop with pointed gourd in Monirampur and Jhikargacha.
Materials and Methods	:	
Crop/varieties	:	Pointed gourd (BARI Potol-2) and Mustard(BARI Sarisha-14)
Design	:	RCB
i) Treatments	:	T ₁ : Broadcast mustard in between pointed gourd

	T ₂ : Line sowing mustard in between pointed gourd T ₃ : Sole pointed gourd
ii)Replication	: 6 (dispersed)
Plot size	: 20m × 10m
Planting system	: Pointed gourd: 2m × 2m, Mustard: 30cm × 10cm
Fertilizer dose and application method	: FRG, 2018. Entire amount of cowdung, TSP, gypsum and half amount of MoP will be applied at final land preparation. Urea will be applied into three equal installments at 15 DAT, fruiting stage and mid time of harvesting. Rest amount of MoP will be applied at fruiting stage.
Irrigation/ rainfed	: Irrigated
Data to be recorded	: Dates of all operation, yield and yield contributing characters, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigators	: M H Rahman and K U Ahammad
Season	: <u>Rabi</u>
Date of initiation	: November 2023
Date of completion	: July 2025
Expected output	: Total productivity and economic return will be increased
Location	: MLT site, Monirampur (Jashore) and Dhonbari (Tangail)
Status	: <u>New</u>
Estimated cost	: Tk. 60,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 88 Integrated management of bacterial card rot disease of cauliflower

Objective	: To find out effective control measure against bacterial card rot disease of cauliflower
Rationale	: Bacterial card rot is caused by several types of virulent bacteria, including <i>Pectobacterium carotovorum</i> . They attack growing plants by entering tissue through open pores or cracks caused by mechanical injury or <u>insect activity</u> . Temperatures ranging from 20 to 30°C are favorable for an outbreak, especially if plants are calcium deficient. Plants affected by this condition develop soft wet spots on the leaves and/or developing heads that get larger and larger as the plant tissue is broken down by feeding bacteria. The experiment is undertaken to find out the effective control measure against bacterial card rot disease of cauliflower.
Materials and methods	:
Treatments	: T ₁ = Foliar spray with Bactroban 20WP @ 2g/L of water T ₂ = Soil amendment with stable blessing powder @ 25kg/ha + foliar spray with Bactroban 20WP @ 2g/L of water T ₃ = Soil amendment with <i>Bacillus</i> sp. (EMOs) granule @ 500kg/ha + foliar spray with EMOs powder @ 1g/L of water T ₄ = Farmers practice T ₅ = Control
Crop/Variety	: BARI Fullcopy-2/ Local variety
Design:	: RCBD
Replications	: 6
Plot size	: 4m x 3m
Planting system	: Line, Spacing: 60cm x 40cm
Fertilizer dose and methods of application	: Recommended dose

Irrigated/rainfed	: Irrigated
Data to be recorded	: Disease incidence and severity
Investigator(s)	: M.S. Ali, M.B. Anwar (RARS, Jashore) and J.A. Mahmud (OFRD, Kushtia)
Season	: Rabi
Date of Initiation	: November, 2023
Date of completion	: April 2024
Expected output	: Effective control measure will be identified
Location	: MLT site, Chuadanga
Status	: New
Estimated cost	: Tk. 40,000/-
Sources of fund	: BARI
Priority	: 1 st

Expt. 89 Effect of alternative furrow irrigation strategies on potato

Objective	: To find out the effect of alternative furrow irrigation on potato yield, quality, and water use efficiency.
Rationale	: Water is a valuable, precious and non-renewable natural resource which cannot be wasted. Scarcity of irrigation water has now become the main constraint for crop production during the dry, rabi (winter) season in South Asia (Murad et al., 2018; Islam et al., 2019). Irrigation water management, especially in the winter season, is now a challenging issue in targeting resource-constrained farmers with limited access to irrigation in areas of water scarcity of Bangladesh, a heavily-populated country in South Asia. Potato, being an important crop, both cultivated area and total production of potato have increased recently in Bangladesh due to its high demand (Saha et al., 2015). Now, Bangladesh is the seventh-largest potato producer (over 10 million tons) in the world and third-biggest in Asia in 2017. In Bangladesh, potato is primarily consumed as a vegetable, whereas it is a staple food crop in many countries (Khandker and Basak, 2018; www.potatopro.com). Increasing water use efficiency or water productivity (WUE/WP) in potato (tuber yield per amount of water applied) is becoming an important issue worldwide. Deficit irrigation (irrigated water below the maximum crop evapotranspiration) and partial root-zone drying (alternated irrigation of the root-zone by watering in one furrow and keeping dry the adjacent furrow until the next watering cycle) are reported as the promising irrigation techniques to save water with a concomitant increase in WUE or WP without significant tuber yield reduction (Jovanovic et al., 2010; Jensen et al., 2010; Xie et al., 2012). Traditionally, irrigating to each and every furrow is one of the oldest techniques of surface irrigation. This technique still remains a common method for irrigation of row crops across the world (Koech et al., 2014), including South Asia and in particular in Bangladesh. The traditional surface furrow irrigation method, however, uses a high amount of water and hence needs improvement to raise its water use efficiency (Sharma and Minhas, 2005; Jat et al., 2011; Sarker et al., 2016). We hypothesize that AFI would maintain yield, reduce water use, and increase the irrigation WP for potato cultivation in drought-prone areas of Bangladesh where water resources are scarce. In response to this research gap, we compared the potato grown under raised beds with AFI together with every furrow irrigation (EFI) and fixed furrow irrigation (FFI).
Materials/ Methods	:
Crop/variety	: BARI Alu-41
Treatments	: (i) alternate furrow irrigation (AFI), (ii) fixed furrow irrigation (FFI), and (iii) every furrow irrigation (EFI).

Irrigation will be applied at (i) stolonization stage, 20–25 days after planting (DAP), (ii) tuber formation stage (40–45 DAP), and (iii) tuber enlargement stage (60–65 DAP).

Design	: RCBD
Replication	: 6
Plot size	: 4 m X 5 m
Planting system/spacing	: Raised bed
Fertilizer dose	: As per fertilizer recommendation guide-2018
Irrigated/rained	Irrigated
Data to be recorded	: Tuber yield, tuber number, amount of irrigation water applied, dry matter content, etc.
Investigators	: Md. Mahadi Morshed, Md. Mamun Hossain, Dr. Jahan Al Mahmud, Dr. Sujit Kumar Biswas
Season	: Rabi
Date of initiation	: October 2023
Date of completion	: 2025
Expected output	: Finding the effect of alternative furrow irrigation on yield, quality, and water use efficiency of potato.
Location	: OFRD, BARI, Kushtia
Status	: New
Estimated cost	: Tk. 80000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 90 Intercropping cauliflower with Bt Brinjal variety in coastal region

Objectives	: To minimize soil salinity effect on sunflower. To increase system productivity.
Rationale	: In coastal area of Bangladesh, soil salinity and lack of fresh irrigation water set back farmers from cultivating their land. However, in recent years sunflower cultivation is expanding in some pocket areas where irrigation facilities are available. For higher yield sunflower requires at least three irrigations. So, moisture conservation is a primary concern for crop production in coastal area. Rice straw mulch is readily available mulch in coastal area for conserving moisture and reducing soil salinity. Once rice straw used to remain fallow in the field but in recent years it has been using for fodder purpose, which becomes costly. To overcome the situation we hypothesized that short duration green leafy vegetables could be used as cover crops in between Bt brinjal rows, which could conserve soil moisture as well as reduce soil salinity. Moreover, farmers could get extra income from cover crops, thereby system productivity would be increased.
Materials and methods	:
Crop/variety	: BARI Bt Begun-4 and BARI Cauliflower-1
Design	: RCBD
Treatment	: T ₁ : BARI Bt Begun-4+ One row Cauliflower. T ₂ : BARI Bt Begun-4+ Two row Cauliflower. T ₃ : BARI Bt Begun-4(Control)
Replications	: 3
Plot size	: 5 m X 10 m
Spacing	: Bt Begun; 1 m X 1 m and cauliflower at 1 mx 60 cm
Fertilizer dose and Methods	: As per recommended dose from Fertilizer Recommendation Guide (BARC, 2018).
Irrigation/ rained	: -
Data to be recorded	: Dates of all operation

	Yield and yield attributes
	Major disease and insect incidence
	Cost and return analysis
	Farmers' opinion
Investigator(s)	: M.H. Rashid, M.K.Islam, T.Z. Munmun and M.Rahman OFRD, BARI, Khulna
Season	: 2023-2024
Date of initiation	: October, 2023
Date of completion	: April, 2024
Expected output	: System productivity and farmers income will be increased.
Locations	: Khulna, OFRD, BARI
Status	: New
Estimated cost	: Tk. 50,000/-
Source of fund	: BARI
Program Proposed from	: OFRD, BARI, Khulna
Priority	: First

Expt. 91 Effect of Planting Date on Yield of Summer Hybrid Tomato in the Northwest Bangladesh

Objective	: To find out the suitable planting date of summer hybrid tomato To know the days to phenology Yield performance of tomato with different planting dates
Rationale	: In Bangladesh, tomato is one of the major vegetable crops, comprising a good source of vitamins and minerals as well as containing 93.1% water, 0.6% minerals, 0.7% fiber, 1.9% protein, 0.1% fat, and 3.6% carbohydrate per 100 g of edible portion. It is more popular in urban areas. Farmers usually grow tomato in winter season in Bangladesh. On the contrary, it is grown in a limited area of the country during the summer season. Contrarily, BARI released some summer tomato hybrids which are extensively cultivated in the south-west part of Bangladesh, specially Satkhira, Jashore etc. As summer tomato can be marketed in the off-season, farmers get a comparatively higher price and more profit. Time of sowing is the most important non-monetary factor for obtaining the potential yield of a variety since it ensures the complete harmony between the vegetative and reproductive phases (Dhingra and Sekhon, 1988). But little information is available on summer hybrid tomato with time of planting particularly of North-West Bangladesh. In these circumstances, the present study was undertaken to find out the suitable planting date of summer hybrid tomato in different locations of North-West Bangladesh.
Materials and Methods	:
Crop (s)	: Tomato
Variety (s)	: BARI Hybrid Tomato-11
Treatments	: S1: 20 July, S2: 05 August, S3: 20 August and S4: 05 September
Design	: RCB
Replications	: 3 (three)
Unit Plot size	: 5 m x 6m
Fertilizer dose	: STB: 300-90-150-30-1.50 kg N-P-K-S-Zn-B ha ⁻¹ + 10 ton CD ha ⁻¹
Application of fertilizer	: Cow dung and all the inorganic fertilizers except urea will be applied and mixed with soil at the time of final land preparation. The urea will be split 5-7 times at vegetative and fruiting stage.

Data to be collected : Yield and yield components, pest and disease, cost and return
 Expected output : Suitable planting date will be identified
 Status : 2nd year
 Date of initiation : July 2022
 Date of completion : October 2025
 Estimated cost : Tk. 100000/-
 Source of Found : BARI
 Location (s) : Barind, Shyampur, Pabna, Bogura, Rangpur , Mymensingh, Gaibandha
 Investigator(s) : M.F. Hossain, M. S. Hossain and respective scientist of different OFRD station

Expt. 92 Performance on Mixed Cropping System of Lentil, Mustard and Linseed under AEZ-11

Objective(s) : To find out suitable mixed crop combination of lentil, mustard and linseed for higher yield
 Rationale : To increase the land use efficiency as well as farmers' income.
 Rationale : Bangladesh has an acute shortage of pulses and oil seeds in respect of its demand. Lack of suitable high yielding lentil, mustard and linseed varieties and occupying of pulse and mustard land by *boro* rice are two major reasons of this deficit. As done in other regions, the farmers of Pabna area generally grow local lentil, mustard and linseed variety after harvest of T.aman rice. The yield potentiality of this local variety is very low. Furthermore, farmers sow lentil and mustard after harvest of long duration local T.aman rice and hence, get a very low yield due to late planting. In most cases, they cannot grow the *boro* rice. Pulses Research Centre and Oil Seed Research Centre of BARI has developed some short duration high yielding lentil, mustard and linseed varieties which can be grown successfully before *boro* transplanting.

Materials and Methods :
 Crop/variety : Lentil (BARI Masur-8), Mustard (BARI Sarisha-11 or BARI Sarisha-17) and Linseed (BARI Til-4)
 Design : RCBD
 Treatment : T₁= Lentil (80%) + Linseed (20%)
 T₂= Lentil (80%) + Mustard (20%)
 T₃= Lentil (75%) + Mustard (15%) + Linseed (10%)
 T₄= Lentil (100%)
 T₅= Mustard (100%)
 T₆= Linseed (100%)
 Replications : 3
 Plot size : 5m X 4m
 Planting system/spacing : Broadcasting
 Fertilizer dose and application methods : Based on FRG-2018
 Irrigated/rainfed : Irrigated
 Data to be recorded : i) Dates of all operations
 ii) Yield and yield attributes of crops

	iii) Pest and disease reaction
	iv) Cost and return analysis
Investigator (s)	: Concern scientist of OFRD, Pabna
Season	: Rabi
Date of initiation	: 10 November, 2022
Date of completion	: 20 March, 2023
Expected output	: Oil seed and pulse crops production as well as cropping intensity will be increased
Location	: MLT site, Atghoria, Pabna
Status	: 2 nd year
Estimated cost	: Tk. 30000/-
Source of fund	: BARI/BARC
Priority	: 1 st

Expt. 93 Effect of Sowing Time under Different Sowing Options in Sesame

Objective	: To find out optimum sowing time and harvesting time, and sowing method to get high yield of sesame seed
Rationale	: Sesame is grown almost all regions in Bangladesh. Generally, the crop is grown in pre-monsoon seasons in Bangladesh. Although the importance of this crop is huge, the average yield is still very low due to poor management practices as compared to other countries. Quality seed, weed control, proper fertilization, irrigation, method of sowing, optimum sowing time, seed rate, and time of harvest are indispensable for successful production of this crop. Yield decreases progressively with the delay in planting from optimum time of sowing. Research works are limited on sowing dates and time of harvesting in sesame under different planting methods. Therefore, the present study was undertaken to find out optimum sowing time and harvesting time, and sowing method to get high yield of sesame seed.
Materials and Methods	:
Crop/variety	: Sesame/BARI-Til-4
Design	: Split-plot
Treatment	: Main-plot: Tillage (2) <ol style="list-style-type: none"> 1. Strip planting (SP) 2. Conventional tillage (CT) Sub-plot : Sowing time (3) <ol style="list-style-type: none"> 1. 10 March 2. 20 March 3. 30 March
Replications	: 4
Plot size	: 4m X 4m
Planting system/spacing	: Line sowing maintaining 30 cm row to row spacing.
Fertilizer dose and application methods	: Recommended fertilizer dose and application method will be followed as per FRG' 2018
Irrigated/rainfed	: Irrigated
Data to be recorded	: i) Dates of all operations ii) Yield and yield attributes

	iii) Pest and disease reaction
	iv) Cost and return analysis
Investigator (s)	: Md. Ariful Islam, Md. Samim Hossain Mollah, Md. Maniruzzaman, Md. Robiul Alam, OFRD, Gazipur
Season	: Kharif-I
Date of initiation	: March 2023
Date of completion	: May, 2024
Expected output	: Optimum sowing time and method will be identified for higher yield of sesame.
Location	: FSRD, Gangarampur
Status	: 2 nd year
Estimated cost	: Tk. 40000/-
Source of fund	: OFRD, BARI
Priority	: 1st

Expt. 94 Performance of Sesame under Different Weed Management Practices

Objective(s)	: To see the effect of different weed management practices on sesame cultivation.
Rationale	: To reduce farmers cost for weeding in sesame cultivation. Sesame [<i>Sesamum indicum</i> (L.)] is one of the important edible oilseeds cultivated crop in Bangladesh. It is cultivated almost everywhere in the country in the early summer (Kharif-1) under rain fed condition. Severe weed competition is one of the major constraints of low yield of sesame. Prevalence of high temperature with high relative humidity and frequent rainfall during the crop season leads to become wet and moist soil which is favorable for flourishing weed growth and slower plant growth, particularly during early growth stages. A critical period of weed competition in sesame is between 15 and 30 days after seedlings emergence and weeds alone reduce about 50-78% seed yield of sesame (Karnas et al., 2019; Amare et al., 2011). Besides, the rising cost of labour and difficulty of mechanical weeding due to moist soil condition in the summer season call for an alternate weed control measure (Punia et al., 2001). Though manual weeding is effective and eco-friendly yet they are tedious and time-consuming. However, chemical weed management is more favorable and effective as they are quick in action, selective in nature, cost effective and efficient to control weeds during the critical period (Jain et al., 2001; Jain and Badkul, 2013). Many herbicides are presently used for controlling weeds in rice field. BARI has also developed petrol operated weeder that can be also effective for controlling weeds of sesame. But the information about the weed control methods in summer sown sesame is meager.
Materials and Methods	:
Crop/variety	: Sesame (var. BARI Till-4)
Design	: RCBD
Treatment	: T ₁ = Weeding with BARI petrol operated weeder in strip planting system T ₂ = Hand weeding two times in strip planting system

	T ₃ = Herbicide using in strip planting system (Preemergence herbicide Pendimethalin @ 3 ml/L) and one hand weeding
Replications	: 3
Plot size	: 6m X 5m
Planting system	: 30 cm x continuous sowing
Fertilizer dose and methods	: Recommended dose as FRG-2018: 78-18-27-20-0-1 (N-P-K-S-Zn-B kg ha ⁻¹)
Irrigated/rainfed	: Irrigated
Data to be recorded	: i) Dates of all operations ii) Yield and yield attributes of crops iii) Pest and disease reaction iv) Cost and return analysis
Investigator (s)	: Concern scientist of OFRD, Pabna and Md. Rejaul Karim, SO, FMPE
Season	: Rabi
Date of initiation	: 15 March, 2023
Date of completion	: 30 June, 2023
Expected output	: Higher yield of sesame and economic return will be achieved.
Location	: MLT site, Atghoria, Pabna
Status	: 2 nd year
Estimated cost	: Tk. 30000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 95 Performance of Bitter Gourd as Relay Crop with Potato in Rice Based Cropping System

- Objectives** : To study the suitability of growing bitter gourd as relay crop with potato. To ensure higher economic benefits from early harvest of bitter gourd and increase the overall system productivity of imposed pattern.
- Rationale** : Potato is one of the favourite vegetables consumed throughout the year in Bangladesh. In 2019-20, a total of 9606 thousand tons of potatoes were produced from 461 thousand hectares of land in Bangladesh (BBS 2020). Due to the introduction of new high yield potential varieties, country-wide consumption, and export opportunities, the cultivation area, and production are increasing continuously. On the other hand, Bitter gourd, a member of Cucurbitaceae, is one of the staple vegetables of Bangladesh. Although bitter, it is considered a favourite vegetable in Bangladesh. Early production of bitter gourd ensures a higher market price for the growers. To get the higher benefits from the early marketing of bitter gourd farmers are trying to explore the avenues for fitting the bitter gourd in their existing cropping systems. Some farmers grow bitter gourd after harvest of rabi crops in the month of Mid February to Mid April which eventually delays the harvest as well as marketing of bitter gourd. But there is an ample opportunity of early planting of bitter gourd as relay with the potato. Relay planting of bitter gourd with potato will facilitate early harvest and bring chances to the farmers of getting higher market prices. Therefore, the experiment has taken under consideration to study the suitability of growing bitter gourd as relay crop with potato and change boro rice through the inclusion of bitter gourd and T. Aus rice in the existing potato-Boro-T.Aman rice system.

Procedure/Methods:

Treatment	: Existing practice Potato /Bittergourd-T. Aman	Alternate practice Potato /Bittergourd-T. Aus-T. Aman
Variety	Potato: BARI Alu-7; Bittergourd: Local T. Aman: Swarna	Potato: BARI Alu-25, 36; Bittergourd: Local T. Aus: BRRRI dhan82/85/95 and T. Aman: BRRRI dhan87
Planting time (Tentative)	Potato (5-10 November) /Bittergourd) (15-30 December)- T. Aman (15-30 July)	Potato (5-10 November)/ Bitter gourd (15-30 December) T. Aus (15-30 April)- T. Aman (20 July-5 August)
Planting system	: Potato tubers to be sown following recommended practice. Potato: 60cm × 20cm, Bitter gourd: 1.5m × 1.0m; Rice: 20cm × 15cm	
Replication	: 06 dispersed	
Design	: Block trial	
Investigators	: M.A. Islam, M.S. Alam and M.T. Hasan of OFRD, Bogura	
Data to be collected	: Dates of all operation, Yield and yield contributing characters of each crop, Major diseases and insects incidence, Cost and return, Farmers' opinion	
Unit plot size	: 600 m ²	
Season	: 2022-23	
Date of initiation	: November, 2022	
Expected output	: Higher productivity and income will be achieved.	
Location	: Shibganj, Bogura	
Status	: 2 nd year	
Estimated Cost	: Tk. 60,000/-	
Source of Fund	: BARI	

Expt. 96 Effect of Planting Time on Lilium Production at Rangpur

Objectives	: To find out the suitable planting time for lilium production at Rangpur region To increase farmers income through higher market price
Rationale	: Lilium needs partial shade (40-50%) during the growing season and can be grown successfully under protected conditions. In the areas that experience cool climates during the growing period, quality flowers can be grown under shade net house/polyhouse conditions. The climatic condition of the low, mid, and highly hilly are suitable for growing lilies to supply the flowers round the year in the market. In the plains favorable climatic conditions prevail only during the winter seasons, to produce quality flowers. Lilies need 2,000-3,000 foot candles of light for quality flowers production. In low light conditions such as photoperiod, less than 12 to 14 hr and 8 hr night interruption prevents the bud drop. A good rooting system is important for obtaining a higher yield of good-quality flowers and bulbs. The optimum day and night temperature for obtaining higher yield and quality of lilium is 20-25 ^o c and 8-12 ^o c during day and night respectively. Flowers market depend on different occasions in early condition farmers will get higher market price. They earn more money from specific day or festival. Now Lilium is one of the profitable new flowers for the flower growers in the Rangpur region. So, farmers earn more income to produce by different planting date of Lilium production. However, it is essential to find out the suitable planting time for Lilium production at Rangpur region

Materials and methods	:
Crop	: Lilium
Design	: RCB
i. Treatments	: T ₁ : 20 November T ₂ : 30 November T ₃ : 10 December T ₄ : 20 December
ii. Replication	: 3
Plot size	: 100 m ²
Planting system/spacing	: As per recommendation
Fertilizer dose and methods of application	: As per recommendation
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, crop duration, yield and yield attributes, Cost and return, farmers opinion.
Investigators	: M.Z. Ferdous, S.M.A.H.M Kamaland M. A. H. Talukder
Season	: Rabi 2022-23
Date of initiation	: November, 2022
Date of completion	: February, 2024
Expected out put	: Suitable planting time for getting higher market price of lilium
Location	: On station, OFRD, BARI, Rangpur
Status	: 2 nd year
Estimated cost	: Tk. 40,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 97 Verification of Yield Gap Minimization in Potato-Maize-T. Aman Rice Cropping Pattern through Recommended Management System

Objectives	:	To find out the yield gap of research and farmers management To increase yield and income of the farmers
Rationale	:	Potato is one of the cash crops in Rangpur region. In farmers field, potato optimum tuber yield is around 30-35 t/ha but research management its yield 60-70 t/ha The previous data of research management and farmers management, the number of tuber and weight of tuber were recorded 12-15 & 10-12 and around 0.90-1.15 & 0.45-0.50 Kg per plant, respectively. The potato maintains spacing is 60 cm x 25 cm in research management where number of plants 66,666 per ha. . On the other hand, farmer management spacing was maintained 55 cm x 20 cm where number of plants 90909. Farmers use higher dose of fertilizer over the research management. So it is necessary to verify the both management for higher (double) yield through research management
Materials and methods	:	
Variety/Line(s)	:	Potato:var. BARI Alu-25
Design	:	RCB
Treatments	:	1. Research's management in Potato-Maize-T. Aman Rice (STB fertilizer dose + Rec. spacing + Rec. Irrigation+ Rec. Pest control) 2. Farmer's management in Potato-Maize-T. Aman Rice

	(Farmers practice in Fertilizer + FP Spacing + FP Irrigation+ FP Pest control)
Replication	: 6 (dispersed)
Plot dimension	: 200 sq. m
Planting system	: Treatment wise
Fertilizer dose	: AS per treatment wise (FRG, 2018)
Methods of application	: Full dose of NPK were applied as basal dose
Irrigated/Rainfed	: Irrigated
Data to be recorded	: Dates of all operations, yield and yield attributes, cost and return, Farmer's opinion
Investigator	: S.M.A.H.M. Kamal, M.U.S. Khatun, Z. Ferdous and M.A.H. TalukderOFRD, Rangpur.
Season	: Rabi 2022-23
Date of initiation	: November, 2023
Date of completion	: November' 2025
Expected output	: A production package of Potato-Maize-T.aman cropping pattern would be developed for higher income.
Location	: MLTS, Lalmonirhat
Status	: 2 nd year
Estimated cost	: Tk. 60,000/-
Source of fund	: BARI
Priority	: First

Expt. 98 Performance of Different Spices and Aroids as intercropping within Betel nut Orchard

Objective(s)	: To find out suitable Spices and Aroids within betelnut Orchard at AEZ-18 To intensify total productivity and farmers income
Rationale	: Betel nut (Areca catechu) is a common palm in Bangladesh, especially in the coastal areas. Each and every homestead has few to thousands of betel nut trees in the coastal areas. It is not only a crop for family consumption but also a cash crop in this area. Many farmers have betel nut plants like orchard. They grow it without proper care especially manure or fertilizer application At present area under betel nut in Bhola district is 8150 ha (DAE, 2020). The inter space of betel nut orchard remains fallow round the year. So, there is an opportunity to identify different spices and aroid intercrop within betel nut orchard. It will increase total productivity as well as farmers income. Therefore, the study will be undertaken to find out suitable spices and aroids as intercrop within orchard for increasing productivity and farmers' income.
Materials and methods	:
Crop/variety	: Betel nut, Ginger, Turmeric, Golmorich, Chuijhal and aroids
Design	: RCB
i) Treatment	: Var. BARI Ada-1, BARI Holud-4, Jainta Golmorich, BARI Panikochu-4, BARI Panikochu-5
ii) Replication	: 6 (Dispersed)
Plot size	: 66 decimal

Spacing	As per recommended method
Fertilizer dose and methods of application	: FRG-2018/STB and recommended methods
Irrigation/rainfed	: Rainfed
Data to be recorded	: Dates of all operation, Yield and yield attributeds, Major disease and insect incidence, Cost and return analysis. Farmers opinion
Investigator(s)	: GaziNazmulHasan & RashidulHasanAnik
Season	Rabi 2022-23
Date of initiation	: November, 2022
Date of completion	: October , 2024
Expected output/benefit	: Total productivity as well as profitability will be increased
Location	: MLT site Dawlatkhan and Bholasadar
Status	: 2 nd year
Estimated cost	: Tk. 60,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 99 Development of Four crops-based Cropping pattern of Potato-Munbean-T.aus-T. aman against Potato-D. Aus-T. aman Rice Cropping Pattern in Bhola

Objective(s)	: 1. To study the comparative agro-economic performance of improved pattern and farmers' existing pattern. 2. To increase cropping intensity and productivity
Rationale	: Potato-D.Aus-T.aman rice is one of the important cropping patterns in Bhola. Potato is one of the most important oil crops in Bhola area. According to DAE, Mustard-D.Aus-T.aman pattern covers as an area of 8700 ha of land. The main challenge of the Sustainable Development Goal (SDG) is to increase double production per unit area through manipulating the limited land resource. In order to produce more food within a limited area, most important options are i) to increase the cropping intensity producing four or more crops over the same piece of land round the year and ii) to increase the productive efficiency of the individual crop. After harvesting of T.Aman, land remains fallow in some days before sowing of D.aus rice which may be utilize by growing mungbean.If cropping pattern (Potato-Mung-T.aus-T.aman) is done properly, farmer will get more benefit. The present study has taken to observe the performance of Potato-Mung-T.aus-T.aman rice cropping pattern.
Materials and methods	:
Crop/variety	: Potato and Sweet gourd
Design	: RCB
i) Treatment	: Alternate Cropping pattern: Potato (var. BARI Alu-72)-Mung (var. BARI Mung-8)-T.Aus (var.BRRI dhan-82/48) T.aman (var. BRRI dhan-72/87) Existing Cropping pattern Potato (Local)-D.aus (var.BRRI dhan-48)-T.aman (var. Sarna/BRRI dhan-23/52)
ii) Replication	: 6 (Dispersed)
Plot size	: 60 decimal

Spacing	: As per recommended method
Fertilizer dose and methods of application	: FRG-2018/ STB and recommended methods
Irrigation/rainfed	: Rainfed
Data to be recorded	: Dates of all operation, Yield and yield attributeds, Major disease and insect incidence, Cost and return analysis. Farmers opinion
Investigator(s)	: GaziNazmulHasan& RashidulHasanAnik
Season	: Rabi 2022-23
Date of initiation	: November, 2022
Date of completion	: October, 2024
Expected output/benefit	: Total productivity in same land will be increased
Location	: Dawlatkhan and BholaSadar
Status	: 2 nd year
Estimated cost	: Tk. 50,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 100 Performance of Intercrops with Panikachu in Char Land Ecosystem

Objectives	: a. To get the suitable combination of intercrops for panikachu b. Increase productivity of farmer's
Rationale	: Edible taro of Bangladesh are known by the common Bengali name 'Kachu' where taro (Panikachu) production is 62,210 ton and area 5,703 ha (BBS, 2021). Panikachu is a very much nutritious vegetables. But now-a-days, the utilization of aroids is increasing due to increase awareness about nutritional aspect. Taro leaf contain highest amount of vitamins and minerals among other vegetables. Aroids mitigate the demand of vegetables in large period during just after monsoon. Intercrops have the potentials to give higher yield than sole crops, greater yield stability and efficient use of nutrients (Seran and Brintha, 2010). This study on intercropping of taro with other crops will be identify for appropriate companion crops to be intercropped with taro production in char land area.
Materials and methods	:
Crop/variety	: Var. BARI Panikachu-2
Planting system	: Line sowing (60 cm x 45 cm for taro)
Design	: RCBD
i.Treatment	: 6 (Six) T ₁ = Sole Taro T ₂ = Taro + Palankshak (2 line in between 2 taro line) T ₃ = Taro+ Dhonia (3 line in between 2 taro line) T ₄ = Taro + Radish leaf purpose (2 line in between 2 taro line) T ₅ = Taro + Stem amaranth (2 line in between 2 taro line)
ii.Replication	: 6 (dispersed)
Plot size	: 4.5m × 3m
Fertilizer dose	: Urea 350 kg, TSP-200 kg, MoP-350 kg, Gypsum- 130 kg, ZnSO ₄ -16 kg, Boron-12 kg per hectare.

Methods of application	: All PKSZnB and half N should be applied 5-7 days prior to seedling planting and rest of N should be applied as top dress in 6 split at 15 days interval after 60 DAP
Irrigation/rainfed	: Irrigated
Data to be recorded	: i) Yield and yield contributing characters ii) Economic analysis
Investigators	: M.M. Rahman and M.S. Rahman
Season	: Rabi
Date of initiation	: 2 nd week of November, 2022
Date of completion	: Last week of September, 2023
Expected output	: Intercrops will be selected for panikachu and increase farmer's productivity as well as income.
Location	: Char land of Sherpur and Jamlpur
Status	: 2 nd year
Estimated cost	: Tk. 40,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 101 Effect of Sunflower Rows for Onion Seed Production

Objective (s)	: (i) To determine suitable sunflower rows for onion seed production (ii) To increase sustainable yield of onion seed production
Rationale	: Insect are commonly known as the best functioning elements in terms of pollination in terrestrial ecosystem of the world (Klein et al., 2007). During recent year, in case of onion seed production in Faridpur, pollinator abundance is lower resulting poor seed yield. For attracting pollinator in onion seed production, valuable and healthy oil containing crop like sunflower may be introduced as a border or row crop with onion. Different researcher stated that the dense collection of yellow petals of a sunflower (or an 'inflorescence') has ultraviolet (UV) colors that attracts pollinators and aiding in pollination for better seed production. Bees are the most abundant floral visitors in sunflower (Muhammad et al., 2021). Pollinator community is attracted towards flowering plants based on numerous factors including nectar sugars, corolla length and pollen quality. So, the present study will be undertaken to find out suitable sunflower rows for onion seed production and to increase sustainable yield of onion seed production
Materials and Methods	:
Crop/variety	: Onion (var. BARI Piaz-1) and sunflower (var. BARI Surjomukhi-3)
Design	: RCB
i) Treatment	: T ₁ : One row of sunflower after 10 rows of onion T ₂ : Two rows of sunflower after 10 rows of onion T ₃ : Three rows of sunflower after 10 rows of onion
ii) Replications	: 6
Plot size	: 10 m x 10 m
Planting system/spacing	: 30 cm x 15 cm
Fertilizer dose and methods of application	: Onion: 160-60-60-30-3-1.5 kg of N-P-K-S-Zn & B ha ⁻¹ All of organic manure, P, K, S and B; and half of N and K will be applied as basal during final land preparation. Remaining N will be applied as top

dress in two equal splits at 25 and 50 days after planting under moist soil condition and mixed thoroughly with the soil as soon as possible for better utilization

Sunflower: 87-34-80-29-4-2 kg ha⁻¹ N-P-K-S-Zn-B

One-third of nitrogen and all the phosphorus, potassium, sulphur, zinc and boron will be applied as broadcast and incorporated during final land preparation. Remaining nitrogen will be applied at 30 and 55 DAS as top dress followed by irrigation.

Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield and yield contributing characters, quality test of seed, pest incidence, Farmer's opinion
Investigator (s)	: Concerned scientists of OFRD, Faridpur and Entomology Division, Gazipur
Season	: Rabi 2022-23
Date of Initiation	: November 2022
Date of completion	: April 2023
Expected output/benefit	: Suitable rows of sunflower will be found out for higher productivity and return.
Location	: FSRD site Faridpur
Status	: 2 nd year
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 102 Development of Alternate Cropping Pattern as Sunflower-Jute-T. Aman against Existing Fallow-Jute-T. Aman Cropping Pattern in Gopalganj

Objectives	: To introduce sunflower as a new crop To establish a new cropping pattern
Rationale	: In order to mitigate the food demand it is necessary to intensify the crop production through introducing new crop in cropping pattern. The main challenge of the new millennium is to increase per unit yield at least 50% through manipulating the limited land resource. Gopalganj mainly a low laying area and water receding period is thereby very late that's why farmers cannot sow mustard and vegetables in early <i>rabi</i> season and Fallow-Jute-T. aman, one of major cropping pattern of this area. So, it easy to introduce sunflower var. BARI Surjamukhi-3 in existing pattern cropping pattern because BARI Surjamukhi-3 is a photo insensitive crop. As a result seasonal fallow land will be taken under cultivation which increase the cropping intensity as well as increase the oil seed production. Considering the above facts, an improved cropping pattern as Sunflower-Jute-T. aman will be designed against farmers existing Fallow-Jute-T aman cropping pattern
Materials and methods	:
Crop/variety	: Sunflower var. BARI Surjomukhi-3, Jute var. JRO-524 and T. aman var. BRRI dhan-87
Design	: RCB
Replications	: 6 (dispersed)
Treatment	Improved pattern: Sunflower-Jute -T.Aman Existing Pattern: Fallow-Jute-T.Aman
Plot size	: 15 decimal per location

Planting system/Spacing	: Sowing (30 cm line to line)
Fertilizer dose& application methods	: N-P-K-S-Zn-B at the rate of 115-33-43-27-2-1 kg ha ⁻¹ , respectively. Half N and all others fertilizer will be applied as basal and remaining N fertilizer will be top dressed at vegetative stage.
Irrigation/rainfed	: Irrigated
Data to be recorded	: Yield and yield contributing data
Investigator(s)	: M M Howlader
Season	: Rabi
Date of initiation	: December 2022
Date of completion	: February 2024
Expected output/benefit	: To find out the let potential variety for low lying area which increase the productivity of mustard.
Location	: FSRD site, Gopalganj sader and MLT site pirojpur
Status	: 2 nd
Estimated cost	: Tk. 80,000
Source of fund	: OFRD, BARI
Priority	: 1 st

Expt. 104 Development of Mustard- Sesame-T-Aman Cropping Pattern Against Existing Mustard-Fallow-T-Aman Cropping Pattern

Objectives	: To increase productivity of oil seed crops and cropping intensity To Introduce sesame at Netrokona
Rationale	: Some pocket area of Netrokona district existed Mustard-Fallow-T. Aman cropping pattern. The area is comparatively possessing scarcity of irrigation water to cultivate Boro rice. Where sesame can be cultivated easily with low inputs. The crop is tolerant to drought. It can play partial role in fulfilling the oil crisis of our country. In this context, sesame might be a promising crop for cultivation in fallow land. On the other hand, increasing cropping intensity as well as proper utilization of land, a three crops based pattern would be highly encouraged. Hence, therefore the trial will be conducted for higher cropping intensity and economic return at Netrokona district.
Materials and Methods	:
Crop	: Mustard, Sesame and T. Aman
Variety	: Mustard: BARI Sharisha-14, Sesame: BARI Til-4 and BRRI dhan75
Seed rate	: As recommended doses
Treatments	: Existing pattern: Mustard-Fallow-T-aman Improved pattern: Mustard-Sesame-T-aman
Design	: RCBD
Replications	: 06 (Six) dispersed
Unit Plot size	: 20m × 10m
Fertilizer dose	: As per FRG, 2018/STB
Application of fertilizer	: As per FRG, 2018/STB
Data to be collected	: Dates of all operations, Yield and yield attributes of all crops, Pests and diseases reactions, Cost an return analysis & Farmers' opinion
Expected output	: Production of oil seed crops and cropping intensity will be increased.
Status	: 2 nd year

Date of initiation : November' 2022
 Date of completion : November, 2025
 Estimated cost : Tk. 60,000/-
 Source of fund : BARI
 Location (s) : Netrakona
 Investigator(s) : Dr. M.A. Islam, Dr. M.M. Zaman and Dr. F. Begum (CSO, ORC).

Expt. 105 Intercropping of Chilli with Bitter Gourd

Objectives : To increase land use efficiency and
 To increase farm productivity and income of the farmers.

Rationale : Intercropping is one of the techniques of vertical expansion of crop production that increase total productivity per unit area than sole cropping. Bitter gourd is one of the major vegetable crops in char area of Mymensingh Sadar. A large area of char land is covered with this crop without trellis. Inclusion of Chilli with this crop may increase the crop productivity as well as land use efficiency. A few innovative farmers in that locality cultivate brinjal/ chilli/ coriander as intercrop in the bitter gourd field and got extra income from intercrop with little investment. Proper distance/ percentage should be maintained for intercrop cultivation without hampering the yield of main crop (bitter gourd). Hence this technology would be beneficial and stable for the bitter gourd production. Therefore, to identify the suitability of chilli as intercrop in bitter gourd field the experiment will be carried out.

Materials and methods :

Variety/Line : Bitter gourd: BARI Hybrid Korola 3, Chilli: BARI Morich-2
Design : RCB
Treatments : T₁: Bitter gourd (100%) + Chilli (75%)
 T₂: Bitter gourd (100%) + Chilli (50%)
 T₃: Bitter gourd (100%) + Chilli (25%)
 T₄: Sole Bitter gourd

Replication : 6 (Dispersed)
Plot dimension : 8 m × 4.5 m
Planting system : Line sowing at 1.5 m × 2 m distance for Bitter gourd and 50 cm × 50 cm for Chilli

Fertilizer dose : As recommended /STB
Methods of application : Entire cowdung, P, S, Zn, B and 2/6 of K were applied during pit making. Total amount of N and rest of K were applied in four equal installments at 15, 35, 55, and 75 days after transplanting.

Irrigated/Rainfed : Irrigated

Data to be recorded : Dates of all operations, plant height (cm), Fruits/plant (no.), Individual fruit weight (g) and size, Fruit yield (t/ha), Chilli yield, pest and disease reaction, cost and return, Farmer's assessment

Investigator : Dr. Shahana Sultana, SO and Dr. Md. Moniruzzaman, PSO, OFRD, Mymensingh.

Season : Rabi' 2022-23
Date of initiation : Mid October'2022
Date of completion : April'2023
Expected output : At least 20% yield will be increased.
Location : Muktagacha, Mymensingh
Status : 2nd year

Estimated cost : Tk. 30,000/-
Source of fund : BARI
Priority : 1

Expt. 106 Development of Cropping Patterns against Fallow-Boro-Fallow Cropping Pattern in Haor Area

Objectives : To increase land use efficiency and total productivity
To increase farmers income and employment opportunity

Rationale : Sweet potato (*Ipomoea batatas*) is a major food crop, which serves as a source of energy and nutrition in many countries. The crop is regarded as a food security crop due to its low input requirements, ease of production and high nutritional component. It has been recommended as a crop to promote for nutritional food security in Bangladesh especially the Orange fleshed varieties that are capable of alleviating Vitamin A deficiency, in children under five years. Besides ensuring food security of increased population, the country needs to be increased food production by increasing cropping intensity. The average cropping intensity in Nikli upazila of Kishoreganj is 112% whereas national average is 195%. The vast area remains fallow for long time 80-90 days after flood water receded. So, there is a great scope of increasing cropping intensity as well as crop productivity in this area by introduce BARI sweet potato in this area.. Potential adoption of sweet potato in Fallow-Boro-Fallow cropping system would generate employment and additional income of the farmers by utilization fallow and underutilize lands in the haor areas. Considering the above facts, the below mention cropping patterns will be conducted at *Patachapra* haor in Kishoreganj. Hence the trail will be conducted to improve the existing cropping pattern, increase cropping intensity, increase yield and economic return, access to food and nutrition, employment opportunity and woman's participation.

Materials and methods :

Variety/Line(s) : Sweet potato: var. BARI Misti Alu-12/17, Kenaf: BJRI Kenaf-3, Potato: Local cultivar (Romana), Ground nut: var. BARI Chinabadam-9

Design : RCB

Treatments : **Improved cropping patterns:** CP1: Sweet potato- Kenaf-Fallow, CP2: Sunflower-Kenaf-Fallow, CP3: Potato- Ground nut -Fallow
Existing cropping pattern: Fallow-Boro rice-Fallow

Replication : 6 (Dispersed)

Plot dimension : 2000-2400 sq. m

Planting system : Sweet potato (60 × 30 cm), Kenaf (Broadcast), Sunflower (Line 50 Cm × 25Cm) and Boro rice (25× 15cm)

Fertilizer dose : As recommended (FRG Guide BARC, 2018) /STB

Application method : Full dose of NPK as basal dose

Irrigated/Rainfed : Irrigated

Data to be recorded : Dates of all operations, yield and yield attributes, pest and disease incidence, cost and return, Farmer's opinion

Investigator : Dr. M Mohiuddin, SSO, OFRD, Kishoreganj.

Season : Rabi 2022-23

Date of initiation : October'2022

Date of completion	: June, 2023
Expected output	: Total productivity and income of farmers will increase in ha or area
Location	: Nikli, Kishoreganj
Status	: 2 nd year
Estimated cost	: Tk. 100,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 107 Intercropping of Garlic with Sugarcane

Objectives	: To increase productivity and return by intercropping system To maximize land utilization and economic returns
Rationale	: Intercropping is one of the techniques of vertical expansion of crop production that increase total productivity per unit area than sole cropping. Intercropping of one or more crops with Sugarcane is an appropriate approach of getting additional farm income beside the main crop of Sugarcane. Sugarcane is a long duration crop. From planting to harvest it requires 12 to 14 months. The growth of Sugarcane is slow in earlier stages and it takes about 3 to 5 months to establish the full canopy of the crop. During the early stages of Sugarcane growth, some short duration crop can be grown as intercrop in the vacant spaces between two cane rows. Farmers of Tangail district especially in Delduar upazilla cultivate huge amount of chewing type Sugarcane. Most of the farmers do not cultivate short duration crops as intercropped with Sugarcane and few of the farmers practice vegetables as intercropped with Sugarcane. In view of this consideration the experiment will be undertaken to find out the suitable crop for intercropping with Sugarcane under farmers' field condition for increasing cropping intensity, productivity and economic returns.
Materials and Methods	:
Crop	: Sugarcane
Variety	: Sugarcane: var. Bomby Garlic: var. BARI Rashun-3
Treatments	: T ₁ : Sole Sugarcane T ₂ : Sugarcane (100 %) + three rows of Garlic T ₃ : Sugarcane (100 %) + four rows of Garlic T ₄ : Farmers practice (Sole sugarcane)
Design	: RCB
Replications	: 06 (dispersed) as six farmers
Unit plot size	: 20 m x 10 m
Spacing (cm)	: Sugarcane: Row to row distance = 100 cm Plant to plant distance = 45 cm Garlic: Row to row distance = 20 cm & Plant to plant distance = 10 cm
Fertilizer dose	: 55-36-60-15-1-1 kg ha ⁻¹ N-P-K-S-Zn-B (FRG, 2018) with 20% extra fertilizer will be add in garlic
Application method	: FRG, 2018/STB
Data to be collected	: Dates of all operation, yield and yield contributing characters & equivalent yield, major disease and insect incidence, cost and return analysis, farmers' opinion
Expected output	: Economic return will be increased by at least 30-40 %

Investigator(s) : Scientists of OFRD, BARI, Tangail
 Location(s) : FSRD site Atia, Delduar, Tangail
 Date of initiation : Rabi, 2022-23
 Date of completion : Kharif, 2023
 Estimated cost : Tk. 60,000/-
 Source of fund : BARI
 Status : 2nd year

Expt. 108 Intercropping of Onion and Chilli with Brinjal

Objectives : To increase productivity and return by intercropping system
 To maximize land utilization and economic returns

Rationale : Intercropping has recognized as a potentially beneficial system of crop production. It is a traditional practice in Bangladesh. It increases total productivity per unit area through maximum utilization of land, labour and growth resources (Marshal and Willey, 1983; Quayum *et al.*, 1999; Crauford, 2000). By judicious choice of compatible crops, by adopting appropriate planting geometry, inter/intra specific competition may be minimized resulting higher total productivity (Umrani *et al.*, 1994). Canopy architecture of tall stature crop regulates the availability of light on under storied crop (Faruque *et al.*, 2000). Brinjal (*Solanum melongena*) is one of the most important and popular vegetables in Bangladesh that grown widely and round the year. It may be cultivated both as sole crop and as intercrop. Farmers grow Brinjal as a sole crop at Delduar, Tangail. In that case, farmers can easily cultivate onion and chillias an intercrop with Brinjal. Intercropping also gives better efficient use of resources. So, the experiment will be conducted to increase yield and economic return through intercropping Potato with Brinjal in Delduar, Tangail.

Materials and Methods :

Crop & Variety : Brinjal: Purple King
 Onion: BARI Piaz-4
 Chilli: BARI Morich-2

Treatments : T₁: Brinjal (100%)
 T₂: Brinjal (100%) + two rows of chilli
 T₃: Brinjal (100%) + four rows of onion
 T₄: Brinjal (100%) + one row of chilli+ four rows of onion
 T₅: Farmers' Practice (Brinjal + five rows onion)

Design : RCB
 Replications : 06 (dispersed)
 Unit plot size : 5 m x 4 m
 Spacing (cm) : **Sugarcane:** 100 cm x 45 cm
Onion: 20 cm x 10 cm
Chilli: 60 cm x 40 cm

Fertilizer dose : 80-24-60-10-1.0-0.3 kg ha⁻¹ N-P-K-S-Zn-B with 20% extra fertilizer will be add in chilli and onion

Application of fertilizer : FRG, 2018/STB

Data to be collected	: Dates of all operation, yield and yield contributing characters & equivalent yield, major disease and insect incidence, cost and return analysis, farmers' opinion
Expected output	: Economic return will be increased by at least 30-40 %
Status	: 2 nd year
Date of initiation	: Rabi, 2022-23
Date of completion	: Kharif, 2023
Estimated cost	: Tk. 60,000/-
Source of fund	: BARI
Location(s)	: FSRD site, Atia, Delduar, MLT site Madhupur, Tangail
Investigator(s)	: Scientists of OFRD, BARI, Tangail

Expt. 109 Development of Potato/Maize (as Intercrop) – Jute -T.Aman Rice Cropping Pattern against Potato-Jute-T.Aman Cropping Pattern

Objectives	: To increase cropping intensity To increase yield and economic return of farmers
Rationale	: Intercropping is an important tool for getting higher productivity per unit area of land and it improves the food security (Mahfuza <i>et al.</i> , 2012). Intercropping system becomes productive and economical only when it is done properly by selecting compatible crops (Begum <i>et al.</i> , 2010). Potato and maize may be grown as intercrop as they have different photosynthetic pathway, growth habit, growth duration and demand for growth resources. In recent years maize is gaining popularity due to high yield, more economic return and versatile uses. Maize is a spaced crop and there is a scope of using this space through growing other crop as intercrop. For this reason a farmer can do other high productive crop like-Potato. Intercropping of these two crops may fulfill farmers' demand of both maize and potato. With these views the trial has been undertaken with the above objectives.
Materials & Methods	:
Treatments	: Improved pattern: Potato (var. BARI Alu-41) / Maize (var.BARI Hybrid Maize-16) -Jute (var. BJRI Toshapat-8) - T.Aman (var.BRRI dhan87) Existing Pattern: Potato (var. Diamont)-Jute (var.Falguni tosha)-T.Aman (var. Tej gold) (Maize seedling will be sown after 25 DAS of potato in between two potato plant at first week of November)
Spacing	: Maize: Row to row distance = 60 cm Plant to plant distance= 25 cm Garlic: Row to row distance = 60 cm Plant to plant distance = 25 cm
Replication	: 06 (dispersed)
Plot size	: 400 m ² per plot
Fertilizer	: As recommended (FRG Guide BARC, 2018)/STB
Data to be recorded	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence , Cost and returns, Farmers opinion
Investigators	: Scientists of OFRD, BARI, Tangail
Expected output	: New cropping pattern will be developed

Status : 2nd year
 Initiation : August 2022
 Estimated cost : Tk. 80000/-
 Source of fund : BARI
 Location : FSRD site Atia, Delduar and MLT site Madhupur, Tangail

**Expt. 110 Development of alternate cropping pattern Soybean-D. Aus/T.Aus-T.Aman
 Cropping Pattern in Coastal Saline Area of Noakhali**

Objective (s) : -To find out suitable and economic cropping patterns for riverine Area
 - To increase cropping intensity

Rationale : Coastal area of Noakhali specially riverine charland is probably the most vulnerable area in context of agriculture. In this area total agricultural production as well as crops/ varieties is limited due to various causes, like varying degree of soil and water salinity, unavailability of irrigation water in the dry season, cultivation of long duration of local T. aman rice, cyclone, tidal inundation, shorter winter period etc. are most common. T. aman rice is the major crop in this region next to T. aus/ dibbling aus. Rabi crops are cultivated according to farmers choice. In Noakhali district, 100000 ha land remains fallow during dry season because of varying degrees of soil salinity. Of the total cultivable area 84 % area is medium highland (DAE, Noakhali, 2007). So, there is a great scope to enhance crop production in this saline area by adopting salt tolerant crops with their modern varieties.. In rabi season farmers grow few crops like sweet potato, chilli, soybean, ground nut, khesari, cowpea, water melon, mungbean etc. following some traditional cropping patterns and they use mostly the local varieties with very low and not satisfactory yield . BARI has released some promising high yielding varieties of different rabi crops which need to be tested in improved cropping pattern for their yield performance. Keeping this , the experiment is undertaken to compare the suitable and economic cropping patterns at farmers field.

Materials and methods :

Crop/Variety : Soybean (var. BARI Soybean-5/6)- T.Aus/D. Aus (var. BRRI dhan84/Binadhan-19)-T. Aman (var. BRRI dhan87/100)

Design : RCBD

i) Treatment : For Improved CP : Soybean (var. BARI Soybean-5/6)- T.Aus/D. Aus (var. BRRI dhan84/Binadhan-19)- T. Aman (var. BRRI dhan87/100).
 Existing CP: ?

ii) Replication : 6 dispersed farmers

Plot size : 100 dec./Farmer

Fertilizer dose and methods of application : As FRG'2018/STB

Irrigated/rainfed : Rainfed

Data to be recorded : I. Growth parameters
 II. Yield and Yield attributes
 III. Incidence of pest and diseases

Investigator (s) : Concerned Scientist of OFRD, Noakhali and BRRI, Sonagazi

Season : Rabi

Data of initiation : November 2022

Date of completion : December2023
 Exp. Outcome / benefit : Cropping intensity as well as farmers income will be increased
 Location : OFRD, BARI, Noakhali
 Status : 2nd year
 Estimated cost : Tk. 60000/-
 Source of fund : BARI
 Priority : 1

Expt. 111 Intercropping Chilli with Sweet Gourd

Objectives : To find out suitable intercropping combination
 To increase total production
 Rationale : Farmers grow sweet gourd during rabi season after harvesting T. aman rice. Sweet gourds are planted with a wide spacing and it takes more times to cover the space around it. Chilli is also a rabi crop. So, chilli seedlings can be transplanted in sweet gourd beds. Before covering the whole space by sweet gourd, chilli plants will be able to complete its vegetative growth. Thus, chilli with sweet gourd intercropping may be an option to increase total productivity with increased income. Keeping these views in mind, the trial has been undertaken with the above objectives.

Materials and Methods :

Crop/varieties : Sweet gourd (**var.** BARI Hybrid Mistikumra-2) and chilli (var. BARI Morich-3)

Design : RCB

Treatments (4) : T₁- Sole sweet gourd
 T₂- Two rows chilli in sweet gourd bed
 T₃- Four rows chilli in sweet gourd bed

Replication : 6 (dispersed)

Plot size : 8m × 2.5m

Planting system : Sweet gourd in pit; spacing 2.5m × 2.5m
 Chilli in line: spacing 60cm × 40cm

Fertilizer dose and application method : Fertilizers for each crop will be applied as recommended in FRG 2018/ STB. Required amount of fertilizers except urea and MoP for chilli will be applied as basal dose in the field. Urea and MoP will be applied in 3 equal splits in pit for sweet gourd and in line for chilli.

Irrigation/ rainfed : Irrigated

Data to be recorded : Dates of all operations, Yield and yield contributing characters, Major disease and insect incidence, cost and returns analysis, farmers opinion.

Investigators : K U Ahammad and M H Rahman

Season : Rabi

Date of initiation : October 2022

Date of completion : July 2024

Expected output : Sweet gourd and chilli intercropping system will be find out

Location : MLT site,Jhikargacha and Kaliganj

Status : 2nd year

Estimated cost : Tk. 60000/-

Source of fund : BARI

Priority 1st

Expt. 112 Development of Garlic-T.Aus-T. Aman Cropping Pattern against Boro-Fallow- T. Aman Cropping Pattern

Objectives : To improve the existing cropping pattern
To increase crop yields and economic return of farmers

Rationale : Boro-T. Aman-Fallow is an important existing cropping pattern at MLT site, Jhikargacha, Jashore. This cropping pattern acquires 5010 ha area of total cultivable land. In this cropping pattern farmers use old crop varieties those are poor yielding and susceptible to different pest. If this pattern is replaced by Garlic-T. aus-T. aman cropping pattern and introduce modern varieties of the crops then it will be profitable to the farmers. After harvesting of T. aman rice, garlic clove can be sown in zero tillage condition and introduce high yielding crop varieties in Boro-T. aman-Fallow cropping pattern. Therefore, a trial will be conducted for the improvement of the existing cropping pattern and for higher yield and economic return.

Materials and Methods :

Crop/varieties : Rice (var. BRRI dhan28, Swarna, BRRI dhan92, BRRI dhan87) and Garlic (var. BARI Rashun-2)

Design : RCB

Treatments : Existing pattern: Boro (var. BRRI dhan28)-Fallow-T. Aman (var. Swarna)
Alternate pattern: Garlic (var. BARI Rashun-2)-T. Aus (var. BRRI dhan92)-T. Aman (var. BRRI dhan87)

Replication : 6 (dispersed)

Plot size : 800 m² per farmer

Planting system : Seed rate and spacing: As per recommended for the crops

Fertilizer dose and application method : FRG, 2018/STB

Irrigation/ rainfed : Irrigated

Data to be recorded : Dates of all operation, yield and yield contributing characters & equivalent yield, major disease and insect incidence, cost and return analysis, farmers' opinion

Investigators : K U Ahammad and M H Rahman

Season : Round the year

Date of initiation : October 2022

Date of completion : November 2024

Expected output : Crop yields and higher economic return will be achieved over the existing practice

Location : MLT site, Jhikargacha

Status : 2nd year

Estimated cost : Tk. 60000/-

Source of fund : BARI

Priority : 1st

Expt. 113 Development of Alternate Cropping Pattern Mustard - Maize - T. Aman against Lentil - Jute - T. Aman

Objectives	: To improve the existing cropping pattern by inclusion of modern crop varieties To increase crop yield and farmers' income
Rationale	: About 160 million people are in Bangladesh now with the growth rate of 1.37% (BBS, 2011). To produce more food with this limited area, improvement of existing cropping pattern is urgent by using optimum management practices and incorporation of modern varieties. Next to rice, maize is the most important cereal food crop in Bangladesh and its area is increasing day by day for its higher price. So, farmers of Magura district are interested to grow maize in their field where Mustard-Maize-T. aman cropping pattern will be more profitable than Lentil-Jute-T. aman. With this point of view the present study will undertaken to evaluate the alternate cropping pattern and to increase system productivity.
Materials and Methods	:
Crop/varieties	: Lentil (var.BARI Mosur-8), Mustard (var.BARI Sarisha-18), Maize (var. Hybrid), Jute (var.local), and T. Aman rice (var. BRRI dhan87 and BRRI dhan75)
Design	: RCB
Treatments	: Existing cropping pattern: Lentil (var.BARI Mosur-6) –Jute (var. Local)– T. aman (var. BRRI dhan87) Alternate cropping pattern: Mustard (var.BARI Sarisha-18)-Maize (Commercial Hybrid)–T. aman (var. BRRI dhan75)
Replication	: 4
Plot size	: 800 m ² per farmer
Planting system	: Seed rate and spacing: As per recommended for the crops
Fertilizer dose and application method	: FRG, 2018/STB
Irrigation/ rainfed	: Irrigated
Data to be recorded	: Dates of all operation, yield and yield contributing characters & equivalent yield, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigators	: K U Ahammad and M H Rahman
Season	: Round the year
Date of initiation	: October 2022
Date of completion	: November 2024
Expected output	: Total production and farmers income will be increased
Location	: MLT site, Shimakhali, Magura
Status	: 2 nd year
Estimated cost	: Tk. 60,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 114 Intercropping of Garlic with Pointed Gourd

Objectives	: To find out the performance of garlic as intercrop with pointed gourd To increase total productivity and economic return.
Rationale	: Pointed gourd is one of the major vegetable crops in Bangladesh grown round the year. The main growing season of this crop is winter and the farmers of Jhikargacha cultivate it as a sole crop. BARI has released some garlic varieties- BARI Rosun-1, BARI Rosun-2, BARI Rosun-3 and BARI Rosun-4. Among the varieties BARI Rosun-2 is cultivated by some farmers of Jhikargacha in winter season. If garlic is transplanted in between two rows of pointed gourd then the total productivity and economic return of farmers will be increased. But no scientific study has been done in this regard earlier. Therefore, the present experiment will be conducted to find out the performance of garlic as intercrop with pointed gourd in Jhikargacha.
Materials and Methods	:
Crop/varieties	: Pointed gourd (var. BARI Potol-2) and garlic (var. BARI Rosun-2)
Design	: RCB
Treatments	: T ₁ : 1 row garlic between 2 rows of pointed gourd T ₂ : 2 row garlic between 2 rows of pointed gourd T ₃ : 3 row garlic between 2 rows of pointed gourd T ₄ : Sole pointed gourd
Replication	: 6 (dispersed)
Plot size	: 20m × 10m
Planting system	: Pointed gourd : 2m × 2m, garlic: 20cm × 10cm
Fertilizer dose and application method	: FRG, 2018/ STB. Entire amount of cowdung, TSP, gypsum and half amount of MoP will be applied at final land preparation. Urea will be applied into three equal installments at 15 DAT, fruiting stage and mid time of harvesting. Rest amount of MoP will be applied at fruiting stage.
Irrigation/ rainfed	: Irrigated
Data to be recorded	: Dates of all operation, yield and yield contributing characters, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigators	: K U Ahammad and M H Rahman
Season	: <u>Rabi</u>
Date of initiation	: October 2022
Date of completion	: July 2024
Expected output	: Total productivity and economic return will be increased
Location	: MLT site, Jhikargacha
Status	: <u>2nd year</u>
Estimated cost	: Tk. 60,000/-
Source of fund	: BARI

Expt. 115 Management of Gummosis disease of Citrus in Narsingdi

Objectives	:	To identification suitable fungicide for controlling Gummosis. To spread and popularize the technology among the farmers.
Rationale	:	Gummosis disease of Citrus trees caused by Phytophthora Citrophthora. So the application of fungicides to save the trees.
Materials and method	:	
Treatment-	:	T ₁ - Redomil gold (clean the wounded Portion and applied redomil pest and spray four times 2gm/l after 15 days interval. T ₂ - Bordo nixture T ₃ - Alkatra
Replications	:	6(dispersed)
Design	:	RCB
Land area	:	500 m ²
Data To be recorded	:	Disease incidence. disease severity an plot yield will be recorded
Status	:	2 ND Year
Priority	:	1 st
Sate of Initiation	:	November-2021
Benefit	:	Farmers will be benefited.
Estimated cost	:	Tk. 80,000/-
Source of Fund	:	BARI
Location	:	OFRD, BARI, Shibpur, Narsingdi.
Investigator	:	MD. ASADUZZAMAN, Senior Scientific Officer

Expt. 116 Effect of Sowing Time of Mustard variety in Eastern Surma-Kushiyara Floodplain Soil of Sylhet

Objective (S)	:	To find out the optimum sowing date for mustard seed production in the north-east part of Bangladesh
Rationale	:	. Mustard is the major edible oilseed crop in our country. It is extensively grown as a sole crop as well as intercrop or mixed crop. The seed yield and maturity of mustard plants are greatly influenced by environmental conditions regardless of proper sowing time. Mustard sowing at optimum time gives higher yields due to suitable environment that prevails at all the growth stages (Kumar et al., 2018). The growth and yield of mustard are profoundly affected by sowing time (Mondal and Islam, 1993; Shivani and Kumar, 2002; Alam et al., 2014).. The optimum sowing may help plants to expose in to the most favourable environment for better growth and good yield, as well as escape the insect and disease infestation. Keeping this view in mind, the present study will be undertaken to find out optimum sowing date for maximum yield of mustard.
Materials and methods	:	
Crop/Variety	:	Mustard: BARI Sarisha-14 or BARI Sarisha-18
Design	:	RCB
i) Treatment	:	S ₁ : 15 November, S ₂ : 30 November, S ₃ : 15 December, S ₄ : 30 December, S ₅ : 15 January
ii) Replication	:	3
Plot size	:	150 m ²
Planting system/spacing	:	Broadcast

Fertilizer dose and methods of application	: -
Irrigated/rainfed	: Rainfed
Data to be recorded	: Date of all operation; leaves/plant, siliqua/plant, seed/siliqua, weight of 1000 seed in gram, yield/plot, yield/ha, major disease and insect infestation; farmers opinion and weather data.
Investigator (s)	: M. I. Nazrul
Season	: Rabi
Date of initiation	: November 2021
Date of completion	: April 2023
Expected output/benefit	: Appropriate sowing time of mustard will be ascertained for increasing production.
Location	: FSR site, Kamalbazar and all MLT sites
Status	: 2 nd year
Estimated cost	: Tk. 50000/-
Sources of fund	: BARI
Priority	: 1 st

Expt. 117 Analysis of Climatic Effect on Lentil Yield in Barind Region of Bangladesh

Objective(s)	: To analyze the temporal changes in rainfall and temperature in Barind region. To evaluate the relation of lentil area and yield with the changes in rainfall and temperature over the time.
Rationale	: Lentil (<i>Lens culinaris</i> L.) is an annual legume of Fabaceae family. This pulse crop is a very good source of protein. In Barind region, the area coverage of lentil is increasing. But, due to climatic variability over time in that area what changes are being arisen with the area and yield of lentil. Barind region is suffering from drought for the last few years because of groundwater depletion, less rainfall, and high temperature. Moreover, lentil is very responsive to rainfall and sudden changes in climatic conditions. Therefore, a study has been designed to analysis the temporal changes in climatic conditions like rainfall and temperature and the relation between climatic changes and lentil area and yield in Barind region.
Materials & methods :	
Crop/variety	: Lentil
Design	: The information regarding the area and yield of lentil will be gathered and preserved by a server named KoboCollect. Then the location will be tagged in the location map and different indices will be calculated using GIS techniques. The thirty years of rainfall and temperature data will be used, processed, and finally maps will be generated using GIS techniques.
Plot size	: More than 100 farmers' field data will be collected.
Planting system	: Information on the planting system will be recorded.
Fertilizer dose and methods of application	: Information on farmers' applied fertilizer dose will be recorded.
Irrigated/rainfed	: Information on the irrigation system will be recorded.
Data to be recorded	: Monthly and annual total rainfall, monthly maximum and minimum temperature, lentil area, GPS location, farmer address, dates of planting

	and harvest of lentil, planting system, fertilizer dose, irrigation system, and yield of lentil.
Investigators	: Dr. Taslima Zahan, Suman Biswas, Md. Shakhawat Hossain, Istiak Ahmed, Sheikh Ishtiaque, Dr. Apurbo Kumar Chaki and Dr. Md. Faruque Hossain
Date of initiation	: November 2022
Date of completion	: March 2024
Expected output	: Major contributing climatic variables will be identified to boost up the production of lentil in Barind region.
Location	: Agromet and Crop Modeling Lab, OFRD, BARI, Gazipur and OFRD, Barind, Rajshahi
Status	: 2 nd Year
Estimated cost	: 1,00,000/- per year per location
Source of fund	: BARI
Priority	: First

Expt. 118 Yield Prediction of Lentil by Linking Crop Cuts with Phenological Analysis of Sentinel-2 Time Series

Objective(s)	: To monitor phenological growth of lentil in barind region. To develop a model for yield prediction of lentil early before harvest.
Rationale	: Lentil (<i>Lens culinaris</i> L.) is an annual legume of family Fabaceae. This pulse crop is a very good source of protein. By using satellite images, phenological growth of lentil can be monitored and yield can be predicted at least 15 days early before harvest. Therefore, a study has been designed to monitor the phenological growth and also to develop a model for early yield prediction of lentil by using sentinel-2 imageries.
Materials & methods	:
Crop/variety	: Lentil
Design	: Crop cut data will be collected from at least 200 farmer fields of barind region along with GPS reading. Multispectral data will be gathered from sentinel-2 imageries of 5-day interval at 10 m resolution. Data will be pre-processed by using codes in GEE. Temporal profiles per plot will be generated using TIMESAT software. From those profiles, large integrals will be extracted. On the other side, the data quality will be checked and data screening will be done. Then, a linear regression-based model will be developed, calibrated, and validated to estimate yield early before harvest.
Plot size	: At least 200 farmers' field data will be collected.
Planting system	: Information on the planting system will be recorded.
Fertilizer dose and methods of application	: Information on farmers' applied fertilizer dose will be recorded.
Irrigated/rainfed	: Information on the irrigation system will be recorded.
Data to be recorded	: Monthly and annual total rainfall, monthly maximum and minimum temperature, lentil area, GPS location, farmer address, dates of planting and harvest of lentil, planting system, fertilizer dose, irrigation system, crop cut yield of lentil, and satellite imageries of sentinel-2 on the respective dates.
Investigators	: Dr. Taslima Zahan, Dr. Md. Shakhawat Hossain, Istiak Ahmed, Sheikh Ishtiaque, Dr. Apurbo Kumar Chaki and Dr. Md. Faruque Hossain

Date of initiation : November 2022
 Date of completion : March 2024
 Expected output : A model will be developed to predict yield of lentil at least 15 days early before harvest.
 Location : Agromet and Crop Modeling Lab, OFRD, BARI, Gazipur and OFRD, Barind, Rajshahi
 Status : 2nd Year
 Estimated cost : 1,00,000/- per year per location
 Source of fund : BARI
 Priority : First

Expt. 119 Effect of selective herbicides in Black cumin

Objectives : To find out the optimum dose of Oxadiazon and Carfentrazone-ethyl group herbicides and To reduce cost of production and increase yield

Rationale : Black cumin (*Nigella sativa* L.) is an annual herbaceous plant belongs to family Ranunculaceae. In Faridpur, a total of 3000 ha of land remains engaged in black cumin cultivation. Farmers cultivate black cumin but obtain lower yield due to weed interference. Weed interference like grass *Digitatiasangunalis*(Anguli), *Cynodondactylon* (Durba) etc and broad leaf type *Chenopodium album* (Bathua), *Convolvulus arvensis* (Bindu), *Vicia sativa* (Bon masur), *Saussureaaffinis* (Bon shimul) weed in black cumin can reduce 60-85% yield (Ahmad and Gafoor, 2004). Literature cited that, 2/3 times weeding is required for black cumin. Recently, farmers start use of herbicide like oxadiazon group with different doses as post emergence (20-25 DAE) but do not get expected output. In comparison with manual weeding, it provides more effective, economic and easier solution for weed management. Oxadiazon controls the growth of certain undesirable weeds such as broad leaves, grasses, sedge etc. Using only one group of herbicide in black cumin, herbicide resistant weed may develop and applying different doses of herbicide, optimum weed control may not possible. Considering above all situation, the present study will be designed to find out the suitable herbicide and optimum dose of Oxadiazon and Carfentrazone-ethyl group and to reduce cost of production t and increase yield in black cumin.

Materials and Methods : Selective herbicides of Oxadiazon (Activar) and Carfentrazone-ethyl (Hammer) will be applied aspost emergence to control different weeds (Bathua, Angulietc) of black cumin seed after 25 DAE.

Crop/variety Design : Black cumin (BARI Kalozira-1)
 : RCB

i. Treatment : T₁: Oxadiazon @ 1 ml 1 Lt⁻¹ of water, T₂: Oxadiazon @ 1.5 ml 1 Lt⁻¹ of water, T₃: Oxadiazon @ 2 ml 1 Lt⁻¹ of water, T₄: Carfentrazone-ethyl @ 1 ml 1 Lt⁻¹ of water, T₅: Carfentrazone-ethyl @ 1.5 ml 1 Lt⁻¹ of water, T₆: Carfentrazone-ethyl @ 2 ml 1 Lt⁻¹ of water, T₇: Control (No weedicide and no weeding)

ii. Replications : Six dispersed
Plot size : 5 m x 4 m
Planting system/spacing : Line sowing, 40 cm x continuous seed sowing

Fertilizer dose and methods of application	$N_{80}P_{30}K_{30}S_{15}Zn_2B_1$ kg ha ⁻¹ All amount of P, K, S, Zn and B will be applied as basal during final land preparation. N will be applied as top dress in two splits at 30 and 55 DAS under moist soil condition.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all agronomic operations, Identification of weeds, weed density and biomass; yield components and yield of black seed, cost and return, farmers opinion
Investigator (s)	Dr. Selim Ahmed, PSO and AFM Ruhul Quddus, SO, OFRD, Faridpur
Season	Rabi, 2021-22
Date of Initiation	1 st week of November, 2021
Date of completion	Last week of April, 2022
Expected output/benefit	: Suitable herbicide with optimum dose will be found out for higher productivity and return.
Location	FSRD site, Sholakundu, Faridpur
Status	2 nd year
Estimated cost	Tk. 30,000/-
Source of fund	BARI
Priority	1 st

Expt. 120 Development of alternate cropping pattern Boro-B.Aman/Mustard against Boro-B.Aman-Fallow

Objective (s)	: i. to increase the cropping intensity, system productive efficiency and economic return
Rationale	: Boro-Fallow-Fallow is one of total cropping pattern is practiced by farmers' in medium lowland of Faridpur region. This pattern covers about 3600 ha of land which is 2.39% of total cultivable land in Faridpur (DAE, 2020-21). After harvesting of boro rice, the land remains fallow due to submerged condition. Different natural hazard like excess rainfall hamper the cultivation of succeeding crops. Thus, fallow condition prevails about seven months. To increase the cropping intensity and economy of the whole country, this fallow period might be utilized by inclusion of suitable crops like B.Aman (BRRI dhan91) with mustard (BARI Sarisha-14) as relay. Mustard seed will be relayed 10 days before harvesting of B.Aman without hampering the boro transplanting. Again, the productivity of existing pattern is low due to local variety for B. Aman (BRRI dhan91) and poor management practices. However, introducing modern variety and improved technology of B.Aman (BRRI dhan91)/Mustard (BARI Sarisha-14) cropping pattern offers the opportunity to overcome this situation. The study will be therefore, to increase the cropping intensity and system productive efficiency and economic return
Materials and Methods	: Boro rice will be transplanted at 25 January and will be harvested at 10 May. Seed to seed duration of B.aman will be 146 days (28 May to 25 October). Mustard seed will be sown as 5 days before harvesting of B.Aman.
Crop/variety	: Boro, B.Aman and mustard Existing CP: Boro (BRRI dhan28)-B.Aman (local)-Fallow Alternate CP: Boro (BRRI dhan28)-B.Aman (BRRI dhan91)/Mustard (BARI Sarisha-14)
Design	: RCB
i. Treatment	: T ₁ (Existing CP): Boro- B.Aman--Fallow

T₂ (Alternate CP): Boro-B.Aman/Mustard

ii. Replications	: Six dispersed
Plot size	: 33 dec
Planting system/spacing	: Boro Rice: 20 cm x 15 cm, B.Aman: Broadcast or 20 cm x 15 cm, Mustard: Relay sowing with B.Aman
Fertilizer dose and methods of application	Boro: N ₂₄₀ P ₃₀ K ₇₅ S ₁₈ Zn ₃ B ₀ , B.Aman: N ₅₀ P ₁₀ K ₂₀ S ₆ Zn ₁ B ₀ Mustard: N ₁₂₀ P ₃₆ K ₄₀ S ₁₅ Zn ₂ B ₁ B.Aman and Boro: All the phosphorus, potassium, Sulphur, zinc will be applied as broadcast and incorporated during final land preparation. The rest nitrogen will be applied in three equal splits and top dressed at immediately after seedling establishment, rapid tillering stage (25-30 DAT) and at panicle initiation stage (40-45 DAT). Mustard: Half of nitrogen and all the phosphorus, potassium, sulphur, zinc and boron will be applied as broadcast. Remaining half nitrogen will be applied before flower initiation (25 to 30 DAS) as top dress followed by irrigation.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operation, Yield and yield contributing characters, soil fertility, major disease and insect incidence, cost and return related data & farmers' opinion
Investigator (s)	Dr. Selim Ahmed, PSO and AFM Ruhul Quddus, SO, OFRD, Faridpur
Season	Kharif I, 2022
Date of Initiation	1 st week of January, 2022
Date of completion	1 st week of February, 2023
Expected output	: Alternate cropping pattern will be find out for higher productivity and return
Location	FSRD site, Sholakundu, Faridpur
Status	: 2 nd year
Estimated cost	: Tk. 90,000
Source of fund	: BARI
Priority	: 1 st

Expt. 121 Improvement from Fallow-T. Aus rice-T. Aman rice to Mustard-T. Aus rice-T. Aman rice under AEZ-20 of Sylhet region

Objective	: To develop alternate cropping pattern for increasing cropping intensity and productivity
Rationale	: The world requires intensification of agriculture and increase food production in order to meet food demand for the ever-increasing global population. Improvement of the cropping system could play a significant role to enhance food productivity, production potential and economic returns (Nazrul et al., 2013; Shaheb et al., 2014). Due to the decrease in agricultural lands for various reasons, the horizontal expansion for crop production is limited. However, crop yield and profitability could be achieved through vertical expansion. Several multi-year studies showed that the improvement of cropping systems through incorporating high yielding varieties and improved management practices in between T. Aman rice and T. Aus rice provided higher yield and economic profitability over farmers existing cropping patterns (Nazrul et al., 2013; Rahman et al., 2015). However, utilizing residual soil moisture after T. Aman rice, there is a potential scope to produce Mustard and short duration legumes (Nazrul and

Shaheb, 2012; Shaheb et al., 2012). Therefore, incorporating short duration Mustard during the fallow period of the farmers' existing fallow-T. Aus rice -T. Aman rice cropping pattern would provide additional produce and income as well as the best utilization of soils during winter. Hence, the study was undertaken to develop an alternate cropping pattern for increasing cropping intensity and productivity.

Materials and methods	:
Crop/Variety	: Mustard, T. Aus rice and T. Aman rice BARI Sarisha-14; BRRI dhan48/85/98; BRRI dhan57/Binadhan-16
Design	: RCB factorial
i) Treatment	: CP1: Fallow-T. Aus rice-T. Aman rice CP2: Mustard-T. Aus rice-T. Aman rice
ii) Replication	: 6 dispersed)
Plot size	: 8 m × 5 m
Planting system/spacing	: Line sowing/ 60 cm × 25 cm
Fertilizer dose and methods of application	: As per treatment
Irrigated/rainfed	: Rainfed
Data to be recorded	: Dates of all operations, yield and yield contributing characters, disease and insect interaction, cost and return, farmers Opinion
Investigator (s)	: M. I. Nazrul
Season	:
Date of initiation	: November 2021
Date of completion	: October 2024
Expected output/benefit	: Economically viable cropping pattern will be developed/introduced. Utilization of fallow land will be ensured.
Location	: All MLTs and FSRD Site
Status	: 2 nd year
Estimated cost	: Tk. 100000/-
Sources of fund	: BARI
Priority	: 1 st

Expt. 122 Performance of Bushbean intercropped with groundnut in haor areas of Sylhet region

Objective	: To find out the suitable intercrop combination of sesame with groundnut for higher productivity and profitability
Rationale	: The farmers of haor areas of Sylhet region cultivating groundnut and bush bean in separate fields. Both crops are economically very important for haor farmers. Winter is the best period to cultivate haor land because total kahrif time the land remains under water. So farmers have very limited access to the field with many crops in the season. As a result intercrops and mixed intercrops can be the way to minimize their demand of different crops. French bean (<i>Phaseolus vulgaris</i> L.) locally called as Forash is an important leguminous crop mostly grown as a green vegetable in Bangladesh. The immature pod, tender parts and also dry beans are also used as curry. On the contrary, groundnut is one of the most important oil seed crops but recently the area of groundnut is being decreased due to the competition with rabi crops (Alom et. al., 2009). Moreover, during winter mostly the upper

part of haor capturing by various rabi crops which also causes for declining groundnut production area. Some observational trial evidences that groundnut field an bush bean can be grown as intercrop. In this context, the experiment was conducted to find out the suitable intercrop combination of bush bean with groundnut for higher productivity and profitability.

Materials and methods	:
Crop/Variety	: Ground nut and Bush bean
Design	: RCB
Treatment	: T ₁ =sole groundnut, T ₂ =sole bush bean, T ₃ = alternate row of groundnut and bush bean, T ₄ = Two rows of groundnut in between paired rows of bush bean and T ₅ = Two rows of bush bean in between paired rows of groundnut
Replication	: Six dispersed
Plot size	: 8 m × 5m
Planting system/spacing	: Row method with 30 cm × 15 cm
Fertilizer dose and methods of application	: As per FRG' 2018
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operation; yield and yield contributing characters; Major disease and insect infestation; Cost and return; Farmers opinion
Investigator (s)	: M. I. Nazrul
Season	: Rabi
Date of initiation	: November 2021
Date of completion	: March 2023
Expected output/benefit	: Appropriate intercropping systems will be ascertained.
Location	: MLT sites Moulvibazar and Sunamganj
Status	: 2 nd year
Estimated cost	: Tk. 60000/-
Sources of fund	: BARI
Priority	: 1 st

Expt. 123 Development and validation of improve management technologies for increasing the quality yield of existing cashewnut garden in Bandarban

Objective	: To develop appropriate sustainable management practices for higher yield and quality of cashewnut in Bandarban Hill District, Bangladesh.
Rationale	: The cashew tree is a tropical evergreen that naturally grows in hilly areas of Bangladesh and produces the cashew apple and nut. Officially classed as <i>Anacardium occidentale</i> , it can grow as high as 14 meters (46 ft). The fruit's seed, which is shaped like a kidney, dangles at the bottom and is rich in oil and protein. Once roasted and de-shelled, this nut is highly demandable in global market and stood \$14.9 billion in 2019 and is estimated to grow at 4.6 per cent between 2020 and 2025. About 2,000 farmers currently engaged in commercial cultivation of cashew, especially in the hill tract areas, tempted by the high price of the nut in the local market. A kg of cashew nut sells between Tk. 800 and Tk. 1,700 depending on the quality in the local market. And the number of farmers is growing rapidly. In FY 2019-20, about 1,323 tons of cashew were produced, which is 32.3 percent more in compare to

previous years (MoA). But the present demand of cashew is 50,000 tons, as meeting the demand by import from other country. On the other hand, the yield of cashew nut per hectare is very low with inferior quality in compare to other cashew producing countries due to lack of improved production management. Hence, to meet-up the country's present demand and cut back our import, there is an option to increase quality production through introducing improved production management technologies in the existing gardens. With a view to solve the above, the present research program has been proposed and will be undertaken.

Materials and Methods	:
Crop/variety	: Local Cashewnut variety
Design	: RCB
Treatments	: T ₀ = Control (Farmer's practice/no management) T ₁ = T ₀ + Fertilization (2 times, pre-rainy season and post-rainy season) T ₂ = T ₁ + Mulch (before winter) T ₃ = T ₂ + Pruning (1 time after harvesting) T ₄ = T ₃ + pesticide application (after pruning, pre-flowering and at nut set).
Replications	: 06 (dispersed), one farmer's garden will be treated as replications
Plot size	: 21 plants from three rows will be treated as one plot. (7 plants/row)
Planting system	: Existing orchard of 2-10 years.
Fertilizer dose and methods of application	: As recommended (FRG Guide BARC, 2018)/STB applied for mango
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operation, Yield and yield contributing characters , Major disease and insect incidence, Cost and return analysis Farmers' opinion
Investigator(s)	: Mohammad Tanharul Islam, SO, OFRD, BARI, Bandarban, Dr. Md. Altaf Hossain, PSO, HARS, BARI, Raikhali, Dr. S.M. Faisal, PSO, HARS, BARI, Ramgarh, Md. Abdullah Al Malek, SO, HARS, BARI, Khagrachhari.
Season	: 2021-2024
Date of initiation	: September, 2021
Date of completion	: August, 2024
Expected output	: Yield, quality and economic return will be increased by adopting improved management technologies.
Location	: Bandarban, Raikhali, Ramgarh and Khagrachhari
Status	: 2nd year
Estimated cost	: Tk.120000/-
Source of fund	: BARI : 1 st

PROJECT III: ON-FARM TRIALS WITH ADVANCED LINES AND TECHNOLOGIES

JUSTIFICATION

BARI is conducting research on different discipline through its 22 programs and 16 divisions. Those programs and divisions are generating a good number of technologies including new cultivars/different management techniques/machines etc. for the farmers of Bangladesh. However, before transferring those to extension agencies/NGOs and farmers they need On-Farm verification/test or fine-tuning to fit into the farmers existing socio-agro-economic environments. Moreover, through On-Farm trial valuable farmers' feedback is obtained to modify technology or to develop new technology. BARI has given this noble responsibility to OFRD to test those developed On-Station technologies directly to the farmers' field. Hence, On-Farm trials with advance lines and technologies are regarded as an important component of OFRD program. Most of the advance technology studies centered around varietal performance, time of sowing/planting, rates and method of fertilizer application, cultural practices, multiple cropping etc. of major crops rice, wheat, maize, potato, oilseed, pulses, horticultural crops etc.

Expt. 124 On farm trial of turmeric variety in hilly region at Sherpur

Objectives	: To see the performance of turmeric varieties at the farmer's field of Sherpur. To popularize the newly released turmeric varieties among the farmers.
Rationale	: Turmeric is one of the most important spice crop commercially grown in all parts of the country. It is an indispensable component in daily life, mostly in kitchen. The crop has good potential for production because of its diversified use. It has medicinal value also. Spices Research Center, BARI has developed five new turmeric varieties (BARI Halud-1, BARI Halud-2, BARI Halud-3, BARI Halud-4 and BARI Halud-5) which are high yielding, virus free and less susceptible to pest and diseases. Considering the fact as stated above, the present study will be undertaken to study the performance of turmeric varieties in hilly area of Sherpur region.
Materials and methods	:
Crop	: Turmeric
Variety	: BARI Halud-2, BARI Halud-3, BARI Halud-4, BARI Halud-5 and a local cultivar
Design	: RCBD
Replication	: 6 (disperse)
Plot size	: 5 m x 3 m
Plant spacing	: 50 cm x 25 cm
Fertilizer dose and methods of application	: As per recommendation
Irrigated/rainfed	: Irrigated
Data to be recorded	: Growth parameters (plant height, stem diameter, number and size of leaves etc), Weight and size of finger, Yield and storability, Disease and insect reaction, price of all inputs and output, farmers opinion
Investigators	: M.M. Rahman, M.A. Rahman and A.K.M.Z.U. Noor, OFRD, Sherpur
Season	: Kharif 2024
Date of initiation	: April, 2024
Date of completion	: October 2024
Expected output	: Production of turmeric will be increased in hilly region of Sherpur.
Location	: MLT site, Nalitabari and Jhinaigati, Sherpur.
Status	: New
Estimated cost	: Tk. 50000/-
Source of fund	: BARI
Priority	: 1st

Expt. 125 On-farm trial of BARI developed watermelon varieties.

Objective	: To observe the performance of watermelon varieties in off season at Sherpur region.
Rationale	: Watermelon is a very nutritious and considered as high value crop. Advanced farmers of Faridpur already start to cultivate watermelon commercially. Farmers grow imported hybrid watermelon variety but get low yield sometimes due to non-quality seeds. Last year, BARI has developed two high yielding watermelon varieties. But still, the performance was not studied of watermelon at farmer's field in Sherpur and Joypurhat. So, the performances of watermelon varieties should test under farmer's condition. Therefore, the experiment has been undertaken to find out the suitable variety(s) of watermelon for cultivation in Sherpur and Joypurhat region.
Materials and Methods	:

Crop/variety	: Irrigated (3-4 times)
Design	: RCBD
Treatment	: T ₁ : BARI Tarmuj-1, T ₂ : BARI Tarmuj-2 and T ₃ : Local (Sugarking hybrid for Sherpur and Banglalink (united) for Joypurhat)
Replications	: 6 (Six)
Plot size	: 5m ×4 m
Planting system/spacing	: Plant to plant 1.5 meter and line to line 2 meter.
Fertilizer dose and methods of application	Cow dung 10 ton, urea 250 kg, TSP 250 kg, MoP 200 kg, gypsum 100 kg, zinc sulphate 10 kg and boric acid 14 kg to be applied per hectare. Entire cow dung, TSP, gypsum, zinc, and boric acid and half of the total MoP to be applied during final land preparation. Rest of the MoP and entire urea are to be applied in 4 equal splits at 15 days interval.
Irrigated/rainfed	: Irrigated (3-4)
Data to be recorded	: Date of all operations, yield and yield contributing characters, pest incidence, Farmer's opinion
Investigator (s)	: M.M. Rahman, M.A. Rahman and A.K.M.ZU.Noor, OFRD, Sherpur and M.R.A. Mollah, T. Hasan, &M.S. Alam, OFRD, Bogura
Season	Kharif-1, 2024
Date of Initiation	March 2024
Date of completion	June 2024
Expected output	: Suitable BARI developed variety will be found out for higher productivity and return.
Location	: FSRD site Tarakandi, Sherpur and MLT site, Joypurhat
Status	: New
Estimated cost	: Tk. 80,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 126 On-farm trial of BARI developed gladiolus varieties at hilly area of Sherpur

Objectives	: To observe the performance of gladiolus varieties in Sherpur district of Bangladesh To increase cut flower yield production
Rationale	: The floral industry is one of the major industries in many underdeveloped and developing countries. Bangladesh is not an exception. In Bangladesh, floriculture brought into limelight by some innovative farmers in late seventies with tuberose on a small-scale basis. Cultivation of flower is reported to give 3-5 times and 1.5-2 times more returns than obtained from rice and vegetable cultivation, respectively (Dadlani, 2003). The area coverage under commercial flower cultivation is approximately 10,000 hectares of land while commercial nurseries have covered approximately 2,000 to 2,500 hectares of land (Momin, 2006). Gladiolus is one of the most important cut flowers in Bangladesh and recently cultivated in Faridpur region. BARI has developed some gladiolus varieties which need to verify the yield potentialities in AEZ -29 with local cultivar. Therefore, this study will be taken to observe the performance of gladiolus varieties in Sherpur district of Bangladesh.
Materials and Methods	:
Crop/variety	: Gladiolus
Design	: RCBD

Treatment	: T ₁ : BARI Gladiolus-2, T ₂ : BARI Gladiolus-3, T ₃ : BARI Gladiolus-4, T ₄ : BARI Gladiolus-5, T ₅ : BARI Gladiolus-6, and T ₅ :Local
Replications	: 6 (Six)
Plot size	: 4m × 3 m
Planting system/spacing	: 20 cm × 20 cm
Fertilizer dose and methods of application	240-90-90-25-4-2 kg ha ⁻¹ NPKSZnB respectively and cow dung 5000 kg Entire quantity of cow dung, P, K, B, Zn and S will be applied during land preparation. N will be applied in three equal instalments of 30, 45 and 60 days after planting.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield and yield contributing characters, pest incidence, Farmer's opinion
Investigator (s)	: M.M. Rahman, M.A. Rahman and A.K.M.ZU.Noor, OFRD, Sherpur
Season	: Rabi 2023-24
Date of Initiation	: November, 2023
Date of completion	: March, 2024
Expected output	: Suitable BARI developed gladiolus variety will be found out for higher productivity and return.
Location	: MLT site Jhinaigati.
Status	: New
Estimated cost	: Tk. 50000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 127 On-Farm trial of Garlic varieties in Mymensingh

Objectives	: To select and popularize suitable garlic varieties. To increase garlic production and farmers income
Rationale	: Garlic (<i>Allium sativum</i> L.) is one of the most important aromatic herbaceous annual spice under the family Alliaceae and one of the most important spices crop in Bangladesh. It is the second most important cultivated Allium after onion. Lack of suitable varieties and genotypes with adaptation to local condition is also a factor that affects the yield of Garlic. Bangladesh Agricultural Research Institute has developed high yielding Garlic varieties, but farmers are not familiar with BARI garlic varieties. Moreover, the varietal performances in Mymensingh region have not been well studied. Therefore, an on farm trial will be conducted to evaluate the performance of those varieties to increase popularities among the farmers and economic return.
Materials and Methods	:
Crop	: Garlic
Design	: RCBD
Variety	: BARI Rashun-1, BARI Rashun-2, BARI Rashun-3, BARI Rashun-4, BARI Rashun-5 and a local cultivar
Replications	: 6 (dispersed)
Plot size	: 5m × 4m
Plant spacing	: 10cm × 10cm
Fertilizer dose and method of application	: N ₁₆₀ P ₅₀ K ₁₂₅ S ₂₅ Zn ₃ kg ha ⁻¹ All of P, K, S and Zn and one third of N will be applied as broadcast on final land preparing. Remaining N will be applied as top dress at 25-30 and 55-60 DAP.
Irrigated/rainfed	: Irrigated

Data to be collected	: Dates of all operations, Yield and yield attributes, Pests and diseases reactions, Cost and return analysis, Farmers' opinion
Date of initiation	: Mid-October 2023
Date of completion	: Mid-April 2024
Expected output	: Suitable variety of garlic will be selected and at least 25-35% higher economic return could be possible
Location (s)	: Trishal, Mymensingh
Status	: New
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1 st
Investigator (s)	: Dr. Nazma Akhter, SSO and Dr. Md. Moniruzzaman, PSO

Expt. 128 Observation trial of summer onion varieties

Objectives	: To select suitable onion varieties and to popularize BARI onion varieties for the selected location To increase yield and economic return of the farmers
Rationale	: Onion (<i>Allium cepa</i> L.) is an important spice crop. It is used as a seasoning in every kitchen every day in Bangladesh. It has a high medicinal value in case of diabetes and coronary heart diseases. It is one of the major spice crops in Bangladesh ranks first in production 2.1 M ton (BBS, 2018). However, there is an acute shortage of onion in relation to its requirement. This higher demand of onion can be meet up by increasing areas and cultivating high yielding variety. Spice Research Center of BARI has developed both winter and summer onion varieties which is high yielding and less susceptible to pest and disease. Therefore, the present study will undertake to find the suitable variety of winter onion against local cultivar at Muktagacha, Mymensingh region.
Materials and Methods	:
Crop	: Onion
Variety/ Lines	: BARI Piaz-2, BARI Piaz-5 and Local
Design	: RCBD
Replications	: 06 (six) dispersed
Unit Plot size	: 8m × 4.5m
Spacing	: 10cm x 5cm
Fertilizer dose	: 140-60-60-30-3-1.5N-P-K-S-Zn-B kg ha ⁻¹ + CD 5 t ha ⁻¹ (Recommended dose FRG' 2018)
Application of fertilizer	: All organic manures, phosphorus and sulphur should be applied as basal during final land preparation. Nitrogen should be applied as side dressing in two equal splits at 25 and 50 days after emergence.
Data to be collected	: Dates of all operations, Yield and yield attributes, Pest and disease reaction, Cost and return analysis and Farmers' opinion
Expected output	: Farmers will be benefitted by getting a suitable variety and fertilizer dose for garden pea cultivation
Status	: New
Date of initiation	: November 2023
Date of completion	: January 2024
Estimated cost	: Tk. 60,000
Source of fund	: BARI
Location (s)	: Muktagacha, Mymensingh
Priority	: 1 st
Investigator(s)	: Dr. Shahana Sultana, SSO and Dr. M Moniruzzaman, PSO

Expt. 129 On-Farm Trial of BARI brinjal varieties at Manikganj

Objectives	:	To select suitable brinjal variety for winter season. To disseminate among the farmers of the tested areas.
Rationale	:	Brinjal (<i>Solanum melongena</i>) is the most important vegetables crop in Bangladesh cultivated during the rabi season. This crop can be grown whole the year round. It is a good source of vitamins and minerals. This average yield of brinjal is very low compared to other tomato growing countries of the world. Farmers use the traditional varieties those are low yielding and susceptible to diseases and pests. As a result, yield is decreasing day by day. BARI has recently developed some brinjal varieties which are supposed to be high yielding and less susceptible to pest and diseases. The present study will be undertaken to evaluate the performance of BARI developed brinjal varieties in the farmers' field to increase production and economic return of farmers.
Materials & Methods	:	
Crop/varieties	:	BARI developed hybrid varieties with local hybrid as check
Design	:	RCBD
Treatments/Varieties	:	BARI hybrid Begun-4, BARI hybrid Begun-5, BARI hybrid Begun-6 and a commercial hybrid as check
Replication	:	6 (dispersed)
Plot size	:	01 decimal for each unit plot
Planting system/ spacing	:	Line sowing (100 cm x 75 cm)
Fertilizer	:	Recommended fertilizer as per FRG, 2018 i.e. 140-50-40-16-1-1.7 kg, N-P-K-S-Zn-B ha ⁻¹ plus 5 tha ⁻¹ Cowdung. Half of the quantity of cow dung, half amount of P and entire amount of S and B will be applied during final land preparation. The remaining half of cow dung and P are to be applied during pit preparation before a week of planting. The entire N and K are to be applied in 3 equal instalments of 21, 35 and 50 days after seedling transplanting.
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost & returns analysis and Farmers opinion
Investigators	:	Concern scientists Dr. Md. Ruhul Amin and Md. Emdadul Haque of OFRD, Manikganj
Season	:	New
Initiation	:	September 2023
Date of completion	:	Last week of June 2024
Expected output	:	Suitable hybrid brinjal variety will be selected.
Location	:	Sadar and Saturia, Manikganj
Status	:	New
Estimated cost	:	Tk. 40000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 130 On-Farm Trial of BARI Bitter gourd Varieties at Manikganj

Objectives	:	To evaluate the performance of BARI bitter gourd varieties in farmers' field To popularize bitter gourd cultivation in the tested location.
Rationale	:	Bitter gourd (<i>Momordica charantia</i>) is one of the most popular vegetable crops in our country cultivated mostly during Kharif season. During the rainy season its market price is high but the production area

is limited and total production is also low. This declining is probably associated with variety, climatic change, and improper management decreasing soil fertility, deficiency of micronutrient and quality seed availability during the sowing time. Farmers generally collect seeds commercial variety from the seeds traders. Some advance farmers grow commercial hybrid variety but the seeds are very costly that causes economic loss of the farmers. Horticulture Research Centre of BARI has developed some varieties of bitter gourd which are supposed to be higher yielder and less susceptible to pest and diseases. These new varieties should be disseminated in the farmers' field. The present study was therefore undertaken to evaluate the performance of BARI bitter gourd varieties in the farmer's field and to popularize the variety among the farmers.

Materials and methods	:	
Design	:	RCBD
Treatments	:	BARI hybrid Korola-2, BARI hybrid Korola-3 and a commercial hybrid as check.
Replications	:	6 (dispersed)
Plot dimension	:	40 m ²
Plant spacing	:	1.5m × 1.5m
Fertilizer dose and application methods	:	Recommended fertilizer as per FRG, 2018i.e. 80-35-75-18-5-1.8 kg, N-P-K-S-Zn-B ha ⁻¹ plus 5 tha ⁻¹ CD. Whole amount of cowdung, one-third of urea, one-third of MoP, total amount of TSP, Gypsum, Zinc and Boron were applied one week before transplanting of seedlings. The remaining amount of urea and MoP were applied two equal splits at 25 and 40 DAP.
Irrigation/rainfed	:	Irrigated
Date of planting	:	Seed sowing- 1st week of March, 2023 Planting- 1 st week of April, 2024
Plant protection measures	:	As and when necessary
Data to be recorded	:	Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost & returns analysis and Farmers opinion
Expected Output	:	BARI bitter gourd varieties will be popularized among the farmers and production will be increased.
Season	:	Kharif-I
Investigator(s)	:	Concern scientists Dr. Md. Ruhul Amin and Md. Emdadul Haque of OFRD, Manikganj
Date of initiation	:	February, 2024
Date of completion	:	Last week of June 2024
Location	:	Sadar and Saturaia, Manikganj
Status	:	New
Estimated cost	:	Tk. 40000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 131 Adaptive trial of BARI released Coriander variety in plainland of Shibpur, Narsingdi

Objectives	:	To evaluate the performance of BARI developed coriander variety at farmer's field. To popularize the BARI released variety among the farmers.
Rationale	:	Underutilized as minor spices Coriander is an important spice crop in Bangladesh. Farmers usually grow local varieties scattered, as a result they get low yield. BARI has developed high yielding varieties

of coriander. The average yield of coriander can be increased by using high yielding varieties. This program is a good way to disseminate the high yielding variety among the farmers.

Materials and Methods	:	
Design	:	RCBD
Variety	:	BARI Dhania-1, BARI Dhania-2 and local variety
Replication	:	6 dispersed
Planting system	:	Line sowing
Plot size	:	20m × 10m
Fertilizer dose	:	STB dose of fertilizers following FRG 2018
Irrigation/ Rainfed	:	Irrigated
Data to be recorded	:	Yield, major disease and insect incidence, cost, return and farmer's opinion
Investigator(s)	:	Dr. Md. Asaduzzaman, PSO, Dr Md. Hafizur Rahman, SSO of OFRD, Shibpur, Narsingdi
Season	:	Rabi
Date of initiation	:	November, 2023
Date of completion	:	April, 2024
Expected output	:	Yield and as well as income of the farmers will be increased.
Locations	:	Shibpur and Monohardi MLT sites of Narsingdi
Status	:	New
Source of fund	:	Tk. 40,000/-
Priority	:	First

Expt. 132 Performance of country bean varieties in summer season

Objectives	:	To observe the yield of the BARI released summer country bean varieties To popularize the country bean varieties during summer for raising farm income.
Rationale	:	Country bean (<i>Lablab purpureus</i>) is one of the most important leguminous winter vegetables in Bangladesh. Availability of country bean in winter is very high but very scanty during summer. This crop is also very costly in summer season. Due to its photo sensitive nature this crop is mostly grown in winter season in Bangladesh. Some of photo insensitive country bean varieties are grown in Bangladesh but their pod bearing potentiality is very poor. BARI has developed BARI Sheem-3 and BARI Sheem-7 photo insensitive country bean varieties having high yielding potentiality during summer. Therefore, the present study will be undertaken for adaption of promising country bean varieties for summer season in Narsingdi region.
Design	:	RCBD
Replication	:	6 (Dispersed)
Variety	:	BARI Sheem-3, BARI Sheem-7 and a local variety
Plot size	:	2.5m × 10m
Plant spacing	:	1.5m × 1.5m
Irrigation/ Rainfed	:	Irrigated
Data to be recorded	:	Days to first harvest, Fruit/plant, Fruit length and diameter (cm), Yield/plant (kg), Major disease and insect infestation, Cost and return analysis and Farmers' opinion
Investigator(s)	:	Dr. Md. Asaduzzaman, PSO, Dr Md. Hafizur Rahman, SSO of OFRD, Shibpur, Narsingdi

Season	: Kharif
Date of initiation	: Kharif, 2024
Expected output	: Popularized, disseminate BARI developed summer country bean varieties and increase productivity
Locations	: Shibpur and Monohardi MLT sites of Narsingdi
Status	: New
Source of fund	: Tk. 40,000/-
Priority	: First

Expt. 133 On farm trial of BARI sponge gourd varieties in Narsingdi

Objective	: To evaluate the performance of BARI developed sponge gourd variety at farmer's field
Rationale	: BARI Dhundol-1 and BARI Dhundol-2 were newly released high yield potential sponge gourd varieties which need to popularize among the farmers in Narsingdi. As such on-farm trial will help to popularize the variety to the farmers.
Materials and Methods	:
Design	: RCBD
Variety	: BARI Dhundol-1, BARI Dhundol-2 and a local variety
Replication	: 6 dispersed
Plot size	: 1.7m × 7.5m
Plant spacing	: 1.7m × 2.5m
Fertilizer dose	: STB dose of fertilizers following FRG 2018
Irrigation/ Rainfed	: Irrigated
Data to be recorded	: Days to first harvest, Days to last harvest, Fruits/plant, Fruit weight, Yield per plant (kg) and hectare (ton)
Investigator(s)	: Dr. Md. Asaduzzaman, PSO, Dr. Md. Hafizur Rahman, SSO of OFRD, Shibpur, Narsingdi
Season	: Kharif
Date of initiation	: March 2024
Expected output	: Farmers will be benefited by growing the developed varieties
Locations	: Narsingdi
Status	: New
Source of fund	: Tk. 30,000/-
Priority	: First

Expt. 134 Performance of BARI Sajina-1 in homestead area of Tangail

Objectives	: To observe the yield performance of the BARI released Sajina variety. To popularize BARI Sajina-1 variety for its nutritional value raising farmers income.
Rationale	: <i>Sajina (Moringa oleifera)</i> is commonly referred to Drumstick tree while less frequently referred to as 'The Tree of Life' or 'Miracle Tree' due to its economical importance and versatility. <i>Moringa oleifera</i> is referred to as "Moringa", it is considered one of the world's most useful trees. Almost every part of moringa tree can be used for food or other beneficial applications. The leaves, fruits, flowers and immature pods of this tree are edible. Moringa is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, moringa is said to provide 7 times more vitamin C than

oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach. BARI has developed BARI Sajina-1 varieties having high yield potentiality. Therefore, the present study will be undertaken to observe the yield performance of the BARI released Sajina varieties and to popularize BARI Sajina-1 varieties for its nutritional value and raising farmer's income.

Materials and Methods	:	
Design	:	RCBD
Replication	:	6 farmers
Variety	:	BARI Sajina-1 and Local
Plant spacing	:	3.5 m x 3.5 m
Fertilizer dose and methods of application	:	As recommended by FRG, 2018
Data to be recorded	:	Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost and return analysis and Farmers' opinion
Date of initiation	:	Kharif, 2023
Location	:	FSRD site, Atia, and MLT site, Dhonbari, Tangail
Expected output	:	Popularized, disseminate BARI developed Sajina varieties and increase productivity.
Status	:	New
Investigator	:	G. Paul, SO; M. A. Rahaman, SSO; T. Tasmima, SO; S. Roy, SO; K. Roy, SSO, OFRD, BARI, Tangail
Source of fund	:	BARI
Estimated cost	:	Tk. 75, 000/-
Priority	:	1st

Expt. 135 Dissemination of a low cost two-wheel tractor operated potato harvester in farmers field of Tangail

Objectives	:	To popularize potato planter and harvester among the farmers of Tangail area To compare the cost of production of potato planter and harvester with farmers practice
Rationale	:	Potato is economically potential crop. Now a day's mechanization is very much important for our agriculture. Mechanization reduces the production cost, time, labor. Potato planter and harvester is a unique invention of Farm Machinery and Postharvest Process Engineering division, BARI, Gazipur. It's new technology for potato planting and harvesting. The planter and harvester reduce the production cost, time, labor compare to traditional practice. It also reduces both the irrigation cost and time about 25%. Traditionally most of our farmer harvest potato with spade. In some locality farmers use country plough operated by hand or bullock to harvest potato. In both process considerable amount of potato remains under soil. That need to be harvested again which is time consuming and requires high labor cost. If timely potato cannot be harvested then the un-harvested potato damaged by rain which results economic loss of farmers. To eliminate these problems the potato harvester has been invented so that farmers can harvest potato on short time and cost. For that the experiment has undertaken to popularize potato planter and potato harvester among the farmers.
Materials and Methods	:	

Crop	: Potato
Variety	: BARI Alu-8 (Cardinal) , BARI Alu-40, BARI Alu-41
Treatments	: T ₁ . Potato planter and potato harvester T ₂ . Farmers practice
Design	: RCB
Replications	: 06 (dispersed) as six farmers
Unit plot size	: 400 m ² per farmer
Seed rate (kg ha ⁻¹)	: 1500
Spacing (cm)	: 60 cm x 25 cm
Fertilizer dose	: 145-30-90-15-3-1 kg N-P-K-S-Zn-B ha ⁻¹ + CD 5 t ha ⁻¹ (FRG, 2018)
Data to be collected	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost and return analysis and Farmers' opinion
Expected output	: Yield and economic return will be increased by at least 30-35 %
Status	: New
Season	: 2023-24
Date of initiation	: Rabi, 2023-24
Estimated cost	: Tk. 80,000/-
Source of fund	: BARI
Location(s)	: MLT site, Mirzapur & Madhupur and FSRD site Atia, Tangail
Investigator(s)	: K. Roy, SSO; M. A. Rahaman, SSO; S. Roy, SO; T. Tasmima, SO; and G Paul, SO, BARI, Tangail
Priority	: 1st

Expt. 136 Establishment of fruit orchard at Madhapur tract in Tangail district

Objectives	: To increase fruit production by using the BARI developed HY fruit crop varieties along with BARI developed suitable technology. To increase fruit consumption and economic return
Rationale	: Fruits are called the protective foods, rich in vitamins and minerals and it is very essential for maintenance of human health. In Bangladesh most of the fruits are seasonal, only a few are produced round the year. Therefore, availability of fruits in Bangladesh is very poor beyond summer and rainy season. Current production of fruit is considerable below the domestic requirement. There is, therefore, a big gap between the fruit production estimated at about 3.25 million MT and the national requirement estimated at 4.45 million MT. The consumption of fruit per head per day is only 60g as against the minimum requirement of 85g per head per day which indicates that the present production can meet up only 70% of requirement. So, the present production of fruits in our country is far below than the requirement. There is a scope to increase the production of fruits through establishing fruit orchard of high yielding varieties as well as taking proper management practices of trees. An effort of fruit tree plantation in homesteads can also play an important role in this regard. Therefore, an attempt will be undertaken to grow some high yielding quality fruits in the farmer's homesteads to investigate the growth, yield and quality of fruit and to increase income of the poor and marginal farmers.
Materials & Methods	:
Crop & Variety	: Mango: BARI Aam-3 and 4 Jack druit: BARI Kanthal-1, 2, 3 and 4 Litchi :BARI Litchi-2, 3, 4 and 5 Guava : BARI Payara-2, 3 and 4 Ber :BARI Kul-1, 2, 3, 4 and 5 Pummelo:BARI Batabilebu-3, 4, 5 and 6

	Papaya : Shahi pepe
	Malta : BARI Malta-1
	Amra : BARI Amra-2
No. of farmers	8- 10
Total plot size	Depends on locations & land availability
Fertilizer dose	: As recommended by FRG' 2018 for HYG
Data to be recorded	: Survival percentage, Yield and yield contributing characters, Major disease and insect incidence, Cost and return analysis and Farmers opinion
Investigators	: G. Paul, SO; M. A. Rahaman, SSO; T. Tasmima, SO; S. Roy, SO; K. Roy, SSO, OFRD, BARI, Tangail
Date of initiation	: July to August 2023
Expt. Output	: Farmers as well as country will be benefited through wide scale production of different high yielding fruit crop varieties and production technologies developed by HRC, BARI in Tangail District and economic return will be increased by at least 30-40 %.
Location	: MLT site, Madhupur, Tangail
Status	: New
Estimated cost (Tk.)	: Tk. 50000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 137 On Farm Trial of Coriander leaf Production in Kishoreganj

Objectives	: To select suitable variety of coriander for leaf production the study area. To increase income of the farmers.
Rationale	: Coriander is commonly known as 'Dhaniya' in India, Bangladesh and in some parts of Europe. All parts of the plant are edible but fresh leaves are the parts mostly used in cooking. It is an excellent source of Vitamin A and Vitamin C & packed with fiber, magnesium, protein, and many other elements that are making it beneficial for health. It reduces skin inflammation, as it has eleven components of essential oil. These oils of coriander help relieve many skin disorders such as eczema, dryness, and skin infections. Coriander is also popular as an at-home treatment for nausea, vomiting and stomach disorders. It also helps improve bone health. Coriander can be used in all type of curries, pickles. Coriander soups and juices are also popular. Kuliarchar and Bajitpur upazila of Kishoreganj are very famous for coriander cultivation. Farmers here usually cultivate coriander almost throughout the year. They are not very familiar with the varieties of coriander released by BARI and usually use seeds of various private companies to produce coriander. As a result, the cost of production is very high. If we can replace this hybrid variety with BARI released coriander varieties, then the production cost of the farmer will be reduced and at the same time the BARI released coriander varieties will be expanded. Considering the above issues, the present study will be undertaken.
Materials & Methods	:
Crop	: Coriander
Design	: RCBD
Variety	: BARI Dhonia-1, BARI Dhonia-2), BRAC, ACI and Squar variety
Replications	: 6 (dispersed)
Plot size	: 8m × 5m
Plant spacing	: Continuous
Fertilizer dose	: Recommended dose as per FRG-2018
Irrigated/rainfed	:
Data to be recorded	: i) Dates of all operations, ii) Yield and yield attributes of crops, iii) Pest and disease reaction, iv) Cost and return analysis

Investigator (s) : Md. Yeasinul Haque Rayhan, Dr. M. Mohiuddin
 Season : October, 2023
 Date of initiation : October, 2023
 Date of completion : January, 2026
 Expected output : Production and income of farmers will increase
 Location : Kuliarchar and Bajitpur.
 Status : New
 Estimated cost : Tk. 50,000/-
 Source of fund : BARI
 Priority : First

Expt. 138 Screening of different minor crops in acidic soil under rainfed ecosystem

Objective : To select suitable minor crop varieties for rainfed ecosystem in north-eastern part of Bangladesh.

Rationale : The crops those have high value but that are not widely grown. Minor crops are those crops which are not cultivated in huge areas and quantities. Bangladesh is the land of agriculture or country of agriculture. Lot of crops has been cultivated in Bangladesh. Few of crops which have been reduced its number and production. There are lots of reasons behind it for the decreasing number of those crops. However, Bangladesh is endowed with a favourable climate and soil conditions for the production of a variety of crops round the year. Minor crops area big concern for Bangladesh because it is really very important for Bangladesh. The country will be loss few of them and the crops will be in the state of extinction. Different kinds of minor oil seed, pulse and cereals are the dominant carbohydrate, vitamins and minerals source for the global population. Minor crops are decreasing day by day. So it is high time to save minor crops from extinct, though systemic research for finding out easy cultivation process of minor crops.

Materials and methods :
 Crop/Variety : Minor oil seed, pulse, cereals, vegetable and spices
 Design :
 Treatment :

	Oils	Cereals	Pulse
	Til, tisi, groundnut, soyabean, sunflower, safflower and niger	Barly (Jab), jower, bazra, maize, cheena and kaon	black gram, arhar, masur, motor, mung, mashkalai, and khesari

Replication : Three
 Plot size : 40 m²
 Planting system/spacing : Broadcast, lines or row methods
 Fertilizer dose and methods of application : As per FRG' 2018
 Irrigated/rainfed : Rainfed/Irrigated
 Data to be recorded : Date of all operations, yield and yield contributing characters, pest and disease infestation.

Investigator(s) : M. I. Nazrul
 Season : Rabi and Kharif
 Date of initiation : November 2023 and July 2024
 Date of completion : August 2024
 Exp. outcome : Suitable crops and varieties will be identified for Sylhet region
 Location : All MLT site, and FSRD site
 Status : New
 Estimated cost : Tk. 100,000/-
 Sources of fund : BARI
 Priority : 1st

Expt. 139 On-farm adaptive trial of mustard varieties in Cox'sbazar areas

Objectives	:	To select suitable mustard varieties To increase oilseed production and farmer's income
Rationale	:	Bangladesh has an acute shortage of oil seeds in respect of its demand. Lack of suitable high yielding mustard varieties are major reasons of this deficit. The farmers of Chokoria and Cox'sbazar sadar area generally grow local mustard variety after harvest of T. Aman rice. The yield potentiality of this local variety is very low. Oil Seed Research Centre of BARI has developed some high yielding mustard varieties. Therefore this program is undertaken to disseminate and popular the modern mustard varieties instead of existing one.
Materials and Methods	:	
Crop/variety	:	Mustard
Design	:	RCBD
Treatments	:	Mustard variety: BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-20 and Local (Tori-7)
Replications	:	6 (dispersed)
Plot size	:	300 m ² for each farmer
Planting system	:	Broadcast
Fertilizer dose and methods of application	:	N-P-K-S-Zn-B @ 200-150-70-120-4-10 kg ha ⁻¹ respectively. Half of the quantity of urea and entire amount of the other fertilizers would be applied during the final land preparation. The rest of urea would be applied as top dress followed by irrigation during the flowering starts.
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Dates of all operations, Yield and yield attributes, Major disease and pest incidence, Economic analysis and Farmers' opinion
Investigator(s)	:	Mostak Ahmed
Season	:	Rabi season
Date of initiation	:	November 2023
Date of completion	:	February 2024
Expected output	:	A suitable mustard variety will be selected for economic production in Coxsbazar areas
Locations	:	Chokoria, Ramu and Coxsbazar sadar
Status	:	New
Estimated cost	:	Tk. 30000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 140 On-farm adaptive trial of potato varieties

Objectives	:	To select suitable potato varieties To increase production and economic return
Rationale	:	The farmers of Chokoria, Ramu and Sadar area of Coxsbazar generally growing locally popular red skinned potato variety after harvest of T. Aman rice. The yield potentiality of this local variety is very low. It is time to disseminate high yielder modern potato instead of red skinned potato variety in saline prone areas. Therefore, this program is undertaken.
Materials and Methods	:	
Crop	:	Potato
Variety	:	Potato variety: BARI Alu-72, BARI Alu-73 and BARI Alu-78, BARI Alu-79 and BARI Alu-90

Design	: RCBD
Replications	: 6 (dispersed)
Plot size	: 300 m ² for each farmer
Plant spacing	: 60 cm × 25 cm
Fertilizer dose and methods of application	: N-P-K-S-Zn-B @ 325-200-250-100-8-6 kg ha ⁻¹ along with cowdung @ 10 t ha ⁻¹ . Total amount of all fertilizers and half of the total urea would be applied as basal during final land preparation. Rest of the urea would be applied at 20 and 45 DAP as top dressing.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, Yield and yield attributes, Major disease and pest incidence, Economic analysis, Farmers' opinion, Soil salinity
Investigator(s)	: Mohammad Sarfuddin Bhuiyan
Season	: Rabi season
Date of initiation	: November 2023
Date of completion	: March 2024
Expected output	: Increased potato production and cropping intensity in the coastal area
Locations	: Chokoria, Ramu and Cox'sbazar sadar
Status	: New
Estimated cost	: Tk. 60000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 141 On-farm adaptive trial of groundnut varieties

Objectives	: To select suitable groundnut varieties To popularize BARI varieties among the farmers
Rationale	: Groundnut (<i>Arachis hypogaea</i> L) is one of the popular oil seed crop in coastal areas. But, farmers cultivating low yielder variety named Dhaka-1. Farmers are losing their interest on groundnut cultivation due low economic profit and various pest and disease infestation in this old variety. Considering the fact, the present study has been taken to popularized high yielder groundnut varieties for coastal areas.
Materials and methods	:
Crop	: Groundnut
Variety	: BARI Chinabadam-4, BARI Chinabadam-8, BARI Chinabadam-9, BARI Chinabadam-10, Local (Dhaka-1)
Design	: RCBD
Replication	: 6 (Dispersed)
Plot size	: 300 m ² for each farmer
Spacing	: Line sowing
Fertilizer dose and methods of application	: FRG-2018 and recommended methods
Irrigation/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield, pest and insect incidence, cost and return analysis, Farmers opinion
Investigator(s)	: Mohammad Sarfuddin Bhuiyan
Season	: Rabi
Date of initiation	: November 2023
Date of completion	: June 2024
Expected output	: Yield and economic return will be increased by 15-20%
Locations	: Chokoria, Ramu and Cox'sbazar sadar
Status	: New
Estimated cost	: Tk. 40,000/-

Source of fund : BARI
Priority : 1st

Expt. 142 On farm trial of capsicum varieties in Sylhet region

Objective : To evaluate the performance of capsicum varieties in Sylhet region

Rationale : Capsicum is highly nutritious, high value and exportable vegetable. Now-a-days hybrids and open pollinated varieties are cultivated by the farmers. The market demand of capsicum is increasing day by day. Because, Capsicum is being used in delicious continental food in elite restaurants in Sylhet region. Sweet pepper (*Capsicum annuum* L.) is popularly known as capsicum and may be eaten as cooked, raw as salad. Capsicum is rich in vitamin A, vitamin C, carbohydrates, proteins, fiber, unsaturated fatty acid and for having capsaicin, capsanthin, carotinoids and antioxidantal properties it has great medicinal value (Aminifard *et al.*, 2012). This is very sensitive to environmental factors viz. both biotic and abiotic factors (Bhatt *et al.*, 1992). Blossom dropping also occurred at below 16° C night temperature and above 32° C day temperature (Rylski and Spigelman, 1982). In Bandarban, from December to January night temperature usually don't go below 10° C or less which is detrimental to both vegetative and fruiting stage of sweet pepper. So, there might have a large potentiality of growing sweet pepper in this area. On the other hand, the demand of high value crop like sweet is increasing day by day in tourist place like Bandarban. Considering these facts, the present study was undertaken to evaluate BARI released promising sweet pepper varieties. Nazrul (2018) reported that the Capsicum (var. BARI mistimorich-1) can be grown successfully in Sylhet region during winter season. Recently BARI has been released another variety of Capsicum which is good yields and less disease pest susceptible. So the present investigation has been undertaken to identify the suitable capsicum variety for Sylhet and Bandarban areas.

Materials and methods :

Crop : Capsicum

Variety : BARI Misty morich-1, BARI Misty morich-2, Astha hybrid, Yellow wonder

Design : RCBD

Replication : 6 dispersed

Plot size : 8m×5m

Planting system/spacing : Line

Fertilizer dose and methods of application : As per FRG, 2018

Irrigated/rainfed : Irrigated

Data to be recorded : Dates of all operations, Plant height, fruits plant⁻¹, individual fruit weight, Fruit yield (tha⁻¹), pest and disease reaction

Investigator (s) : Concerned Scientists of Sylhet and Bandarban district.

Season : Rabi

Date of initiation : November 2023

Date of completion : March 2024

Exp. output : Suitable capsicum variety will be identified and farmers will be benefited.

Location : FSRD site, Sylhet and Bandarban sadar

Status : 1st

Estimated cost : TK. 60,000/-

Sources of fund : BARI

Priority : 1st

Expt. 143 On farm trial of tomato varieties in Sylhet region

Objectives	: To select a suitable tomato variety for Sylhet region To disseminate and popular new tomato variety
Rationale	: Tomato, botanically known as <i>Lycopersicon esculentum</i> Mill. that belongs to the family Solanaceae. It ranks next to potato and sweetpotato in respect of vegetable production in the world (FAO, 2010). Tomato is widely consumed as fresh or processed. They are important sources of vitamin A, C and E (Rashid, 1993). Tomato is grown well extensively all over the country from November to February with congenial atmosphere. In Sylhet there are many fallow lands which remain fallow during most of the time and after harvest of T.aman rice, tomato can easily be grown in winter with a rational use of irrigation water as compared to Boro and other vegetables. Nearly 8 months of the year Komolgong farmers are cultivate tomato. With this views in mind this trial has been design to find out a suitable tomato variety in Sylhet region.
Materials and methods	:
Crop/Variety	: Tomato
Design	: RCBD
i) Treatment	: BARI Tomato-15, BARI Tomato-16, BARI Tomato-17, BARI Tomato-18, BARI Tomato-19, BARI Tomato-20, BARI Tomato-21
ii) Replication	: 3 compact
Plot size	: 100 m ²
Planting system/spacing	: Line (60 cm × 40 cm)
Fertilizer dose and methods of application	: As per FRG, 2018
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, date of first flower and first harvest, date of last harvest, individual fruit weight, harvesting period, no of branches per plant, number of fruits plant-1, Fruit yield plant-1
Investigator (s)	: M. I. Nazrul and M. Zulfiqar
Season	: Rabi
Date of initiation	: November 2023
Date of completion	: March 2024
Exp. output	: Suitable tomato varieties will be identified
Location	: FSRD site, Sylhet
Status	: 1 st
Estimated cost	: Tk. 30,000/-
Sources of fund	: BARI
Priority	: 1 st

Expt. 144 Adaptive trial of mungbean varieties in fallow land of Barishal and Jhalokathi

Objective	: To find out the location specific best variety to be adopted by farmers
Rationale	: Mungbean cultivation in Barishal and Jhalokathi region is expanding in late Rabi season. In general, farmers use BARI Mung-6 as variety. In some areas, farmers use local cultivars. The potentiality of BARI developed HYV mungbean varieties along with BINA developed best mungbean varieties need to be evaluated in fallow land of Barishal and Jhalokathi. Therefore, the program will be undertaken to evaluate the performance of mungbean varieties in fallow land.
Materials and methods	:

Crop/variety	: As per treatment
Design	: RCBD
Treatment	: BARI Mung-6, BARI Mung-8, BINA Mung-8 and local
Replication	: 3 (Dispersed)
Plot size	: 8 m × 5m
Spacing	: 30 cm
Fertilizer dose and methods of application	: FRG-2018 and recommended dose
Irrigation/rainfed	: Rainfed
Data to be recorded	: Dates of all operation Yield and yield attributes, Major disease and insect incidence, Cost and return analysis and Farmers opinion
Investigator(s)	: R. Uddin, SO, M.S. Islam, PSO and B. C. Kundu, CSO
Season	: Rabi 2023-24
Date of initiation	: January 2024
Date of completion	: June 2024
Expected output	: Fallow land will be utilized Cropping intensity will increase
Location	: Banaripara, Barishal, Rajapur and Kathalia, Jhalokathi
Status	: New
Estimated cost	: Tk. 50,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 145 Adaptive trial of grasspea varieties as relayed with T.Aman rice in fallow land of Barishal and Jhalokathi

Objective	: To find out the location specific best grasspea variety to be adopted by farmers
Rationale	: Grasspea is a major pulse crop in south central coastal region of Bangladesh. Aside BARI developed varieties, local cultivars are still practiced by farmers. Dissemination of modern grasspea varieties in fallow land areas are highly prioritized. For fallow land utilization, selection of location specific best HYV grasspea varieties needed to be identified. Therefore, the study will be undertaken to identify the best grasspea in fallow land areas.
Materials and methods	:
Crop/variety	: As per treatment
Design	: RCBD
Treatment	: BARI Keshari-2, BARI Keshari-3, BARI Keshari-5, BARI Keshari-6 and local
Replication	: 3 (Dispersed)
Plot size	: 8m × 5m
Spacing	: Relayed with T.Aman rice (Broadcasted)
Fertilizer dose and methods of application	:
Irrigation/rainfed	: Rainfed
Data to be recorded	: Dates of all operation, Yield and yield attributes, Major disease and insect incidence, Cost and return analysis and Farmers opinion
Investigator(s)	: R. Uddin, SO; M.S. Islam, PSO and B.C. Kundu, CSO
Season	: Rabi 2023-24
Date of initiation	: November, 2023
Date of completion	: May, 2024
Expected output	: Fallow land will be utilized Cropping intensity will increase

Location : Banaripara, Barishal, Rajapur and Kathalia, Jalokathi
 Status : New
 Estimated cost : Tk. 50000/-
 Source of fund : BARI
 Priority : 1st

Expt. 146 On-Farm Trial of Short duration Mustard Varieties in Bhola

Objectives : To see the performance of mustard varieties at the farmer's field
 To popularize the newly released mustard varieties among the farmers

Rationale : Mustard is an important oilseed crop in Bangladesh and traditionally farmers used to cultivate it after harvesting of short duration T.Aman rice in residual soil moisture. Annual requirement of edible oil is 5 lakh metric tons. That is, the internal production of edible oil can meet up only less than one-third of the annual requirement (Mondal and Wahhab, 2001). So, there is a great scope of increasing yield of mustard by introducing high yielding varieties in this non-traditional area. BARI and BINA have already developed some high yielding short varieties with good quality and yield. Therefore, it is necessary to select suitable variety for upscaling in tested areas.

Materials and methods :

Crop : Mustard
 Variety : BARI & BINA developed mustard varieties
 Design : RCB
 Treatments : BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-20 and Binasarisha-9 (Check)

Replication : 6 (dispersed)
 Plot size : 4m × 8m
 Plant spacing : 50cm × 10 cm
 Fertilizer dose and methods of application : As per recommendation, FRG, 2018/ STB

Irrigated/rainfed : Irrigated
 Data to be recorded : Dates of all operations, crop duration, yield and yield attributes, Cost and return, farmer's opinion.
 Investigators : Gazi Nazmul Hasan, Rashidul Hasan Anik & Md. Mominul Islam
 Season : Rabi 2023-24
 Date of initiation : November, 2023
 Date of completion : March, 2024

Expected output : Suitable mustard variety can be selected for upscaling in Bhola
 Location : Dawlatkhan & Bhola Sadar
 Status : New
 Estimated cost : Tk. 50000/-
 Source of fund : BARI
 Priority : 1st

Expt. 147 On-farm trial of BARI developed sweet potato variety in riverine island of Rajbari

Objective	: To observe the performance of sweet potato variety in Char area of Rajbari
Rationale	: The sweet potato (<i>Ipomoea batatas</i> L.), is a highly enriched nutritious crop. It contains Vit-A. 125 gram of sweet potato can fulfill the daily demand of Vit-A of a matured person. It has low Glycemic Index (44-46), so diabetics patient can also consume sweet potato. Sweet potato can be grown in char lands. The farmers of Faridpur cultivate local varieties which have production of 10 t ha ⁻¹ or less. BARI developed sweet potato varieties has an average production of 30-40 t ha ⁻¹ . Therefore, the experiment has been undertaken to find out the performance of BARI developed sweet potato varieties in char area of Faridpur region.
Materials and Methods :	
Crop/variety	: Irrigated
Design	: RCBD
i) Treatment	: Available source
ii) Replications	: 6 (Six)
Plot size	: 5m ×3 m
Planting system/spacing	: Plant to plant 30 cm and line to line 60 cm.
Fertilizer dose and application (kg ha ⁻¹)	: Urea-250, TSP- 150, MoP-250, Gypsum- 70, Zinc sulphate- 10, Boric acid-7, Cowdung-10,000 All the cowdung, TSP, Gypsum, Zinc, Boric acid and half of Urea and Mop will be applied after land preparation. The residual Urea and MoP will be applied at 35-40 DAS.
Irrigated/rainfed	: Irrigation
Data to be recorded	: Date of all operations, yield and yield contributing characters, pest incidence, Farmer's opinion
Investigator (s)	: Concerned scientists of OFRD, Faridpur
Season	: Rabi
Date of Initiation	: October,2023
Date of completion	: March, 2024
Expected output	: For higher productivity and return.
Location	: Moukuri Char, Sadar, Rajbari
Status	: New
Estimated cost	: Tk. 10000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 148 On-farm trial of BARI developed fennel varieties in riverine island of Rajbari

Objective	: To observe the performance of fennel variety in Char area of Rajbari
Rationale	: Bangladesh is already experiencing the adverse effect of global warming and climate change. For that reason, government of Bangladesh has placed special emphasis on the development of minor spices crops in char land. The area under spice farming in Bangladesh is 995202 acres of land with an annual yield of 2672826 metric tons as well as the annual demand for spices seeds 30 lakh metric tons (BBS, 2020). Spices account up about a 2.53 percent of Bangladesh's total cropped land (BBS, 2020). Char land which are the vastest area of unfavorable eco-system Bangladesh's land area is estimated to be 0.83 million hectares (Ahmed et al.,1987) out of which about 64 to 97% are cultivable. BARI has developed two high yielding fennel varieties. But still, the performance was not studied at farmer's field of Char area in Rajbari. So, the

performances of fennel varieties should test under farmer's condition. Therefore, the experiment has been undertaken to find out the performance of fennel variety in char area in Rajbari region.

Materials and Methods	:	
Crop/variety	:	Rainfed
Design	:	RCB
i) Treatment	:	T ₁ : BARI Mouri-1, T ₂ :BARI Mouri-2 and T ₃ :Local
ii) Replications	:	6 (Six)
Plot size	:	4m ×2 m
Planting system/spacing	:	Plant to plant 10 cm and line to line 40 cm.
Fertilizer dose and methods of application	:	Cowdung: 5t/ha, 180:175:140:110:8:10, urea, TSP, MOP, Gypsum, Zinc sulphate, and Boric acid applied per ha at the time of sowing except urea. Urea split 2 times (25 DAS and after flowering)
Irrigated/rainfed	:	Rainfed
Data to be recorded	:	Date of all operations, yield and yield contributing characters, pest incidence, Farmer's opinion
Investigator (s)	:	Concerned scientists of OFRD, Faridpur
Season	:	Rabi, 2023-24
Date of Initiation	:	November,2023
Date of completion	:	April, 2024
Expected output	:	For higher productivity and return.
Location	:	Moukuri Char, Rajbari Sadar, Rajbari
Status	:	New
Estimated cost	:	Tk. 30000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 149 Adaptive trial of sweet potato varieties in Gopalganj Region

Objective	:	To disseminate and popularize the BARI released sweet potato Varieties at on-farm level of Gopalganj area
Rationale	:	Sweet potato (<i>Ipomoea batatas</i>) is the fourth important food crop in Bangladesh after rice, wheat and potato (Delowar and Hakim, 2014). It is mainly cultivated by the marginal or subsistence farmers in a sporadic way in different river belts, charlands, deltas and seasonally inundated flood plains (Ahmed et al., 1998). It gives satisfactory yield under adverse climatic and soil conditions as well as under low or non-use of external inputs (Ndoloet al, 2001). The average yield is very low as compare to many tropical to subtropical countries due to cultivation of local and poor quality indigenous sweet potato varieties. As well as, some farmers of Gopalganj and Pirojpur district cultivated sweet potato in char land with local varieties as a result they get lower yield and very low nutritional benefits. But BARI has released some high yielding sweet potato varieties But adaptation rate of those varieties in these area is very poor. So, it should be disseminated and popularize to farmers level. With this point of view, the program is taken to evaluate their performance and popularize it within the farmers of Gopalganj area.

Materials and methods

Crop/ variety	:	Sweet potato
Design	:	RCB
Replication	:	Six (dispersed)
Variety	:	BARI Mistialu-12, BARI Mistialu-14, BARI Mistialu-15, BARI Mistialu-16 and a local variety
Plot size	:	6mx9m

Plant spacing	: 60cm × 30 cm
Fertilizer dose	: Cowdung 10 t ha ⁻¹ and N-P-K-S-Zn-B @ 105-45-105-15-2-1Kg ha ⁻¹ , respectively. Fifty percent of N, K and full amount of cowdung and other fertilizers were applied during final land preparation. The rest amount of N and K fertilizer were applied at 35 DAP.
Irrigation/rainfed	: 2-3 Irrigation
Data to be recorded	: Dates of all operation, yield and yield contributing +characters, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigator (s)	: M M Howlader and Dipok Halder
Season	: Rabi
Date of initiation	: November, 2023
Date of completion	: February 2024
Expected output	: Farmers will be benefited by growing the BARI developed variety(s)
Location	: Gopalganj Sadar and MLT site, Pirojpur
Status	: New
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1 st
Program	

Expt. 150 On-farm trial of sesame varieties in Gopalganj district

Objective	: To disseminate and popularize the BARI released sesame varieties at on-farm level of Gopalganj area.
Rationale	: Sesame is one of the important oil crops grown during the kharif season in Bangladesh. It is cultivated in almost everywhere of the country. Sesame contains 42-50% oil and 25% protein. The average yield of sesame in the country is low compared to world context. Farmers of Gopalganj district mostly grow the local variety and having average poor yield (800.00 kg ha ⁻¹). There is a scope of replacing the traditional cultivar by the improved high yielding varieties. Oilseed Research Centre, BARI has developed some high yielding sesame varieties that have significant yield advantage over local variety. But till to now, performance of these varieties were not tested in the farmers' field of Gopalganj area. So, the present study is undertaken to evaluate the field performance of different sesame varieties in Gopalganj area.
Materials and methods	
Crop	: Sesame
Variety	: BARI Til-3, BARI Til-4, BARI Til-5, BARI Til-6 and Local
Design	: RCB
Replication	: Six (dispersed)
Plot size	: 6m x 5m
Plant system/ spacing	: 30cm line sowing
Fertilizer dose	: N-P-K-S-Zn-B @ 100-40-40-20-3-2 kg ha ⁻¹ , respectively. Half quantity of urea and all other fertilizers were applied as basal during final land preparation. The rest half of urea was applied at 25-30 days after sowing.
Irrigation/rainfed	: Irrigation-As and when necessary
Data to be recorded	: Dates of all operation, yield and yield contributing +characters, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigator (s)	: M M Howlader
Season	: Kharif
Date of initiation	: March 2024
Date of completion	: June 2025

Expected output	: Farmers will be benefited by growing the BARI developed variety(s)
Location	: FSRD site, Gopalganj Sadar and MLT site, Muksedpur
Status	: New
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 151 Adaptive trial of bushbean varieties in Jashore region

Objective	: To evaluate the performance of BARI developed bush bean varieties
Rationale	: Bush bean is one of the most important vegetables crop. It is very much popular to the farmers and its market price is high. BARI has developed some bush bean varieties but the farmers of this region have no idea about the varieties and they do not know how to cultivate these varieties. So, it is urgent to test the varieties in the farmer's field to show the performance of the varieties. Therefore, the experiment will be undertaken to test the performance of bush bean varieties in the farmer's field.
Materials and Methods	:
Crop	: Bush bean
Varieties	: BARI Jhar Sheem-1, BARI Jhar Sheem-2 and BARI Jhar Seem-3
Design	: RCB
ii) Replication	: 6 (dispersed)
Plot size	: 8m × 5m
Planting system	: Line sowing: 25cm × 15cm
Fertilizer dose and application method	: FRG, 2018
Irrigation/ rainfed	: Irrigated
Data to be recorded	: Dates of all operation, yield and yield contributing +characters, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigators	: K U Ahammad and M H Rahman
Season	: Rabi
Date of initiation	: October 2022
Date of completion	: March 2024
Expected output	: Total production and economic return will be increased
Location	: MLT site, Monirampur and Jhenaidah
Status	: New
Estimated cost	: Tk. 35,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 152 Adaptive trail of elephant foot yam varieties at saline prone areas

Objectives	: To evaluate the performance of elephant foot yam varieties at saline prone areas. To increase the yield and farmers income.
Rationale	: Elephant foot yam (<i>Amorphophallus paeoniifolius</i>) or 'Olkachu in Bengali name' is a perennial herbaceous diploid Araceae ($2n = 2 \times = 26, 28$) is a tuber crop grown well in various soils but thrives in well-drained sandy loam or sandy clay loam with a neutral soil reaction. Elephant foot yam is a good source of energy, sugar, starch, proteins, fiber and minerals. It is used as a vegetable in various Indian, Chinese, and Japanese cuisines and

produce of value-added products like pickles, dried cubes, chips, flour, thickening agent. It also contains some therapeutic qualities, including gastroprotective, antioxidative, antidiarrheal and anti-inflammatory properties. According to the Bangladesh Bureau of Statistics (BBS 2022) the total production of elephant foot yam was about 17037.58 metric tons (MTs) produced from 2219.64 acres of land and the average yield of elephant foot yam was (35-45 t ha⁻¹) in the year 2020-2021 (BBS, 2022) which is lower compare to India (50-80 t ha⁻¹).

Materials and methods	:	
Crop	:	Elephant foot yam
Variety	:	BARI Olkochu-1, BARI Olkochu-2 and local
Design	:	RCBD
Replications	:	3
Plot size	:	4 m x 4m
Spacing	:	1m x 1m
Fertilizer dose and Methods	:	Cowdung 20 t/ha, Urea 325 kg/ha, TSP 210 kg/ha and Mop 175 Kg/ha
Irrigation/ rainfed	:	-
Data to be recorded	:	Days to sprouting, Main Plant height (cm), Corm height (cm), Corm diameter (cm), Corm weightplant ⁻¹ (g) and Corm yield (t/ha)
Investigator(s)	:	M.H. Rashid, M.K.Islam, T.Z. Munmun and M.Rahman OFRD, BARI, Khulna
Season	:	2023-2024
Date of initiation	:	February, 2024
Date of completion	:	October, 2024
Expected output	:	Salt tolerant and high yielding elephant foot yam variety will be selected.
Locations	:	Khulna, OFRD, BARI
Status	:	New
Estimated cost	:	Tk. 50000/-
Source of fund	:	BARI
Program Proposed from	:	OFRD, BARI, Khulna
Priority	:	First

Expt. 153 On-farm Adaptive Trial of BARI Developed Summer Hybrid Tomato Varieties in different locations of Bangladesh

Rationale : In Bangladesh, tomato (*Solanum lycopersicum*) is one of the major vegetable crops comprising a good source of vitamins and minerals as well as contains 93.1% water, 0.6% minerals, 0.7% fiber, 1.9% protein, 0.1% fat and 3.6% carbohydrate per 100 g of edible portion. The area under tomato cultivation in Bangladesh is 24.69 thousand hectares and its production is 231.68 thousand metric ton and the average yield is 9.39 t ha⁻¹ (BBS, 2011). Farmers are usually growing tomato in winter season as winter vegetables in Bangladesh. On the contrary, it is grown in limited area of the country during summer season. But tomato cultivation in summer season become popularizing day by day as high value crop in the country. Summer tomato has been grown in some districts of Bangladesh like Satkhira, Jessore, Netrokona, Brahmanbaria and Moulvibazer. Farmers of those areas are using different commercial hybrid tomato varieties with high price of seeds. Bangladesh Agricultural Research Institute (BARI) already developed high yielding 11 summer tomato varieties, of which 5 varieties are hybrid having average yield 35-40 tha⁻¹. Newly developed tomato varieties viz. BARI Hybrid

Tomato-4, BARI Hybrid Tomato-8, and BARI Hybrid Tomato-11 are high yield potentials and suitable for summer season. On-farm trial could help to popularize the variety to the farmers. Therefore, this study will be under taken to evaluate the performance of BARI hybrid tomato varieties and to popularize those varieties among the farmers.

Objectives	<ul style="list-style-type: none"> • To evaluate the performance of summer hybrid variety in farmers' field condition • To increase the productivity and income of farmers
Materials & methods :	
Materials	: V ₁ =BARI Hybrid Tomato-8, V ₂ = BARI Hybrid Tomato-11 V ₃ = Cross 4, V ₄ = Cross 12 & V ₅ = commercial hybrid as check
Design	: RCB
Replications	: 6 Dispersed
Plot dimension	: 4 decimal
Plant spacing	: 60 cm × 40 cm
Fertilizer dose	: 253 - 90 - 125 - 22 - 5.5 - 2 kg, N - P - K - S - Zn - B ha ⁻¹ with 10 tha ⁻¹ CD
Fertilizer application methods	: Half of the quantity of cow dung, half amount of P and entire amount of S and B will be applied during final land preparation. The remaining half of cow dung and P are to be applied during pit preparation before a week of planting. The entire N and K are to be applied in 3 equal installments of 21, 35 and 50 days after seedling transplanting.
Planting date	Seed sowing- 1 st week of May 2021 Planting- 1 st week of June 2021
Plant protection measures	: As and when necessary
Data to be recorded	: Days to 50% flowering, Days to 1 st and last harvest, No. of fruits/plant, Individual fruit weight (g), Yield/plant (kg) and per hectare (ton), Virus infestation (%), Bacterial wilt infestation (%), Other insect/disease problem, Cost and return analysis, Farmer's reaction
Expected output	: Yield and economic return will be increased by at least 20-25 %
Investigator(s)	: M.F. Hossain, Nazim Uddin, M. M. Anower and respective scientist of different sites of OFRD
Location	: Dinajpur, Rangpur, Bogura, Barind, Pabna, Kushtia, Jashore, Khulna, Mymensingh, Tangail, Manikganj, Narsingdi, Faridpur, Sylhet, Cumilla.
Status	: 2 nd Year
Estimated cost	: Tk. 750000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 154 On-Farm Trial of Garlic Variety in Rajshahi

Objective(s)	: To see the performance of Garlic varieties at the farmer's field of Rajshahi. To popularize the newly released Garlic varieties among the farmers.
Rationale	: Garlic is one of the most important bulb crops commercially grown in all parts of the country. It is an indispensable component in daily life, mostly in kitchen. The crop has good potential for production because of it's of diversified use It has medicinal value also. SRC, BARI has developed four new garlic varieties (BARI Rashun-1, BARI Rashun-2, and BARI Rashun-3 and BARI Rashun-4) which are high yielder, virus free and less susceptible to pest and diseases. Considering the fact as stated above, the present study will be under taken to study the performance of garlic varieties in Rajshahi region.

Materials and methods	:	
Crop	:	Garlic
Variety	:	BARI developed garlic varieties with local one as check
Design	:	RCB
i. Treatments	:	<ul style="list-style-type: none"> i. BARI Rashun-1 ii. BARI Rashun-2 iii. BARI Rashun-3 iv. BARI Rashun-4 v. BARI Rashun-5 vi. Local cultivar
ii. Replication	:	6 (dispersed)
Plot size	:	4m x 1.2 m
Planting system/spacing	:	10 cm x 10 cm
Fertilizer dose and methods of application	:	As per recommendation
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Growth parameters (plant height, stem diameter, number and size of leaves etc.), Weight and size of bulb, cloves/bulb, clove size, Yield and storability, Disease and insect reaction, price of all inputs and output.
Investigators	:	M.S. Rahman; M.Z Islam; M.M.I. Chowdhury of OFRD, Shyampur, Rajshahi, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	:	Rabi 2022-23
Date of initiation	:	October, 2022
Date of completion	:	March, 2023
Expected out put	:	Production of garlic will be increased
Location	:	MLT site, Shibpur, Rajshahi
Status	:	2 nd year
Estimated cost	:	Tk. 25,000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 155 On-Farm Trial of Winter Type Onion Varieties in Different Location of Bangladesh

Objective(s)	:	To evaluate the performance of onion varieties in winter season To popularize onion variety among the farmers of tested sites
Rationale	:	Onion is one of the most important spices crop, commercially grown in all parts of the country. It is used in every home almost daily as a seasoning for a wide variety of dishes. Onion can be eaten raw as well as cooked. Mild flavored or colorful bulb onions are often chosen for salads. It is also used in processed form e.g. flakes, powder, paste, crush and making pickles. It has very good medicinal values. It is known the benefit in the prevention and treatment of atherosclerosis, diabetes and coronary heart diseases. In Bangladesh there is an acute shortage of onion with compared to its total annual requirement (Ullah et al., 2008; Alam et al., 2009). So a huge amount of onion is imported every year to meet up the demand of Bangladesh. (BBS, 2007). BARI has developed three winter type onion varieties which are high yielder and less

susceptible to pest and diseases. Considering the above fact, the present study will be undertaken to evaluate the performance of winter onion varieties throughout the country.

Materials and methods	:	
Crop	:	Onion
Variety	:	BARI developed Onion varieties with local cultivar as check
Design	:	RCB
i. Treatments	:	<ul style="list-style-type: none"> i. BARI Piaz-1 ii. BARI Piaz-4 iii. BARI Piaz-6 iv. Local cultivars
ii. Replication	:	3 (dispersed)
Plot size	:	5m x 3 m
Planting system/spacing	:	15cm x10 cm
Fertilizer dose and methods of application	:	As per recommendation of FRG, 2018/ STB
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Plant height (cm), No. of leaves per Plant. Average bulb weight (g) and number of bulbs/kg. Type of bulb (single or multiplier), bolted (prematurely flowering) bulb, doubled bulbs and split bulbs. Bulb yield/plot, price of all inputs and output.
Investigators	:	Concern scientist from respective sites, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	:	Rabi 2022-23
Date of initiation	:	October, 2022
Date of completion	:	March, 2023
Expected out put	:	Production of Onion will be increased
Location	:	MLT site Shibpur, Rajshahi and MLT & FSRD site, Sylhet, Saghata, Gaibandha, Shibpur, Narsingdi
Status	:	2 nd year
Estimated cost	:	Tk. 120,000/-
Source of fund	:	BARI
Priority	:	1

Expt. 156 On-Farm Trial of Summer Onion Varieties

Objective (S)	:	To select suitable onion variety in summer season. To popularize onion variety among the farmers of tested sites
Rational	:	Onion is one of the most important spices crop in Bangladesh. It is used as spices, vegetable and salad. Onion bulbs and leaves are rich in minerals like calcium, phosphorus and sulphur. In Bangladesh onion cultivation is mainly limited in winter season and it remain available in market up to May. Hereafter, demand and price are increasing every year and the country is depending on import of onion. In Bangladesh there is an acute shortage of onion with compared to its total annual requirement (Ullah et al., 2008; Alam

et al., 2009). BARI has already developed three summer type onion variety viz. BARI Piaj-2, BARI Piaj-3 and BARI Piaj-5 which can be grown round the year. So, these summer and winter onion cultivation can be a new way to increase the onion production in Bangladesh and make it available throughout the year. So, this study is designed to evaluate and select suitable summer type onion variety for tested locations.

Materials and methods	:	
Crop/Variety	:	Onion
Design	:	
i) Treatment	:	Onion Variety: <ul style="list-style-type: none"> i. BARI Piaj-5 ii. Local
ii) Replication	:	6 (Dispersed)
Plot size	:	40 m ²
Planting system/spacing	:	Row method (10 cm × 5 cm)
Fertilizer dose and methods of application	:	As per FRG' 2018/STB
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Date of sowing, date of harvest, single bulb weight, leaves per bulb, bulb diameter, pest and disease incidence, yield per plot and yield/ha.
Investigator (s)	:	Concern scientist from respective sites, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	:	Rabi and Kharif
Date of initiation	:	November 2022 and March 2023
Date of completion	:	February 2024/August 2024
Exp. outcome/benefit	:	Suitable variety of onion will be identified for Sylhet farmers
Location	:	MLT site & FSRD sites of Sylhet, Faridpur, Pabna, Munshiganj and Dhirashram, Gazipur
Status	:	2 nd year
Estimated cost	:	Tk. 90,000/-
Sources of fund	:	BARI
Priority	:	1 st

Expt. 157 On-Farm Trial of Mint Varieties in Sylhet

Objective (S)	:	To select suitable mint variety for Sylhet area.
Rational	:	Mint (<i>Mentha</i> sp.), commonly known as pudina is a perennial plant that belongs to the family Lamiaceae and has approximately 25 species (Harley and Brighton, 1977). All mints contain the volatile oil menthol, which gives mint that characteristic cooling, cleansing feeling (Curci, 2012). Mint is also rich in Vitamins A and C and also contains smaller amounts of Vitamin B2. It has high demand in local market of Sylhet region. At present farmers in this area are growing local mint cultivars. Previous on-farm observation trials with mint results revealed that it can be grown successfully in homestead and as well as medium high land in Sylhet. BARI has been developed two

mint varieties, it is necessary to be tested in the farmers' field. Hence, the present experiment has been undertaken to test and select suitable BARI developed mint variety at farmer's field.

Materials and methods	:	
Crop/Variety	:	Mint varieties
Design	:	RCB
i) Treatment	:	BARI Pudina-1, BARI Pudina-2 and Local cultivar as check
ii) Replication	:	6 dispersed
Plot size	:	20 m ²
Planting system/spacing	:	Row method (25-30 cm × 20-25 cm)
Fertilizer dose and methods of application	:	As per Krishi Projukti Hand Book,, 2020)
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Date of sowing, date of harvest, shoot length, leaf size, leaf colour, spad value, chlorophyll content, pest and diseases infestation, leaf yield per plot and yield/ha.
Investigator (s)	:	M. I. Nazrul of OFRD, Sylhet and Q. Naher & M.F. Hossain of OFRD, Gazipur
Season	:	Kharif-II
Date of initiation	:	May 2022
Date of completion	:	February 2024
Exp. outcome	:	Suitable mint variety will be identified for Sylhet region.
Location	:	FSRD site, Kamalbazar
Status	:	2 nd year
Estimated cost	:	Tk. 20,000/-
Sources of fund	:	BARI
Priority	:	1 st

Expt. 158 On-Farm Trial of Short duration Mustard Varieties in different Location of Bangladesh

Objective(s)	:	<ul style="list-style-type: none"> • To see the performance of mustard varieties at the farmer's field • To popularize the newly released mustard varieties among the farmers
Rationale	:	Mustard is an important oilseed crop in Bangladesh and traditionally farmers used to cultivate it after harvesting of short duration T.Aman rice in residual soil moisture. Annual requirement of edible oil is 5 lakh metric tons. That is, the internal production of edible oil can meet up only less than one-third of the annual requirement (Mondal and Wahhab, 2001). So, there is a great scope of increasing yield of mustard by introducing high yielding varieties in this non-traditional area. BARI and BINA have already developed some high yielding short varieties with good quality and yield. Therefore, it is necessary to select suitable variety for upscaling in tested areas.
Materials and methods	:	
Crop	:	Mustard
Variety	:	BARI & BINA developed mustard varieties
Design	:	RCB
I. Treatments	:	BARI Sarisha-14 BARI Sarisha-15

	BARI Sarisha-17
	BARI Sarisha-20
	Binasarisha-9 (Check recently variety name abbreviation)
	Binasarisha-10
II. Replication	: 6 (dispersed)
Plot size	: 4m × 8m
Planting system/spacing	: 50cm × 10 cm
Fertilizer dose and methods of application	: As per recommendation, FRG, 2018/ STB
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, crop duration, yield and yield attributes, Cost and return, farmer's opinion.
Investigators	: Concerned scientist of different locations, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	: Rabi 2022-23
Date of initiation	: November, 2022
Date of completion	: March, 2024
Expected out put	: Suitable mustard variety can be selected for upscaling in tested areas,
Location	: MLT site, Paba & Shibpur, Rajshahi; Charfashion, Dawlatkhan & Bhola Sadar and Bandarban Sadar, Pabna, Barind, Cox'sbazer
Status	: 2 nd year
Estimated cost	: Tk. 195000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 159 On-Farm Trial of Sesame Varieties in Different Locations of Bangladesh

Objectives	: To select the suitable sesame variety. To popularize sesame variety among the farmers
Rationale	: Sesame is one of the most important summer oil crops grown in Bangladesh. It plays an important role in human diet. In Bhola more than 280 ha area remain under sesame cultivation (DAE-Bhola). Farmers use the traditional varieties those are low yielding and susceptible to diseases and pests. As a result, yield is decreasing day by day. Oil crop research center of BARI has developed some sesame varieties which are supposed to be high yielding and less susceptible to pest and diseases. The present study will be undertaken to evaluate the performance of BARI developed sesame varieties at different locations and to increase production and economic return of farmers.
Materials & Methods	:
Crop/varieties	: BARI developed sesame varieties with local cultivar as check
Design	: RCB
Treatments/Varieties	: BARI Til-3, BARI Til-4, BARI Til-5, BARI Til-6 & Local as check
Replication	: 6 (disperse)
Plot size	: 01 decimal for each unit plot
Planting system/spacing	: Line sowing, spacing
Fertilizer	: Recommended as per FRG Guide, 2018/ STB

Irrigated/rainfed	Rainfed
Data to be recorded	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost and returns analysis and Farmers opinion
Investigators	: Concerned scientist of different locations, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	: <i>Kharif</i> 2023
Initiation	: Last week of January 2023
Date of completion	: Last week of May 2024
Expected output	: Suitable Sesame variety in <i>Kharif</i> season will be ascertained
Location	: MLT site of Charfashion, Dawlatkhan & Bhola Sadar, Gournadi & Jhalokathi Sadar and Mymensingh & Netrokona, Faridpur, Tangail, Patuakhali, Barind
Status	: 2 nd year
Estimated cost	: Tk. 50000/location
Source of fund	: BARI
Priority	: 1st

Expt. 160 On-Farm Trial of Groundnut Varieties in Different Locations of Bangladesh

Objective (s)	: <ul style="list-style-type: none"> • To find out the suitable groundnut varieties for tested areas • To increase the groundnut production and productivity in tested areas
Rationale	: Groundnut (<i>Arachis hypogaea</i> L) is an important warm-season oilseed crop and is one of the most important oil producing crops in Bangladesh and ranking in second position in area and production. In Bangladesh, groundnut is generally grown in both the Rabi and Kharif season mainly in char areas. Oilseed research Centre (ORC), BARI has developed different varieties of groundnut which has higher yield potentiality and tolerant to insect and disease attack. But farmers in this area usually cultivate Dhaka-1 variety which is very old variety and productivity is very low. Considering the above fact, the present study has been undertaken to find out the suitable groundnut varieties for tested areas.
Materials and Methods	:
Crop/variety	: BARI developed groundnut varieties
Design	: RCB
i. Treatment	: BARI Chinabadam- 8 BARI Chinabadam-9 BARI Chinabadam- 10 BARI Chinabadam- 11 Dhaka-1 as check
ii. Replications	: 6 (disperse)
Plot size	: 8 m × 5 m (unit plot)
Planting system/spacing	: Line sowing, 30 cm X 15 cm
Fertilizer dose and methods of application	: Cowdung-5 t/ha, Urea 115kg/ha, TSP 30 kg/ha, MP 125 kg/ha, Zypsum 25 kg/ha Zn 2 kg/ha and Boric Acid 1.5 kg/ha. Entire quantity of cowdung, P, K, S, B and half amount of Urea will be applied at the time of final land preparation. Rest N will be applied 30-35 days after germination.

Irrigated/rainfed	: Irrigated
Data to be recorded	: Plant height (cm), flowering behavior, number of fruits/plant, weight of single fruit (g), yield/plant (kg), Yield (t/ha), number of seeds per fruit, 100-seed weight (g), disease and pest infestation, Farmer's reaction
Investigator (s)	Concerned scientist of different locations, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	Rabi, 2022-23
Date of Initiation	Last week of October 2022
Date of completion	Last week of March 2024
Expected output	: Suitable variety of groundnut will be identified for char area
Location	MLT site Chilmari, Kurigram; FSRD site, Gopalganj Sadar and MLT site, Muksedpur, Gopalganj, Patuakhali, Faridpur
Status	New
Estimated cost	Tk. 150000/-
Source of fund	BARI
Priority	1 st

Expt. 161 On-Farm Trial of Soybean Varieties in Saline Area

Objective (s)	: To evaluate performance of soybean varieties in saline areas To popularize soybean crops among the farmers of tested locations
Rationale	: About 0.82 million hectares of lands are estimated as Char lands in Bangladesh and is highly dynamic as it is disappeared or reappeared due to river erosion or accretion. Cultivated soils of chars are mostly sandy loam to silty loam with slightly acidic to slightly alkaline in reaction and deficient in plant nutrients as well as organic matter content. Generally top soils of charland are dried quickly but sub-soils remain wet for longer time. Soybean has a fairly wide range of adaptation involving a wide array of climatic, soil, and growth conditions though it is mostly grown on rain-fed land (Fageria, 1997). Soybean (<i>Glycine max</i> L.) is the most important oil seed crop of the world in terms of its use in human foods and livestock. Farmers of char areas grow soybean after receding flood water. Therefore, present trail was undertaken to select suitable soybean variety for charland under rainfed condition.
Materials and Methods	:
Crop/variety	: Soyabean
Design	: RCB
Treatment	: BARI Soybean-5, BARI Soybean-6, BARI Soybean-7, Binasoybean-8 & Local variety
Replications	: Six dispersed
Plot size	: 8 m x 5 m for each unit plot
Planting system/spacing	: Line sowing, 30 cm x 10 cm
Fertilizer dose and methods of application	Fertilizer @ 35-40-60-25-2 kg, N-P-K-S-B ha ⁻¹ . All fertilizer as basal dose
Irrigated/rainfed	: Rainfed
Data to be recorded	: Yield and yield contributing characters, benefit & cost, disease and pest infestation and farmers opinion.
Investigator (s)	Concerned scientist of OFRD, Patuakhali, Q. Naher and M.F. Hossain of OFRD, Gazipur

Season	Rabi, 2022-23
Date of Initiation	First week of December 2022
Date of completion	Last week of May 2024
Expected output/benefit	: Increase soybean production and income of the farmers in char lands
Location	MLT site Kuakata, Patuakhali, Noakhali, Khulna,
Status	1 st year
Estimated cost	Tk. 75000/-
Source of fund	BARI
Priority	1 st

Expt. 162 On-Farm Trial of Chickpea Varieties in Rajshahi

Objective(s)	: To see the performance of chickpea varieties at the farmer's field of Rajshahi.
Rationale	: To popularize the newly released chickpea varieties among the farmers : Chickpea is an important pulse crop in Rajshahi region. Traditionally farmers used to cultivate chickpea after harvest of T.Aman rice in residual soil moisture condition. The long duration T.Aman rice affects the proper sowing time of chickpea that causes lower seed yield. Therefore, development of suitable chickpea variety is necessary for improving chickpea productivity in Rajshahi region. BARI has already developed some high yielding chickpea varieties with good quality. Therefore, it is necessary to evaluate the performance of BARI developed chickpea varieties at Rajshahi region.
Materials and methods	:
Crop	: Chickpea
Variety	: BARI released Chickpea varieties
Design	: RCB
I. Treatments	: i. BARI Chola-5 ii. BARI Chola-9 iii. BARI Chola-10 iv. BARI Chola-11
ii. Replication	: 6 (dispersed)
Plot size	: 4m × 8m
Planting system/spacing	: 50cm × 10 cm
Fertilizer dose and methods of application	: As per recommendation of FRG,2018/STB
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, crop duration, yield and yield attributes, Cost and return, farmer's opinion.
Investigators	: Concern scientists of OFRD, Shyampur and Barind, Rajshahi, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	: Rabi 2022-23
Date of initiation	: November, 2022
Date of completion	: March, 2024
Expected out put	: BARI released Chickpea will be evaluated for higher yield
Location	: MLT site, Paba and FSRD site, Godagari, Rajshahi
Status	: 2 nd year
Estimated cost	: Tk. 50000/- per location

Source of fund : BARI
Priority : 1st

Expt. 163 On-Farm Trial of Grasspea Varieties

Objectives : To evaluate the performance of grasspea varieties
To popularize varieties among the farmers of tested site

Rationale : Khesari (*Lathyrus sativus* L.) is the most important pulse crop of Bangladesh especially in southern areas. Grasspea seeds are being used in several dishes. Its seeds provide a great amount of protein for both human and domestic animals. Also it is used in the traditional dish, a soup like recipe is popular in Bangladesh. However, Gopalganj and Pirojpur districts are grasspea growing areas but farmers of these areas use local or old BARI released varieties. Recently BARI has released some new varieties. So, it is very essential to test their adaptability to the farmers' fields of these areas, also introduced the new high yield varieties among the farmers of Gopalganj and Pirojpur district.

Materials and methods :

Crop : Grasspea

Design : RCBD

i. Treatment : i. BARI Khesari-3
ii. BARI Khesari-5
iii. BARI Khesari-6
iv. Local cultivar as check)

ii. Replications : 6 (dispersed)

Plot size : 10m x 8m (unit plot size)

Planting system/spacing : Broadcast

Fertilizer dose & application methods : Fertilizer @ 15-15-18-9-2 kg N-P-K-S-B ha⁻¹. All amount of N, P, K, S and B fertilizer will be applied as basal dose during the final land preparation.

Irrigation/rainfed : Irrigated

Data to be recorded : Yield and yield contributing data

Investigator(s) : Concern scientist of OFRD, Gopalganj and Q. Naher & M.F. Hossain of OFRD, Gazipur

Season : Rabi

Date of initiation : December 2022

Date of completion : March 2024

Expected output/benefit : Farmers will be benefited by replacing locally adapted varieties

Location : MLT site Moksedpur; Kashiani, Gopalganj & Pirojpur

Status : 2nd year

Estimated cost : Tk. 60,000

Source of fund : BARI

Priority : 1st

Expt. 164 On-Farm Trial of Winter Type Country Bean Varieties in different Location of Bangladesh

Objectives	: • To evaluate the performance of BARI country bean variety • To know the farmers feedback
Rationale	: Country bean (<i>Lablab purpureus</i>) is one of the most important leguminous winter vegetables in Bangladesh (Sultana, 2001). Around 12,000 ha of land are cultivated and 50,000 metric tons of pods are produced every year. Country bean is very delicious and rich in protein and normally grown in rabi or winter season in Bangladesh. Farmers normally used local imported variety. However, the traditional local varieties have a prolonged vegetative period and poor yield potential, and are often infected with mosaic virus disease. BARI has developed some high yielding country bean varieties with good quality. The varieties have been popularized in some areas of the country. Therefore, it is necessary to evaluate the performance of BARI released country bean varieties in different Location of Bangladesh.
Materials and methods	:
Crop/Variety	: BARI developed country bean varieties with local check
Design	: RCB
i) Treatments	: i. BARI Sheem-1 : ii. BARI Sheem-6 : iii. BARI Sheem-8 : iv. BARI Sheem-9 : v. Local cultivar as check
ii) Replication	: 06 (dispersed)
Plot size	: 6 m× 6 m
Planting system/spacing	: 1.5m×1.5m
Fertilizer dose and methods of application	: As recommended (FRG, 2018)/ STB
Irrigated/ rainfed	: Irrigated
Data to be recorded	: Dates of all operations Yield and yield components Disease and pest incidence Economic analysis
Investigator (s)	: Concern scientists of OFRD, BARI, Dinajpur, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	: Rabi season
Date of initiation	: October, 2022
Date of completion	: April, 2023
Expt. Output/Benefit	: Selection of suitable variety, farmers income increased
Location	: MLT site, Dinajpur &Thakurgaon; Charfashion, & Bhola Sadar and Bandarban Sadar, Cox'sbazar
Status	: 2 nd year
Estimated cost	: Tk. 240000/-
Source of fund	: BARI
Priority	: 1

Expt. 165 On-Farm Trial of Summer Type Country Bean Varieties

Objective(s)	: • To evaluate the performance of summer type country bean varieties • To popularize these varieties among the farmers of tested areas.
Rationale	: Country bean (<i>Lablab purpureus</i>) is one of the most important leguminous winter vegetables in Bangladesh (Sultana, 2001). The peak harvesting season of this crop is in winter and over supply is common in the markets. This results in sales at low prices, which are not enough to compensate the production cost. Country bean can withstand excessive soil moisture and temporary waterlogging. Considering this, farmers could plant them on soil heaps or raised beds in waterlogged land with trellis support during the late monsoon season. Due to lower supply and higher prices in the markets at that time, farmers earn more income from this innovative practice. Country bean is a photo sensitive crop. But Some of photo insensitive varieties are grown in Bangladesh but their pod bearing potentiality is very poor (Islam, 2008). BARI has developed BARI Sheem-3 and BARI Sheem-7 photo insensitive country bean varieties having high yield potentiality during summer (Anonymous, 2011). However, the demand for country bean is high during the off season and the price is 3-4 times higher than in winter. Therefore, the present study will be undertaken for adaptation of promising country bean varieties for summer season.
Materials & Methods	:
Crop	: Developed country bean varieties by BARI and other organization.
Design	: RCB
i. Treatment as variety	: i. BARI Sheem-3 ii. BARI Sheem-7 iii. IPSA Sheem-2 iv. Sikribi Sheem-1 v. Local cultivar
ii. Replications:	: 6 (Dispersed)
Plot size	: 6 m x 3 m
Planting system/spacing	: 1.5 m x 1.5 m
Fertilizer dose and methods of application	: Fertilizer @ 60-40-30-10-2 kg, N-P-K-S-Zn ha ⁻¹ plus 4 t ha ⁻¹ CD. Half of the quantity of cow dung will be applied during the land preparation. The remaining half of the cow dung, the entire amount of P and half of each N and K are to be applied during pit preparation. The rest of N and K are to be applied as top dressing at 30 days after planting.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield and yield contributing characters. Farmer's opinion, pest incidence
Investigator(s)	: Concern scientists of different sites, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	: Kharif 2022-23
Date of initiation	: March 2023
Date of completion	: July 2023
Expected output/benefit	: Popularize and disseminate BARI developed summer country bean varieties and increase productivity. It is expected that the availability of country bean in the market will be extended to 9-10 months from only 4-5 months at present.
Location	: MLT site, Bandarban Sadar and Charfashion, Bhola, Khulna, Faridpur, Patuakhali
Status	: 2 nd year
Estimated cost	: Tk. 240000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 166 On-Farm Trial of Hybrid Brinjal Varieties in Different Location of Bangladesh

Objectives	: • To evaluate the performance of hybrid brinjal varieties in farmers' field • To popularize hybrid brinjal varieties among the farmers
Rationale	: Brinjal (<i>Solanum melongena</i>) is one of the most important and popular vegetables in Bangladesh that grown widely round the year. A wide range of variability of different characters is found in this crop. It is also a rich source of K, Mg, Ca and Fe. It is largely cultivated in almost all districts of Bangladesh. A number of cultivars are grown in Bangladesh, consumer preference being dependent upon fruit color, size and shape. BARI has recently developed some hybrid and OP varieties of brinjal which are supposed to be high yielder and less susceptible to pest and diseases. The present study will be undertaken to evaluate the performance of BARI released brinjal varieties under farmer's field condition and popularize those varieties among the farmers to promote their adoption.
Materials and methods	:
Crop	: Brinjal
Design	: RCB
Treatment	: i. BARI Hybrid Begun-4 ii. BARI Hybrid Begun-5 iii. BARI Hybrid Begun-6 iv. BARI Begun-12 v. Locally commercial hybrid (check)
Replications	: 6 (dispersed)
Plot size	: 4 decimal (unit plot 8m x 5m)
Planting system/Spacing	: Transplanting (60 cm x 40 cm)
Fertilizer dose and application methods	: Fertilizer @ 122-50-100-20-2-1 kg, N-P-K-S-Zn-B ha ⁻¹ + CD 5 tha ⁻¹ . 1/3 of MoP and full amount of others fertilizers except urea will be applied during final land preparation. Remaining two third MoP will be divided into three split and applied at 20 DAP, at first flowering and first fruiting stage. Urea will be applied in four equal installments.
Irrigation/rainfed	: Irrigated
Data to be recorded	: Days to 50% flowering, Days to 1 st and last harvest, No. of fruits/plant, Individual fruit weight (g), Yield/plant (kg) and per hectare (ton), Virus infestation (%), Bacterial wilt infestation (%), Insect/disease problem.
Investigator(s)	Concerned scientist of different locations, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	Rabi
Date of initiation	October 2022
Date of completion	April 2024
Expected output/benefit	Farmers will be benefited by locally adapted varieties
Location	MLT site, Sherpur & Jamlpur; Shibpur, Rajshahi; Rajbari, Dinajpur; Charfashion & Bhola Sadar; Chuadanga & Kushtia sadar; Muksedpur & Tungipara and FSRD site Gopalganj Sadar, Pabna
Status	2 nd year
Estimated cost	Tk. 520000/-
Source of fund	OFRD, BARI
Priority	1 st

Expt. 167 On-Farm Trial of Tomato Varieties during Winter Season in Different Location of Bangladesh

Objectives	:	To select suitable tomato variety for winter season. To disseminate among the farmers of the tested areas.								
Rationale	:	Tomato (<i>Solanum lycopersicum</i>) is the most important vegetables crop in Bangladesh cultivated during the rabi season. It is a good source of vitamins and minerals. This average yield of tomato is very low compared to other tomato growing countries of the world. Farmers use the traditional varieties those are low yielding and susceptible to diseases and pests. As a result, yield is decreasing day by day. BARI has recently developed some tomato varieties which are supposed to be high yielding and less susceptible to pest and diseases. The present study will be undertaken to evaluate the performance of BARI developed tomato varieties at different locations and to increase production and economic return of farmers.								
Materials & Methods	:									
Crop/varieties	:	BARI developed tomato varieties with local cultivar as check								
Design	:	RCB								
Treatments/Varieties	:	<table border="0"> <tr> <td>i. BARI Tomato-14</td> <td>v. BARI Tomato-18</td> </tr> <tr> <td>ii. BARI Tomato-15</td> <td>vi. BARI Tomato-19</td> </tr> <tr> <td>iii. BARI Tomato-16</td> <td>vii. BARI Tomato-21</td> </tr> <tr> <td>iv. BARI Tomato-17</td> <td>viii. Local as check</td> </tr> </table>	i. BARI Tomato-14	v. BARI Tomato-18	ii. BARI Tomato-15	vi. BARI Tomato-19	iii. BARI Tomato-16	vii. BARI Tomato-21	iv. BARI Tomato-17	viii. Local as check
i. BARI Tomato-14	v. BARI Tomato-18									
ii. BARI Tomato-15	vi. BARI Tomato-19									
iii. BARI Tomato-16	vii. BARI Tomato-21									
iv. BARI Tomato-17	viii. Local as check									
Replication	:	04 (dispersed) each location								
Plot size	:	01 decimal for each unit plot								
Planting system/ spacing	:	Line sowing								
Fertilizer	:	Recommended fertilizer as per FRG, 2018 i.e. 253-90-125-22-6-2 kg, N-P-K-S-Zn-B ha ⁻¹ plus 10 tha ⁻¹ CD. Half of the quantity of cow dung, half amount of P and entire amount of S and B will be applied during final land preparation. The remaining half of cow dung and P are to be applied during pit preparation before a week of planting. The entire N and K are to be applied in 3 equal installments of 21, 35 and 50 days after seedling transplanting.								
Irrigated/rainfed	:	Irrigated								
Data to be recorded	:	Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost & returns analysis and Farmers opinion								
Investigators	:	Concern scientists of different sites, Q. Naher and M.F. Hossain of OFRD, Gazipur								
Season	:	New								
Initiation	:	November 2022								
Date of completion	:	Last week of June 2024								
Expected output	:	Suitable tomato variety will be selected.								
Location	:	MLT sites of Charfashion, Dawlatkhan & Bhola Sadar; Kushtia sadar & Chuadanga and Gopalganj & Pirojpur, Manikganj, Gaibandha, Cox'sbazar, Shibpur, Rajshahi								
Status	:	2 nd year								
Estimated cost	:	Tk. 350000/-								
Source of fund	:	BARI								
Priority	:	1 st								

Expt. 168 On-Farm Trial of Processing Type Tomato Varieties during Winter Season in Rajshahi

Objective(s)	: • To find out the suitable processing variety for Rajshahi. • To see the performance of those tested varieties at farmers' field
Rationale	: Tomato is one of the important vegetables of Bangladesh. BARI has already developed some high yielding tomato varieties with good quality and processing purpose. Pran company has huge demand of tomato for katup. The tomato grows well in Rajshahi. Farmers normally use local imported variety. BARI has developed some winter varieties. Therefore, it is necessary to observe the adaptability of this variety and thus the on-farm trial will be undertaken to evaluate the performance of BARI developed tomato varieties at Rajshahi region.
Materials and methods	:
Crop	: Tomato
Variety	: BARI released Tomato varieties
Design	: RCB
I. Treatments	: BARI Tomato-19 Local as check
ii. Replication	: 6 (disperse)
Plot size	: 4 × 1 m (unit plot)
Planting system/spacing	: 60 × 40 cm
Fertilizer dose and methods of application	: Recommended fertilizer as per FRG, 2018i.e. 253-90-125-22-6-2 kg, N-P-K-S-Zn-B ha-1 plus 10 tha-1 CD. Half of the quantity of cow dung, half amount of P and entire amount of S and B will be applied during final land preparation. The remaining half of cow dung and P are to be applied during pit preparation before a week of planting. The entire N and K are to be applied in 3 equal installments of 21, 35 and 50 days after seedling transplanting.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operations, crop duration, yield and yield attributes, Cost and return, farmer's opinion.
Investigators	: M.S. Rahman; M.Z Islam; M.M.I. Chowdhury of OFRD, Shyampur, Rajshahi, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	: Rabi 2022-23
Date of initiation	: November, 2022
Date of completion	: February, 2023
Expected out put	: BARI released Tomato will be disseminated and farmers will be benefitted
Location	: MLT site, Shibpur & Paba, Rajshahi
Status	: 2 nd year
Estimated cost	: Tk. 50,000/-
Source of fund	: BARI
Priority	: 1st

Expt. 169 On-Farm Trial of Hybrid Tomato Varieties during Winter Season in Different Location of Bangladesh

Objectives	: To evaluate the performance of hybrid tomato variety in farmers' field To popularize hybrid tomato cultivation in the tested areas.
Rationale	: Tomato (<i>Lycopersicon esculentum</i> Mill) is one of the most important and popular vegetables in Bangladesh. It is one of the most popular vegetables due to its outstanding nutritive value and widely grown in the world. It plays a vital role in providing a substantial quantity of vitamin C and vitamin A in human diet. (Chowdhury, 1979; Rashid, 1999). It is also rich in medicinal value (Bose and Som, 1986). BARI has already developed a good number of hybrid tomato varieties. So, the present study will be undertaken to evaluate the performance as well as popularize these hybrid tomato varieties among the farmers of tested areas.
Materials and methods	:
Design	: RCB
i. Treatments	: i. BARI Hybrid Tomato-5 ii. BARI Hybrid Tomato-7 iii. BARI Hybrid Tomato-9 iv. BARI Hybrid Tomato-11 v. Locally available commercial hybrid as check
ii. Replications	: 4 (dispersed)
Plot dimension	: 40 m ²
Plant spacing	: 60 cm × 40 cm
Fertilizer dose and application methods	: Recommended fertilizer as per FRG, 2018i.e. 253-90-125-22-6-2 kg, N-P-K-S-Zn-B ha ⁻¹ plus 10 tha ⁻¹ CD. Half of the quantity of cow dung, half amount of P and entire amount of S and B will be applied during final land preparation. The remaining half of cow dung and P are to be applied during pit preparation before a week of planting. The entire N and K are to be applied in 3 equal installments of 21, 35 and 50 days after seedling transplanting.
Irrigation/rainfed	: Irrigated
Date of planting	: Seed sowing- 1 st week of October, 2022 Planting- 1 st week of November, 2022
Plant protection measures	: As and when necessary
Data to be recorded	: Days to 50% flowering, days to 1 st and last harvest, no. of fruits/plant, individual fruit weight (g), yield/plant (kg) and per hectare (ton), virus infestation (%), bacterial wilt infestation (%), other insect/disease problem, farmer's reaction
Output	: BARI released winter hybrid tomato varieties will be popularized among the farmers of Sherpur region and production will be increased
Season	: Rabi
Investigator(s)	: Concern scientists of different sites, Q. Naher and M.F. Hossain of OFRD, Gazipur
Date of initiation	: October, 2022
Date of completion	: April, 2023
Location	: MLT site, Narsingdi, Bolaier char, Sherpur and FSRD site Tarakandi, Sherpur, Manikganj, Gopalganj, Bhola, Munshiganj
Status	: 2 nd Year
Estimated cost	: Tk. 280000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 170 On-Farm Trial of Watermelon Varieties in Different Locations of Bangladesh

Objective (s)	: <ul style="list-style-type: none">• To evaluate the performance of BARI watermelon varieties• To popularize these varieties among the farmers.
Rationale	: Watermelon (<i>Citrullus lanatus</i>) is a highly nutritious fruit under the Cucurbitaceae family. It is a good source of vitamins, minerals, and antioxidants. 100 g of watermelon contains 92% water, 30 kcal energy, 0.61 g protein, 0.15 g fat, 0.4 g fiber, 6.2 g carbohydrate, 112 mg potassium, 7 mg calcium, 11 mg phosphorus, 0.24 mg Fe, 230 mg carotene, 569 IU vitamin A, 0.498 mg vitamin-B, 8.1 mg vitamin-C (Gebhardt and Thomas, 2002). BARI recently released two open pollinated watermelon varieties namely BARI Tormuj-1 and BARI Tormuj-2. The dependence, as well as the import cost of hybrid seeds, may be minimized if these OP varieties become popularized among the farmers. The farmers of different areas of Bangladesh produce watermelon using imported hybrid seeds in a limited area. So, there is a huge scope to cultivate the BARI developed high yielding watermelon varieties. But still, the performance was not studied of watermelon at farmer's field condition. Therefore, the trial has been undertaken to find out the suitable variety(s) of watermelon in the tested location.
Materials and Methods	:
Design	: RCB
variety	: <ol style="list-style-type: none">BARI Tormuj-1BARI Tormuj-2Local as check
ii) Replications	: 6 (Six)
Plot size	: 6m × 3 m
Planting system/spacing	: Plant to plant 1.5 meter and line to line 2 meter.
Fertilizer dose and methods of application	: Cowdung 10 ton, urea 250 kg, TSP 250 kg, MoP 200 kg, gypsum 100 kg, zinc sulphate 10 kg and boric acid 14 kg to be applied per hectare. Entire cowdung, TSP, gypsum, zinc, and boric acid and half of the total MoP to be applied during final land preparation. Rest of the MoP and entire urea are to be applied in 4 equal splits at 15 days interval.
Irrigated/rainfed	: Irrigated (3-4)
Data to be recorded	: Date of all operations, yield and yield contributing characters, pest incidence, Farmer's opinion
Investigator (s)	: Concern scientist of respective sites and M.F. Hossain of OFRD, Gazipur
Season	: Kharif-1, 2022-23
Date of Initiation	: March 2023
Date of completion	: June 2023
Expected output	: Suitable BARI developed variety
Location	: FSRD site Faridpur, MLT site Kotalipara, Gopalganj and MLT site Bhuapur and FSRD site Atia, Tangail, Narsingdi, Pabna, Shayampur, Rajshahi
Status	: 2 nd year
Estimated cost	: Tk. 210000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 171 Evaluation of Pineapple Germplasm at Madhupur

- Objectives**
- To evaluate the performance of pineapple varieties
 - To popularize the pineapple varieties and farmers' income.
- Rationale** : Pineapple (*Ananas comosus*) is one of the most popular fruits in Bangladesh. It is incredibly delicious, healthy tropical fruit. On an average, around two lakh tons of pineapple is produced in the country each year. It is an important cash crop of Madhupur, Ghatail and Shakhipur hilly area of Tangail. According to DAE in Madhupur upazila, pineapples were cultivated on around 6,500 hectares of land in the region. Similarly, more than 3,000 hectares of land in the adjacent Ghatail upazila and Shakhipur upazila are used to grow pineapple. About 85 percent pineapples grown in the region are the Giant Q variety, locally known as Calendar, of the rest 5 per cent are the Honey Queen variety, locally called Joldungi, and 10 per cent are the Ashwina variety but the shelf life of these varieties is much shorter. A large amount of locally grown pineapples is left to rot each year due to shorter shelf life and lack of preservation facilities. So, the growers are fallen problem when all fruit ripens together causes problems in marketing. Recently, an exotic variety MD-2 which has highest storability among all the varieties (3-4 weeks) but the yield performance of this variety is not studied at these areas. So, present study will be undertaken to evaluate the performance of MD-2 against local cultivar in respect of fruit yield and storability.

Materials and Methods:

- Crop** : Pineapple
- Variety** :
i. MD-2
ii. Ghorashal
iii. Honey Queen
- Replications** : 6 dispersed replications
- Area** : 40 m² for each variety in each replication
- Spacing (m)** : Two pair pineapple should be planted in one-meter-wide bed where, row to row distance is 50 cm and plant to plant distance is 50 cm.
- Fertilizer dose** : Cowdung: 5 t/ha and N-P-K-S-B: 225-85-150-30-1.5 kg/ha, respectively.
- Application method** : Cowdung, Gypsum and TSP fertilizer should be applied during the bed preparation. Urea and MOP fertilizer should be divided into 5 equal split and applied starting from 4-5 months after planting.
- Irrigated/rainfed** : Irrigation should be provided in dry season
- Data to be collected** : Dates of all operation, Yield and yield contributing characters. Major disease and insect incidence, Cost & return analysis and Farmers' opinion
- Expected output** : Farmers will be benefited to increase at least 25% of their production
- Investigator(s)** : Scientists of OFRD, Tangail and Q. Naher & M.F. Hossain of OFRD, Gazipur
- Status** : 2nd year
- Date of initiation** : October, 2022
- Date of completion** : June, 2024
- Estimated cost** : Tk. 100000/-¹
- Location(s)** : MLT site Madhupur, Tangail
- Source of fund** : BARI
- Priority** : 1st

Expt. 172 On-Farm Trial of Potato Varieties in Rajshahi

Objective(s)	:	<ul style="list-style-type: none">• To see the performance of potato varieties at the farmer's field of Rajshahi.• To popularize the newly released potato varieties among the farmers
Rationale	:	Potato is one of the important vegetables of Bangladesh. BARI has already developed some high yielding potato varieties with good quality. The varieties have been popularized in some areas of the country. The potato grows well in Rajshahi. Farmers normally cultivate BARI Alu-8 that is susceptible to many diseases. Therefore, it is necessary to observe the adaptability of this variety and to evaluate the performance of BARI developed potato varieties at Rajshahi region.
Materials and methods	:	
Crop	:	Potato
Variety	:	BARI released Potato varieties
Design	:	RCB
I. Treatments	:	BARI Alu-62, BARI Alu-87, BARI Alu-88, BARI Alu-90 & BARI Alu-8 as check
ii. Replication	:	6 (dispersed)
Plot size	:	25m × 10m
Planting system/spacing	:	60cm × 25 cm
Fertilizer dose and methods of application	:	As per recommendation of FRG, 2018/ STB
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Dates of all operations, crop duration, yield and yield attributes, Cost and return, farmer's opinion.
Investigators	:	Scientists of OFRD, Region-1, Shyampur, Rajshahi, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	:	Rabi 2022-23
Date of initiation	:	November, 2022
Date of completion	:	February, 2023
Expected output	:	BARI released Potato will be disseminated and farmers will be benefitted
Location	:	MLT site, Shibpur & Paba, Rajshahi
Status	:	2 nd year
Estimated cost	:	Tk. 50,000/-
Source of fund	:	BARI
Priority	:	1

Expt. 173 On-Farm Trial of Potato Varieties

Objectives	:	To select suitable potato varieties in Sherpur area To increase profitability of farmers
Rationale	:	Potato (<i>Solanum tuberosum</i> L.) is the fourth biggest crop of the world and second largest food crops in Bangladesh after the rice. Potato is the staple food of about 40 countries in the world. It contributes a lot to the total vegetable supply of the country. In Bangladesh it is cultivated in 4.72 lakh hectares of land and produces about 85 lac metric tons of potato (Krishi Project Hathi, 2019). Most of the farmers in Sherpur are cultivating locally available potato varieties. The local varieties of potato are susceptible to different insect and diseases; thus, they get very poor yield as well as economic return. BARI has developed several modern varieties of potato, which are

supposed to be higher yielder and less susceptible to insect and diseases. Therefore, a trial with BARI developed high yielding potato varieties will be conducted for higher yield and economic return.

Materials and Methods

Crop	: Potato
Treatment (varieties)	: BARI Alu-82, BARI Alu-89, BARI Alu-90, BARI Alu-91 & BARI Alu-92
Design	: RCB
Replications	: 06 (dispersed)
Unit plot size	: 8 m x 5 m
Seed rate	: 1500 (kg ha ⁻¹)
Spacing	: 60 cm x 20 cm
Fertilizer	: As recommended by FRG, 2018
Application of fertilizer	: Cowdung, half of N and all others fertilizer will be applied as basal during final land preparation. Remaining N will be applied as top dressing at 30-35 days after planting followed by earthing up.
Irrigated / Rainfed	: N/A
Data to be recorded	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Economic analysis, Farmers' opinion
Investigator(s)	: A.K.M.Z.U Noor, M.M Rahman and M. S. Rahman.
Season	: Rabi, 2022
Date of initiation	: November, 2022
Date of completion	: April, 2023
Expected output	: New HYV potato varieties will be introduced in the locality and increased the yield
Location(s)	: Sherpur and Munshiganj
Status	: 2 nd year
Estimated cost	: Tk. 50,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 174 On-Farm Adaptive Trial of Quinoa in Saline Soil

Objective (s)	: To determine the yield performance of Quinoa at field condition.
Rationale	: Quinoa (<i>Chenopodium quinoa</i>) is known as pseudo cereal, belongs to amaranth family. It is a herbaceous annual plant grown primarily for its edible seeds. The seeds are used as human consumption which is highly nutritious. The seeds are rich in protein, dietary fibre, B vitamins, and dietary minerals in amounts greater than in many grains. Quinoa is gluten-free. Because of high concentration of protein (14-18%), ease of use, versatility in preparation, and potential for increased yields in controlled environments, it has been selected as an experimental crop in NASA's Controlled Ecological Life Support System for long duration human occupied space flights. From agronomic point of view Quinoa is a hardy crop and can withstand drought and high salinity (up to 18 dS/m). A preliminary trial from On-Farm Research Division at Khulna revealed that sowing on 9 November 2021 produced 1.84 t ha ⁻¹ grain yield. So, it is necessary whether it is suitable for cultivation

	:	under the field condition of the coastal region at various degree of salinity.
Materials and Methods	:	
Crop	:	Quinoa
Design	:	RCB
Treatment	:	Sowing date may be treatment variable or Quinoa and Chia experiment should be one.
Replication	:	$\frac{3}{4}$ (dispersed)
Plot size	:	5 decimal
Planting system/spacing	:	30 cm row spacing
Fertilizer dose and methods of application	:	Cow dung : 5 t ha ⁻¹ before ploughing, 325-220-85-50-10-5 Kg ha ⁻¹ of urea-TSP-MoP-Gypsum-Zinc sulphate-Boric acid. One-third of urea and whole amount of other fertilizers during final land preparation, rest urea in two equal installments at 25-30 DAS and at 35-40 DAS.
Irrigated	:	Two irrigations at 25-30 DAS and 35-40 DAS.
Data to be recorded	:	Dates of all operation, yield and yield contributing characters.
Investigator (s)	:	M K Shahadat, SO; M H Rashid, PSO; M K Islam SSO; T.S. Munmun, SSO and M Rahman SO, OFRD, Khulna
Season	:	2022-23
Date of Initiation	:	December 2022
Date of completion	:	May 2024
Expected output / benefit	:	Adaptive nature of Quinoa will be determined.
Location (s)	:	MLT site, Koyra, Dacope, and Batiaghata.
Status	:	2 nd year
Estimated cost	:	Tk. 50000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 175 On-Farm Adaptive Trial of Anthocyanin Rich Potato Varieties/Lines in Rangpur

Objective (s)	:	<ul style="list-style-type: none"> • To find out the suitable anthocyanin rich potato varieties for Rangpur area. • To increase farmers income
Rationale	:	<p>Potato (<i>Solanum tuberosum</i>) is the world's fourth most economically important food crop, after wheat, rice and maize. In Bangladesh, the crop is the third most important crop in Bangladesh next to rice and wheat. According to DAE, the crop occupies 4.963 lac hectare lands with the annual production of 103.04 lac metric tons during 2015-16. The national average yield of potato is very low (20.77 tha⁻¹) compare to its potential yield, due to lack of quality seed, cultivation of indigenous potato and high price of quality seed. Tuber Crop research Centre (TCRC), BARI has developed a good number of potato lines which are supposed to be higher yielder and less susceptible to insect pest and diseases. These newly lines need to be evaluated for their performance under different agro-ecological zones. Therefore, an adaptive trial with BARI developed anthocyanin rich potato varieties/lines was conducted to evaluate their yield performance.</p>
Materials and Methods :	:	

Crop	: Potato
Design	: RCB
Variety	: Blackberry, Spatarn Red, BARI Alu-53 & BARI Alu-82
Replications	: 6 (dispersed)
Plot size	: 8 m × 5 m (unit plot)
Planting system/spacing	: Line sowing, 60 cm × 30 cm
Fertilizer dose and methods of application	: Cowdung-5 t/ha, Urea 115, TSP 30, MP 125 , Gypsum 10 , Zn 2 and Boric Acid 1.5 kg/ha. Entire quantity of cowdung, P, K, S, B and half amount of Urea will be applied at the time of final land preparation. Rest N will be applied 30-35 days after planting.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Plant height (cm), flowering behavior, number of tuber/plant, yield (t/ha), disease and pest infestation, farmer's opinion
Investigator (s)	: M.Z. Ferdous, OFRD, Rangpur, Md. Safiqul Islam, TCRC, Gazipur, Q. Naher and M.F. Hossain of OFRD, Gazipur
Season	: Rabi, 2022-23
Date of Initiation	: Last week of October,2022
Date of completion	: Last week of March 2024
Expected output/benefit	: Suitable lines/varieties of potato will be identified for northern region
Location	: FSRD site, Rangpur and Chilmary, Kurigram
Status	: New
Estimated cost	: Tk. 40000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 176 On-Farm Adaptive Trial of Chia Seed in Saline Soil

Objective	: To determine yield performance of Chia seed at field condition.
Rationale	: Chia seeds are the edible seeds of <i>Salvia hispanica</i> , a flowering plant in the mint family (Lamiaceae) native to central and sothern Mexico. Chia seed is cherished most for its nutritious values. Dried seeds contain 6% water, 42% carbohydrates, 16% protein, and 31% fat. In a 100-gram amount, chia seeds are a rich source of B vitamins (20% or more of daily value, DV), thiamin (54% DV), niacin (59% DV) and a moderate source of riboflavin (14% DV) and folate (12% DV). The seeds are rich in several dietary minerals, including calcium, iron, magnesium, manganese, phosphorus and zinc (>20% DV). The fatty acids of chia seed oil are mainly unsaturated, with linoleic acid (17-26% of total fat) and linolenic acid (50-57%) as the major fats. A preliminary trial from On-Farm Research Division at Khulna revealed that sowing on 9 November 2021 produced 1.79 t ha ⁻¹ grain yield. However, there is hardly any salinity at the on-station condition of Khulna. So, it is hard to decide whether it is suitable for cultivation under the field condition of the coastal region, which is inherently saline at various degree.
Materials and Methods	:
Crop	: Chia seed
Design	: -
Treatment	:
Replication	: -
Plot size	: 5 decimal

Planting system/spacing : 30 cm row spacing

Fertilizer dose and methods of application : 5-10 t ha⁻¹ before ploughing, 325-220-85-50-10-5 Kg ha⁻¹ of urea-TSP-MoP-Gypsum-Zinc sulphate-Boric acid. One-third of urea and whole amount of other fertilizers during final land preparation, rest urea in two equal installments at 25-30 DAS and at 35-40 DAS.

Irrigated : Two irrigations at 25-30 DAS and 35-40 DAS.

Data to be recorded : Dates of all operation, yield and yield contributing characters.

Investigator (s) : M K Shahadat ; M H Rashid ; M K Islam; T.S. Munmun, and M Rahman , OFRD, Khulna

Season : 2022-23

Date of Initiation : December 2022

Date of completion : May 2024

Expected output / benefit : Adaptive nature of Chia seed will be determined.

Location(s) : MLT site, Koyra, Dacope and Batiaghata

Status : 2nd year

Estimated cost : Tk. 50000/-

Source of fund : BARI

Priority : 1st

PROGRAMS FROM OTHER DIVISION OR CENTER

Vegetable Division, Horticulture Research Center

Expt. 177 On-farm trial of BARI developed Eggplant variety (OP)

Objective : To evaluate the performance of the eggplant variety in farmers' field
Rationale : BARI Begun- 12 were developed and released for its high yield during winter season. On-farm trial will help to popularize the variety to the farmers.

Materials and Methods:

Materials : BARI Begun-12 and local variety as check
Design : RCB
Treatment : 3
Replications : 6 (each farmers' field/plot will be treated as replication)
Plot dimension : 7.0 × 0.7 m (unit plot)
Plant spacing : 70 × 70 cm

Fertilizer dose and application methods:

Cowdung	: 10 t/ha		
Urea	: 375 kg/ha	N	: 170 kg/ha
TSP	: 300 kg/ha	P	: 60 kg/ha
MoP	: 250 kg/ha	K	: 125 kg/ha
Gypsum	: 100 kg/ha	S	: 18 kg/ha
Zinc sulphate	: 12 kg/ha	Zn	: 4.3 kg/ha
Boric acid	: 10 kg/ha	B	: 1.70 kg/ha

One third of the cowdung and half of P and full of S, Zn and B will be applied during final land preparation. Rest of cowdung and P and 1/3 of K will be applied as basal in pit. One fifth of N and K were applied after 20 days of transplanting. After that, rest of N and K were applied in equal four installments at 20 days interval.

Irrigated/rainfed:Irrigated

Planting date : Sowing- 1st week of September, 2023
Transplanting- 3rd week of September, 2023

Data to be recorded:

- i. Days to 1st and last harvest
- ii. No. and wt. of fruits/plant
- iii. No. and wt. of infested and healthy fruits / plot
- iv. Marketable yield /plant (kg) and per hectare (ton)
- v. Disease and insect reaction
- vi. Farmer's reaction

Investigator (s) : Scientists of OFRD and HRC
Season :
Date of initiation : September, 2023
Location : Tangail, Comilla, Rajshahi, Rangpur, Shatkhira, Daulatpur and Mymensingh
Status : New
Estimated cost : Tk. 140,000/-
Source of fund : BARI
Priority : 1st

Expt. 178 On-farm trial of BARI developed Brinjal hybrids

Objective : To evaluate the performance of the hybrid eggplant variety in farmers' field
Rationale : BARI Hybrid Begun- 5 and BARI Hybrid Begun- 6 were developed and released for its high yield during winter season. On-farm trial will help to popularize the variety to the farmers.

Materials and Methods:

Materials : BARI Hybrid Begun - 5 and BARI Hybrid Begun- 6 with local hybrid variety as check
Design : RCB
Treatment : 3
Replications : 6 (each farmers field/plot will be treated as replication)
Plot dimension : 7.0 × 0.7 m (unit plot)
Plant spacing : 70 × 70 cm

Fertilizer dose and application methods:

Cowdung	: 10 t/ha		
Urea	: 375 kg/ha	N	: 170 kg/ha
TSP	: 300 kg/ha	P	: 60 kg/ha
MoP	: 250 kg/ha	K	: 125 kg/ha
Gypsum	: 100 kg/ha	S	: 18 kg/ha
Zinc sulphate	: 12 kg/ha	Zn	: 4.3 kg/ha
Boric acid	: 10 kg/ha	B	: 1.70 kg/ha

One third of the cowdung and half of P and full of S, Zn and B will be applied during final land preparation. Rest of cowdung and P and 1/3 of K will be applied as basal in pit. One fifth of N and K were applied after 20 days of transplanting. After that, rest of N and K were applied in equal four installments at 20 days interval.

Irrigated/rainfed: Irrigated

Planting date : Sowing- 2st week of September, 2023
Transplanting- 4st week of September, 2023

Data to be recorded:

- i. Days to 1st and last harvest
- ii. No. and wt. of fruits/plant
- iii. No. and wt. of infested and healthy fruits / plot
- iv. Marketable yield /plant (kg) and per hectare (ton)
- v. Disease and insect reaction
- vi. Farmer's reaction

Investigator (s) : Scientists of OFRD and HRC

Season :

Date of initiation : September, 2023

Location : Narasindi, Comilla, Pabna, Rajshahi, Rangpur, Shatkhira, Daulatpur and Mymensingh

Status : New

Estimated cost : Tk. 160,000/-

Source of fund : BARI

Priority : 1st

Expt. 179 On-farm trial of BARI developed Tomato variety (OP)

Objective : To evaluate the performance of the variety under farmers' field
Rationale : BARI Tomato-21 was released for attractive colour, shape, long shelf life and yield potentials. As such on-farm trial will help to popularize the varieties among the farmers.

MATERIALS AND :

METHODS

Materials : BARI Tomato - 21 and a commercial variety as check
Design : RCB
Treatment : 4
Replications : 6 (each farmers field/ plot will be treated as replication)
Plot dimension : 4 × 1 m (unit plot)
Plant spacing : 60 × 40 cm
Planting date : Seed sowing- 2st week of October, 2023
Planting- 1st week of November, 2023

Fertilizer dose and application methods :

Cowdung	: 10 t/ha		
Urea	: 550 kg/ha	N	: 253 kg/ha
TSP	: 450 kg/ha	P	: 90 kg/ha
MoP	: 250 kg/ha	K	: 125 kg/ha
Gypsum	: 121 kg/ha	S	: 22 kg/ha
Zinc sulphate	: 15 kg/ha	Zn	: 5.40 kg/ha
Boric acid	: 12 kg/ha	B	: 2 kg/ha

Half of the quantity of cow dung, half amount of P and entire amount of S and B will be applied during final land preparation. The remaining half of cow dung and P are to be applied during pit preparation before a week of planting. The entire N and K are to be applied in 3 equal installments of 21, 35 and 50 days after seedling transplanting.

Irrigation/rainfed : Irrigated
Plant protection measures : As and when necessary

Data to be recorded :

- | | |
|---|-----------------------------------|
| i) Days to 1 st and last harvest | v) Bacterial wilt infestation % |
| ii) No. of fruits/plant | vi) Virus infestation % |
| iii) Individual fruit weight (g) | vii) Other insect/disease problem |
| iv) Yield/plant (kg) and per hectare (ton) | viii) Farmer's reaction |

Investigator (s) : Scientists of OFRD and HRC
Season : Rabi
Date of initiation : October, 2023
Location : Rajshahi, Comilla, Daulatpur, Noakhali, Cox's Bazar and Bandarban
Status : New
Estimated cost : Tk. 60,000/-
Source of fund : BARI
Priority : 1st

Expt. 180 On-farm trial of BARI developed hybrid Pumpkin variety

Objective : To evaluate the performance of hybrid pumpkin variety in farmers field
Rationale : BARI Hybrid Mistikumra-1 and BARI Hybrid Mistikumra-2 were released for its high yield and seed production potentiality. On-farm trial will help to popularize the variety to the farmers.

MATERIALS AND METHODS:

Materials : BARI Hybrid Mistikumra-1 and BARI Hybrid Mistikumra-2 with locally available hybrid variety as check
Design : RCB
Treatment : 2
Replications : 6 (each farmer's field/ plot will be treated as replication)
Plot dimension : 10 × 7.5 m
Plant spacing : 2.5 × 2.5 m
Sowing time : October, 2023, Transplanting: 15-20 days old seedlings
Land area : 200 sq. m

Fertilizer dose and application methods:

Cowdung	: 10 t/ha		
Urea	: 170 kg/ha	N	: 78 kg/ha
TSP	: 175 kg/ha	P	: 35 kg/ha
MP	: 150 kg/ha	K	: 75 kg/ha
Gypsum	: 99 kg/ha	S	: 18 kg/ha
Zinc sulphate	: 13 kg/ha	Zn	: 4.32 kg/ha
Boric acid	: 12 kg/ha	B	: 2.0 kg/ha

Entire cowdung, P, S, Zn, B and 1/3 of K will be applied during pit preparation at least 7 days before transplanting. N @ 50 kg /ha will be applied at the day of transplanting. Rest of K @ 50kg /ha will be applied twice after transplanting at 20 days interval and N will be applied in 4 equal installments at 15, 35, 55 and 75 days after transplanting.

Control measure of fruit fly: Poison trap (From flowering to fruit maturity).

Data to be recorded

- | | |
|--------------------------------------|-----------------------------------|
| i. Fruits/plant | ii) Fruit skin colour at maturity |
| ii. Average fruit weight (kg) | iii) Flesh thickness |
| iii. Fruit shape | iv) Flesh colour |
| iv. Yield/plant (kg) and hectare (t) | v) Disease and insect reaction |
| | vi) 9. Farmer's reaction |

Investigator (s) : Scientists of OFRD and HRC
Season : Rabi
Date of initiation : October, 2023
Expected output/benefit : Farmers will be benefited by growing the developed hybrid variety(s)
Location ; Daulatpur, Tangail, Comilla, Kishorjang, Patuakhali and Rangpur
Status : On-going
Estimated cost : Tk. 60,000/-
Source of fund : BARI
Priority : 1st

Expt. 181 On-farm trial of BARI developed Sponge gourd variety (hybrid)

Objective : To evaluate the performance of sponge gourd variety in farmer's field
Rationale : BARI Hybrid Dhundol-1 were newly released high yield potential sponge gourd variety which needs to popularize among the farmers. As such On-farm trial will help to popularize the variety to the farmers.

Materials and methods:

Materials : BARI Hybrid Dhundol-1 and a commercial hybrid as check
Design : RCB
Treatment : 3
Replications : 6 (each farmer's field/ plot will be treated as replication)
Plot dimension : 1.2 × 12.5 m
Plant spacing : 1.2 × 2.5 m
Sowing time : March, 2024

Fertilizer dose and application methods:

Oranic fertilizer	:	5000 kg/ha		
Urea	:	165 kg/ha	N	: 76 kg/ha
TSP	:	160 kg/ha	P	: 32 kg/ha
MoP	:	140 kg/ha	K	: 70 kg/ha
Gypsum	:	80 kg/ha	S	: 14.5 kg/ha
Zinc Sulphate	:	10 kg/ha	Zn	: 3.6 kg/ha
Boric acid	:	10 kg/ ha	B	: 2 kg/ha

Entire cow dung, P, S, Zn, B and 1/3 of K will be applied during pit preparation at least 7-10 days before transplanting. Rest of K will be applied in two equal installments at 15 and 30 days after transplanting. N will be applied in 4 equal installments at 7, 15, 30 and 45 days after transplanting.

Data to be recorded	:	
i) Days to 1 st harvest	iv)	Average fruit wt (g)
ii) Days to last harvest	v)	Yield per plant (kg) & hectare (ton)
iii) Fruits/plant	vi)	Farmer's reaction
Investigator (s)	:	Scientists of OFRD and HRC
Season	:	Kharif
Date of initiation	:	March, 2024
Expected output/benefit	:	Farmers will be benefited by growing the developed variety(ies)
Location	:	Narsinghdi, Mymensingh, Pabna, Tangail, Rajshahi and Rangpur
Status	:	New
Estimated cost	:	Tk. 60,000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 182 On-farm trial of BARI developed Watermelon variety.

Objective : To evaluate the performance of watermelon gourd variety in farmer's field
Rationale : BARI Tarmuj-1 and BARI Tarmuj-2 were newly released high yield potential watermelon variety which needs to popularize among the farmers. As such On-farm trial will help to popularize the variety to the farmers.

Materials and methods:

Materials : BARI Tarmuj-1 and BARI Tarmuj-2 a local variety as check
Design : RCB
Treatment : 3
Replications : 6 (each farmer's field/ plot will be treated as replication)
Plot dimension : 10 × 2.0 m
Plant spacing : 2.0 × 2.0m (excluding 50 cm drain)
Sowing time : Jan, 2024 and Apr 2024

Fertilizer dose and application methods:

Cowdung	:	10 kg/ha		
Urea	:	250 kg/ha	N	: 115 kg/ha
TSP	:	250 kg/ha	P	: 50 kg/ha
MoP	:	200 kg/ha	K	: 100 kg/ha
Gypsum	:	100 kg/ha	S	: 18 kg/ha
Zinc Sulphate	:	12 kg/ha	Zn	: 4.3 kg/ha
Boric acid	:	10 kg/ha	B	: 1.70 kg/ha

Entire cow dung, P, S, Zn, B and 1/3 of K will be applied during pit preparation at least 7-10 days before transplanting. Rest of K will be applied in two equal installments at 15 and 35 days after transplanting. N will be applied in 3 equal installments at 15, 35 and 45 days after transplanting.

Data to be recorded :

- | | |
|------------------------------------|--|
| i. Days to 1 st harvest | iv. Average fruit wt (g) |
| ii. Days to last harvest | v. Sweetness (TSS) |
| iii. Fruits/plant | vi. Yield per plant (kg) & hectare (ton) |
| | vii. Farmer's reaction |

Investigator (s) : Scientists of OFRD and HRC
Season : Rabi and Kharif
Date of initiation : Jan, 2024
Expected output/benefit : Farmers will be benefited by growing the developed variety(ies)
Location : Bholā, Patuakhali, Khulna, Bandarban and Rajshahi
Status : New
Estimated cost : Tk. 50,000/-
Source of fund : BARI
Priority : 1st

Expt. 183 On-farm trial of BARI developed Stem amaranth variety

Objective : To evaluate the performance of stem amaranth variety in farmer's field
Rationale : BARI Data-3 and BARI Data-4 were newly released high yield potential stem amaranth variety which needs to popularize among the farmers. As such On-farm trial will help to popularize the variety to the farmers.

Materials and methods:

Materials : BARI Data -3 and BARI Data-4 a local variety as check
Design : RCB
Treatment : 3
Replications : 6 (each farmer's field/ plot will be treated as replication)
Plot dimension : 5 × 2.0 m
Plant spacing : 20 cm × 20cm
Sowing time : Mar, 2024 and Nov, 2023

Fertilizer dose and application methods:

Cowdung	:	10 kg/ha		
Urea	:	250 kg/ha	N	: 115 kg/ha
TSP	:	250 kg/ha	P	: 50 kg/ha
MoP	:	200 kg/ha	K	: 100 kg/ha
Gypsum	:	100 kg/ha	S	: 18 kg/ha
Zinc Sulphate	:	12 kg/ha	Zn	: 4.3 kg/ha
Boric acid	:	10 kg/ ha	B	: 1.70 kg/ha

Entire cow dung, P, S, Zn, B and 1/3 of K will be applied during pit preparation at least 7-10 days before transplanting. Rest of K will be applied in two equal installments at 15 and 35 days after transplanting. N will be applied in 3 equal installments at 15, 35 and 45 days after transplanting.

Data to be recorded :

- | | |
|------------------------------------|--|
| i. Days to 1 st harvest | iv. Average fruit wt (g) |
| ii. Days to last harvest | v. Sweetness (TSS) |
| iii. Fruits/plant | vi. Yield per plant (kg) & hectare (ton) |
| | vii. Farmer's reaction |

Investigator (s) : Scientists of OFRD and HRC
Season : Rabi and Kharif
Date of initiation : Nov, 2023
Expected output/benefit : Farmers will be benefited by growing the developed variety(ies)
Location : Manikjang, Tangail, Sherpur, Pabna and Rajshahi
Status : New
Estimated cost : Tk. 50,000/-
Source of fund : BARI
Priority : 1st

Soil Science Division

Expt. 184 Validation of biofertilizer on different legumes (Mungbean, lentil, chickpea, groundnut, soybean etc.)

Objective(s)	: To popularize the rhizobium biofertilizer technology for producing pulse and oilseed legumes in the farmer's level.
Materials and methods	:
Crop/variety	: Mungbean: BARI Mung-6 Lentil: BARI Masur-6 Chickpea: BARI Chola-5 Groundnut: BARI Chinabadam-7 Soybean: BARI Soybean-6
	: Rhizobium strains: Mungbean: BARI RVr-403 Lentil: BARI RLC-104 Chickpea: BARI RCa-203 Groundnut: BARI RAh-801 Soybean: BARI RGM-901
Design	: RCBD
Treatment	: 1. Without <i>Rhizobium</i> inoculant + PKSZn 2. With <i>Rhizobium</i> inoculant + PKSZn 3. NPKSZn
Replication	: 4 (Dispersed)
Plot size	: 10 m × 15 m
Fertilizer dose and methods of application	: Mungbean: P ₂₂ K ₄₂ S ₂₀ Zn ₅ kg ha ⁻¹ Lentil: P ₂₂ K ₄₂ S ₂₀ Zn ₅ kg ha ⁻¹ Chickpea: P ₂₂ K ₄₂ S ₂₀ Zn ₅ kg ha ⁻¹ Groundnut: P ₂₂ K ₄₂ S ₄₀ Zn ₅ kg ha ⁻¹ Soybean: P ₂₂ K ₄₂ S ₄₀ Zn ₅ kg ha ⁻¹ Rhizobium biofertilizer: 1.5 kg ha⁻¹ Nitrogen: 50 kg N kg ha ⁻¹ for mungbean, lentil, chickpea and 100 kg N kg ha ⁻¹ for groundnut and soybean
Investigator(s)	: M.E. Ali, SSO, SSD, M. Rahman, SO, SSD, M.F.A. Anik, SO, SSD, H.M. Naser, CSO, SSD, M.M. Anwar, CSO, OFRD, Joydebpur and Concerned Scientists of OFRD, BARI substation
Season	: Mungbean: First week of March 2024 at Kushtia, Satkhira, Sylhet & Faridpur; Mid-January to Mid February 2024 at Patuakhali, Bhola and Cox's Bazar. Lentil : November 2023 Chickpea : November 2023 Groundnut : November 2023 Soybean : December 2023
Expected output/benefit	: Application of biofertilizer will reduce the dependence of nitrogenous fertilizers. Farmers will benefit through use of low cost biofertilizer. Woman income generation will be increased by picking mungbean pod and harvesting of crops.
Location	: i) For mungbean: Kushtia, Faridpur, Patuakhali, Bhola, Satkhira, Sylhet, Cox's Bazar ii) For lentil: Meherpur, Faridpur, Jessore, Sylhet, Jamalpur iii) For chickpea: Kustia, Faridpur, Rajshahi, Pabna, Sylhet iv) For groundnut: Rangpur, Jamalpur, Kishoregonj, Cox's Bazar. v) For soybean: Noakhali, Lakhmipur, Bhola, Rangpur
Status	: On going
Estimated Cost	: Tk. 2,00,000/- (Tk. 8,000/- for each location & for each crop)
Source fund	: BARI
Priority	: 1 st

Seed Technology Division

Expt. 185 Vermicompost stimulated integrated nutrient management on seed yield and quality of onion

Objective	:	To evaluate the performance of vermicompost based integrated nutrient management for quality seed production of onion
Rationale	:	The technology of vermicompost based integrated nutrient management system was developed for its higher seed yield and quality in onion seed production. On-farm trial will help to popularize the technology to the farmers.
Materials and methods	:	
Crop/Variety	:	BARI Pij-4
Design	:	RCB (Dispersed)
Treatment	:	T ₁ =Vermicompost @ 3 t ha ⁻¹ with recommended chemical fertilizer (105-45-60-20-2-1.5 kg ha ⁻¹ of NPKSZnB respectively) T ₂ = Farmer's Practice
Replication	:	4
Plot size	:	5 m X 4 m
Planting system/Spacing	:	Line sowing; Row-row: 25 cm, plant-plant:20 cm
Fertilizer dose and methods of application	:	Recommended Fertilizer will be applied @ 105-45-60-20-2-1.5 NPKSZnB, respectively. Half of nitrogen and potassium, and entire amount of other fertilizers will be applied during basal. Remaining nitrogen and potassium will be applied in two splits at 25 and 50 days after planting. Entire vermicompost will be applied during final land preparation and mixed with soil.
Irrigated/ rain fed	:	Irrigated
Date to be recorded	:	Date of all operations, seed yield and yield attributes, disease and pest incidence, seed moisture content, , germination (%). seedling length, seedling dry weight, vigor index, name of pathogen and per cent disease infection. Cost and return analysis.
Investigator(s)	:	P. C. Sarker, M.Islam, M. S. Rahman and OFRD scientist of respective site.
Season	:	Robi
Date of initiation	:	October, 2023
Date of completion	:	April, 2024
Expected output	:	A vermicompost based nutrient management package will be finalized for quality onion seed production at farmer level.
Location	:	Faridpur
Status	:	New
Estimated cost	:	40,000
Source of fund	:	BARI
Priority	:	1 st

Tuber Crop Research Center

Expt. 186 Adaptive Trial with Latest Potato Varieties

Objectives	:	To popularize the latest potato varieties. To collect the feedback of the released varieties.
Rationale	:	Introduction and release of new potato varieties through several different trials is a routine program of TCRC. In true sense, end users are the decision maker for the fate of a new variety. So, this study was undertaken with a view to promote and to explore the farmer's response regarding the new ones.
Material and methods	:	Around 10 latest potato varieties will be included. Two farmers each district. Each farmer will receive 20 kg tubers of each variety for each farmer (two farmers of each district). Field day may be arranged. Farmers will be selected by the help of OFRD/DAE/RARS/ARS/TCRC stations. Preference will be given to those farmers who were successful last year in producing potato. The plot size will be 50 m x 20 m (adjustable). The spacing will be 60 x 25 cm. Manure and fertilizers: as recommended as FRG of STB.
Crop/Variety	:	Potato
Design:	:	Not applicable
i) Treatment	:	Selected varieties.
ii) Replications	:	Not applicable No replications
Plot size	:	50 m x 20 m (1000 sq. m) or 40 x 24 (1000 sq. m)Note: Area is not fixed.
Planting system/spacing	:	Row planting/60cm x 25 cm
Fertilizer dose and Method of application	:	Fertilizers will be applied @ 325-220-250-120 kg/ha of urea, TSP, MOP and gypsum, respectively
Irrigated /rainfed	:	Irrigated
Data to be recorded	:	Recording the date of planting, harvesting, fungicide & insecticide spraying and number of intercultural operation. Collection data on(i)Emergence % at 30 DAP, (ii)No of stem/hill at 45 DAP, (iii) Plant height (cm) at 50 DAP, (average of 10 hill), (iv) disease and insect reaction, and(v) tuber yields (t/ha) and (vi) Farmer's opinion for all the tested varieties.
Investigator (s)	:	A.T.M.T. Islam, M.A. Kawochar, S. Naznin, T. Jahanand S. Akhter and all other scientists of TCRC, concerned OFRD/BARI scientist of the respective area and DAE personnel.
Season	:	Rabi 2023-2024
Date of initiation	:	October 2023
Date of completion	:	July 2024
Expected Output/benefit	:	Locally adapted varieties will be identified by the farmers.
Location	:	Haor areas –RARS, Akbarpur, Moulavibazar – <i>Moulavibazar, Habiganj</i> ; OFRD, Sylhet – <i>Sunamganj</i> ; OFRD, Manikganj – <i>Manikgonj</i> ; (04 districts) Hilly areas – HARS, Khagrachari and HARS, Ramgor, Khagrachari - <i>Khagrachari</i> , HARS, Raykhali, Rangamati – <i>Rangamati</i> ; and OFRD, Bandarban – <i>Bandarban</i> (03 districts)

Favourable land areas – TCRC, Gazipur – *Gazipur*; TCRSC, Munshiganj – *Munshiganj*; BSPC, Debigabj – *Panchagarh*; TCRSC, Bogura – *Bogura*; RARS, Jamalpur – *Jamalpur*; RARS, Jashore – *Jashore*; OFRD, Gopalganj – *Gopalganj*; ARS, Dinajpur (own transport) – *Dinajpur*; OFRD, Tangail – *Tangail*; OFRD, Rangpur -*Rangpur* – (10 districts)
two trials in each of the above districts

Status : On-going
Estimated cost : Tk. 2,00,000/- per trial (02 trials per district)
Source of fund : TCRC, BARI, Gazipur and PARTNER project
Priority : 1st

Expt. 187 Selection and Dissemination of Area Specific Promising Varieties with Replacement of BARI Alu-7 (Diamant)

Objectives : To popularize the newly released high yielding potato varieties with the replacement of old variety BARI Alu-7(Diamant)
To collect the feedback of the newly released varieties.
Rationale : To increase the production as well as income of the potato growers.
Introduction new potato varieties with the replacement of BARI Alu-7 (Diamant) will be possible through several different demonstration trials in farmers' field at different locations. In true sense, end users are the decision maker for the fate of a new variety. So, this study was undertaken with a view to promote and to explore the farmer's response regarding the new ones.
Material and methods : BARI Alu-37, BARI Alu-47, BARI Alu-57, BARI Alu-62, BARI Alu-73, BARI Alu-80, BARI Alu-85, BARI Alu-87, BARI Alu-103 with check BARI Alu-7(Diamant); Ten (10) varieties.

Each farmer will receive 10 kg tubers of each variety. Three farmers will be selected by the help of OFRD/DAE. Preference will be given to those farmers who were successful last year in producing potato. Field day may be arranged.

The plot size will be 50m × 40m (Adjustable). The spacing will be 60cm × 25cm. Manure, fertilizers, insect, disease control and other intercultural operations will be applied as TCRC recommendation.

Crop/Variety : Potato
Design : Not applicable
i) Treatment : Selected varieties.
ii) Replications : Not applicable
Plot size : 40m × 25m
Planting system/spacing : Row planting: 60cm × 25 cm
Fertilizer dose and methods application : Fertilizers will be applied @ 325-220-250-120 kg/ha of urea, TSP, MOP and gypsum, respectively
Irrigated/rainfed : Irrigated
Data to be recorded : Recording the date of planting, harvesting, fungicide & insecticide spraying and number of intercultural operation.

Collection data on (i) Emergence % at 30 DAP, (ii) No of stem/hill at 45 DAP, (iii) Plant height (cm) at 50 DAP, (average of 10 hill), (iv)

disease and insect reaction, and (v) tuber yields (t/ha) and (vi) **Farmer's opinion on the view regarding BARI Alu-7(Diamant) for all the tested varieties.**

Investigator(s)	: S. Naznin, A.T.M.T. Islam, M.A. Kawochar, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Sultana, M.T. Rahman, M. Selim, M.K. Alam, S. Sultana, M.R. Amin, M.S. Rahman, M.M Kadir, and S. Akhter
Season	: Rabi 2023-24
Date of initiation	: October 2023
Date of completion	: July 2024
Expected output	: Potential high yielding latest potato varieties will be identified by which target to replace BARI Alu-7(Diamant).
Location	: TCRC, Gazipur – <i>Gazipur</i> ; BSPC, Debigabj – <i>Panchagarh</i> ; TCRSC, Munshiganj – <i>Munshiganj (03 districts)</i>
Status	: New
Estimated cost	: Tk. 2,00,000/- per location
Source of fund	: PARTNER project
Priority	: 1 st

Expt. 188 Selection and Dissemination of Late Blight Resistant Variety from Existing Mega Varieties

Objective	: To select promising late blight resistant potato variety(s) from existing late blight resistant varieties
Rationale	: The opinion of farmers is required for selecting promising late blight resistant varieties. The demonstration trials will therefore be conducted on a farmers' field under their close supervision.
Material and methods	: Five late blight resistant potato varieties (BARI Alu-46, BARI Alu-53, BARI Alu-77 (Sarpomira), BARI Alu-90 (Alouette) and BARI Alu-91 (Carolus) with checks BARI Alu-7 (Diamant) and BARI Alu-25 (Asterix). 10kg seeds per variety for each farmer, 3 farmers per location. Field day may be arranged. Planting will be done on 15-20 November. Fungicide will not be sprayed for late blight diseases
Crop/Variety	: Potato
Design:	: Not Applicable
i) Treatment	: Selected varieties
ii) Replications	: No replication
Plot size	: 40m × 25m (adjustable)
Planting system/spacing	: Spacing 60cm × 25 cm
Fertilizer dose and Method of application	: As per recommendation
Irrigated/rainfed	: Irrigated
Data to be recorded	: Recording the date of planting, harvesting, fungicide & insecticide spraying and number of intercultural operation.

Collection data on (i) Emergence % at 30 DAP, (ii) No of stem/hill at 45 DAP, (iii) Plant height (cm) at 50 DAP, (average of 10 hill), (iv) **AUDPC value for late blight (note: please co-operate), disease and insect reaction**, and (v) tuber yields (t/ha) and (vi) Farmer's opinion for all the tested varieties.

Investigators	: S. Naznin, A.T.M.T. Islam, M.A. Kawochar, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Sultana, M.T. Rahman, A.K. Saha, M.S. Rahman, M.M Kadir, M. M. Begum, and S. Akhter
Season	: Rabi 2023-24
Date of initiation	: 3rd week of November 2023
Date of completion	: 1 st week of March 2024
Expected output/benefit	: Sort out suitable LBR potato variety.
Location	: TCRC, Gazipur – <i>Gazipur</i> ; BSPC, Debigabj – <i>Panchagarh</i> ; TCRSC, Bogura – <i>Bogura</i> ; RARS, Rangpur - <i>Rangpur</i> , RARS, Jamalpur– <i>Jamalpur (05 districts)</i>
Status	: New
Estimated cost	: Tk. 2,00,000/- per location
Source of fund	: PARTNER project
Priority	: 1 st

Expt. 189 Selection and Dissemination of Potato Varieties with Processing Attributes from Existing Mega Varieties

Objective	: To select promising potato varieties with processing attributes
Rationale	: The opinion of stakeholders is required for selecting promising processing varieties. The demonstration trials will therefore be conducted on a farmers' field under their close supervision of the concern scientist.
Material and methods	: Promising processing potato varieties viz. BARI Alu-43 (Atlas), BARI Alu-68 (Atlantic), BARI Alu-70 (Destiny), BARI Alu-71 (Dolly), BARI Alu-76 (Caruso), BARI Alu-87, BARI Alu-88, BARI Alu-97 (Alverston Russet) and BARI Alu-103 with checks BARI Alu-28 (Lady Rosetta) and BARI Alu-29 (Courage)–11 varieties. 10kg seeds per variety for each farmer, 3 farmers per location. During harvest concern stakeholders may participate. Field day may be arranged. Planting will be done on 15-20 November. Fertilizer and chemical costs will be borne by TCRC.
Crop/Variety	: Potato
Design:	: Not Applicable
Treatment	: Selected varieties
Replications	: No replication
Plot size	: 40m × 25m
Planting system/spacing	: Spacing 60cm × 25 cm
Fertilizer dose and Method of application	: As per recommendation
Irrigated/rainfed	: Irrigated
Data to be recorded	: Recording the date of planting, harvesting, fungicide & insecticide spraying and number of intercultural operation.

Collection data on (i) Emergence % at 30 DAP, (ii) No of stem/hill at 45 DAP, (iii) Plant height (cm) at 50 DAP, (average of 10 hill), (iv) disease and insect reaction, and (v) **Large size (>40mm to 65mm diameter) tuber grade %** and tuber yields (t/ha) and (vi) Farmer's opinion for all the tested varieties.

Measuring reducing sugar

Investigators	: Making chips and French fry and organoleptic test M.A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, M. Rahman, M.A. Halim, M.S. Hossain, M. Sultana, M.T. Rahman, M. Selim, M.K. Alam, M.S. Rahman, M.M Kadir, M.B. Anowar and S. Akhter
Season	: Rabi 2023-24
Date of initiation	: 3rd week of November 2023
Date of completion	: 1 st week of March 2024
Expected output/benefit	: Sort out suitable potato variety(s) with processing attributes.
Location	: TCRC, Gazipur – <i>Gazipur (01 districts)</i>
Status	: New
Estimated cost	: Tk. 2,00,000/- per location
Source of fund	: PARTNER project
Priority	: 1 st

Expt. 190 Selection and Dissemination of Drought Resistant Potato Varieties for Char Land Areas from Existing Mega Varieties

Objective	: To select promising drought resistant potato varieties
Rationale	: The opinion of farmers is required for selecting promising drought resistant. The demonstration trials will therefore be conducted on a farmers' field under their close supervision.
Material and methods	: Few promising potato varieties BARI Alu-62, BARI Alu-72, BARI Alu-73, BARI Alu-78, BARI Alu-79 and BARI Alu-86 with checks BARI Alu-7 (Diamant), BARI Alu-13(Granola) and BARI Alu-25 (Asterix) – 10 varieties. 20kg of seeds per variety for each farmer, 3 farmers per location, Planting will be done on 15-20 November. Field day may be arranged. Fertilizer and chemical costs will be borne by TCRC.
Crop/Variety	: Potato
Design:	: Not Applicable
Treatments	: Selected varieties
Replications	: No replication
Plot size	: 40m × 25m
Planting system/spacing	: Spacing 60cm × 25 cm
Fertilizer dose and Method of application	: As per recommendation
Irrigated/rainfed	: Irrigated
Data to be recorded	: Recording the date of planting, harvesting, fungicide & insecticide spraying and number of intercultural operation. Collection data on (i) Emergence % at 30 DAP, (ii) No of stem/hill at 45 DAP, (iii) Plant height (cm) at 50 DAP, (average of 10 hill), (iv) disease and insect reaction, and (v) Large size (>40mm to 65mm diameter) tuber grade % and tuber yields (t/ha) and (vi) Farmer's opinion for all the tested varieties.
Investigators	: T.M.T. Islam, A M.A. Kawochar, S. Naznin, T. Jahan, M. A. H. Talukder, Abdullah-al-Mahmud, G.N.Hasan, M.R. Amin, M.J.Uddin, M.S.Rahman and S. Akhter
Season	: Rabi 2023-24
Date of initiation	: 3rd week of November 2023
Date of completion	: 1 st week of March 2024

Expected output/benefit	: Sort out suitable drought resistant potato variety(s)
Location	: OFRD, Rangpur – <i>Kurigram</i> ; OFRD, Gibandha - <i>Gibandha</i> , OFRD, Manikgonj – <i>Manikganj</i> ; OFRD, Cumilla – <i>B. Baria</i> ; OFRD, Shampur, Rajshahi - <i>Rajshahi(04 districts)</i> –for Char land areas
Status	: New
Estimated cost	: Tk. 2,00,000/- per location
Source of fund	: PARTNER project
Priority	: 1 st

Expt. 191 Selection and Dissemination of Heat and Salt Tolerant Potato Varieties from Existing Mega Varieties

Objectives	: To select heat and salt tolerant potato varieties for specific region. To collect the feedback of the selected varieties. To increase the production as well as income of the growers.
Rationale	: The opinion of farmers is required for selecting promising heat and salt tolerant potato varieties. The demonstration trials will therefore be conducted on a farmers' field under their close supervision.
Material and methods	: Heat and Salt tolerant potato varieties: BARI Alu-72, BARI Alu-73 and BARI Alu-78 with check BARI Alu-7(Diamant and BARI Alu-25(Asterix). Each farmer will receive 20kg tubers of each variety. 3 farmers for each location. Farmers will be selected by the help of OFRD/DAE. Preference will be given to those farmers who were successful last year in producing potato. The plot size will be 50m×40m (Adjustable). The spacing will be 60cm×25cm. Manure, fertilizers, insect, disease control and other intercultural operations will be applied as TCRC recommendation.
Crop/Variety	: Potato
Design	: Not applicable
Treatment	: Selected varieties.
Replications	: Not applicable
Plot size	: 40m × 25m
Planting system/spacing	: Row planting: 60cm × 25cm
Fertilizer dose and methods application	: Fertilizers will be applied @ 325-220-250-120 kg/ha of urea, TSP, MOP and gypsum, respectively
Irrigated/rainfed	: Irrigated
Data to be recorded	: Recording the date of planting, harvesting, fungicide & insecticide spraying and number of intercultural operation. Collection data on (i) Emergence % at 30 DAP, (ii) No of stem/hill at 45 DAP, (iii) Plant height (cm) at 50 DAP, (average of 10 hill), (iv) disease and insect reaction, and (v) Non-marketable tuber yield (take note about the cause) and marketable tuber yields (t/ha) and (vi) Scientist and Farmer's opinion for all the tested varieties.
Investigator(s)	: M.A. Kawochar, A.T.M.T. Islam, S. Naznin, T. Jahan, B.C. Kundu, M.S.I. Khan, M. Ahmed, M.H. Rashid, M.S. Islam, M.S. Rahman, S. Mondal and S. Akhter.
Season	: Rabi 2023-24

Date of initiation	: Mid-December, 2023 (heat stress)
Date of completion	: Mid-March 2024 (heat stress)
Expected output	: Locally adapted varieties will be identified by the farmers
Location	: RARS, Rahmatpur, Barishal - <i>Barishal</i> , OFRD, Patuakhali - <i>Patuakhali</i> ; OFRD, Cox's Bazar - <i>Cox's Bazar</i> ; OFRD, Khulna - <i>Khulna</i> ; OFRD, Shyampur, Rajshahi - <i>Rajshahi</i> ; ARS, Benerpota, Satkhira - <i>Satkhira</i> (06 districts)
Status	: New
Estimated cost	: Tk. 2,00,000/- per location
Source of fund	: TCRC BARI and PARTNER project
Priority	: 1 st

Expt. 192 Adaptive trials with sweet potato varieties

Objective	: To popularize the newly released improved sweet potato varieties. To collect feedback of the newly released varieties.
Rationale	: Introduction and release of new sweet potato varieties through several different trials is a routine PROGRAMME of TCRC. In true sense, end users are the decision maker for the fate of a new variety. So, this study was undertaken with a view to promote and to explore the farmer's response regarding the new ones.
Material and methods	: BARI Mistialu-12, BARI Mistialu-14, BARI Mistialu-15, BARI Mistialu-16 and BARI Mistialu-17
Crop/Variety	: Sweet Potato
Design	: -
Treatment	: BARI Mistialu-12, BARI Mistialu-14, BARI Mistialu-15, BARI Mistialu-16 and BARI Mistialu-17
Replication	: -
Plot size	: 6 m × 3 m
Planting system/spacing	: 60 cm × 30 cm
Fertilizer dose and Method of application	: The crop will be fertilized with a dose of 260-150-250-75-12-10 kg/ha of Urea-TSP-MOP-Gypsum-Zinc Sulphate-Boric acid, respectively and 10 t/ha of cow dung. Half of Urea and MOP and full dose of TSP, Gypsum, Zinc sulphate, Boric acid and cow dung will be applied in plot during the final land preparation. Rest of Urea and MOP will be top dressed at 30-40 days after planting (DAP) followed by earthing up and irrigation.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Farmer's name, Father's name, Address with Mobile Number, Date of planting, Plant establishment (%) at 30 DAP, disease and insect data. Date of Harvesting, Tuber No. & wt./plant/plot, Tuber yields (t/ha), Farmer's opinion for all the tested varieties.
Investigator(s)	: M. A. H. Khan, M. S. Alam, Z. Alam (Gazipur), M. Z. H. Prodhon (Bogura), M. S. Islam (Bogura), A. A. Mahmud (Gaibandha), M. M. Rahman, M. M. Quader (Jamalpur), M. S. Rahman (Sherpur), M. Mohiuddin (Kishoreganj), M.I. Nazrul (Sylhet), M.R. Islam, M.R. Uddin (Barishal), concerned Scientists of the other stations of BARI, M.A.H.S. Jahan, M. M. Islam, M. M. H. Molla and S. Akhter
Season	: Rabi 2023-24
Date of initiation	: October 2023
Date of completion	: April, 2024
Expected output/benefit	: Locally adapted varieties will be identified by the farmers.

Locations	: Gazipur, Bogura, Gaibandha, Jamalpur, Sherpur, Kishoreganj, Sylhet and Barishal
Status	: 2 nd year
Estimated cost	: Tk. 80,000/-
Source of fund	: BARI
Priority	: 1 st

Expt. 193 Demonstration of BARI Released Varieties of Panikachu

Objective	: To study the performance of the improved varieties of Panikachu at farmers' level. To know the farmer's choice among the varieties
Rationale	: There are six released improved varieties of Panikachu but only BARI Panikachu 1 (Latiraj) has become popular to the farmers. Some local cultivars are being also cultivated by the farmers. The newly released varieties are not well known to them. So, it is necessary to disseminate these varieties through demonstration.
Materials and Methods	: Farmers will be selected by the OFRD personnel of the respective areas. The suckers of the newly released Panikachu varieties will be supplied to the selected farmers Farmer(s) will be selected by the OFRD/TCRC personnel of the respective areas. The suckers of the Panikachu varieties will be supplied to the selected farmers.
Crops/variety	: Panikachu
Design	: Non replicated
Treatment	: Set I : Stolon producing Panikachu : BARI Panikachu 1 (Latiraj) and BARI Panikachu 2 Set II : Rhizome producing Panikachu BARI Panikachu 3, BARI Panikachu 4, BARI Panikachu 5 and BARI Panikachu 6
Replication	N/A
Plot Size	: The plot size will be (\pm) 12 m \times 18 m for each variety (20 lines, 40 plants/line = 800 seedlings per variety; around 5.33 decimal/variety)
Planting system/spacing	: The plant spacing will be 60 \times 45 cm.
Fertilizer dose and methods of application	: The crop will be fertilized with a dose of 350-175-300-125-14-10 kg/ha of Urea-TSP-MOP- Gypsum- Zinc sulphate- Boric acid, respectively and 15 t/ha of cowdung. Half of MOP and full dose of TSP, Gypsum, Zinc sulphate, Boric acid and cowdung will be applied in plot during the final land preparation. One fifth of Urea was top dressed started from 20-25 days after planting (DAP) and other 4 installments will be applied at an interval of 25-30 days after that 1sttop dressed. Rest of MOP will be topdressed at 50-60 DAPS with the second top dressed of Urea.
Irrigated/rainfed	: N/A
Data to be recorded	: (i) Name, Father's name and address of farmer(s) with mobile number (ii) Date of planting (iii) Harvesting period of stolon (date of First and Last harvest), (iv) No. and wt. of stolon/plant (v) Yield of stolon and marketable rhizome (t/ha), (vi) Disease and insect pest reaction and (vi) Farmers' comments on acceptability.
Investigator(s)	: M.S. Alam, F. Begum, M. Asaduzzaman (Narsingdi-2), M.S. Alam (Bogura-2), A.A. Mahmud (Gaibandha-3), M.S. Rahman (Sherpur-

	2), M. Mohiuddin (Kishoregong-1), M.I. Nazrul (Sylhet-2), M.M. Kamruzzaman (Gopalganj-1), M.A.H. Khan (Tangail-2), M. Moniruzzaman (Mymensingh-4), M.J.Uddin (Cumilla-1), Jahan Al Mamud (Kushtia-1&Meherpur-1), M.A. Hossain (Khagrachari-1), M. Ahamed (Cox's Bazar-1) concerned Scientists of the other stations of BARI M.M.H. Molla, M.M. Islam and S. Akhter
Season	: Rabi to Kharif
Date of initiation	: December, 2023 to January, 2024
Date of completion	: September 2024
Expected output/benefit	: Improved Panikachu variety(s) will be identified by the farmers.
Locations	: Narsingdi, Bogura, Gaibandha, Sherpur, Kishoregong, Sylhet, Gopalganj, Tangail, Mymensingh, Kushtia, Meherpur, Khagrachari, Cox's Bazar and Cumilla
Status	: 1st year (New)
Estimated cost	: Tk. 5,00,000/- (20,000/- for each trial, No. 25)
Source of fund	: Kachuphasoler ... Kormosuchi, TCRC, BARI
Program proposed from	: TCRC, BARI, Gazipur
Priority	: 1st

Expt. 194 Demonstration of BARI Released Varieties of Mukhikachu

Objective	: To study the performance of the improved varieties of Mukhikachu at farmers' level.
Rationale	: There are two released improved varieties of Mukhikachu but only BARI Mukhikachu1 (Bilashi) has become popular to the farmers. Some local varieties are being also cultivated by the farmers. The newly released variety is not well known to them. So, it is necessary to disseminate these varieties through demonstration.
Materials and Methods	: Farmers will be selected by the OFRD/TCRC scientists of the respective areas. The cormels of the newly released Mukhikachu varieties will be supplied to the selected farmers.
Crops/variety	: Mukhikachu
Design	: Non replicated
Treatment	: Bilasi and BARI Mukhikachu 2
Replication	: N/A
Plot Size	: The plot size will be 12 m × 12 m
Planting system/spacing	: The plant spacing will be 60 × 45 cm
Fertilizer dose and methods of application	: The crop will be fertilized with a dose of 275-150-225-125-14-10 kg/ha of Urea-TSP-MOP-Gypsum-Zinc sulphate-Boric acid, respectively and 15 t/ha of cowdung. Half of MOP and full dose of TSP, Gypsum, Zinc sulphate, Boric acid and cowdung will be applied in plot during the final land preparation. Rest of MOP and half of urea will be top dressed at 35-45 days after planting (DAP) and the rest half of urea will be applied at 80-90 DAP followed by earthing up and irrigation.
Irrigated/rainfed	: N/A
Data to be recorded	: Name, Father's name and address of farmers with mobile number (ii) Date of planting (iii) Date of harvesting, (iv) No. and wt. of corm and cormel/plant (v) Yield of corm+cormel (t/ha), (vi) Disease and insect pest reaction and (vi) Farmers' comments on acceptability.

Investigator(s)	: M.S. Alam, F. Begum, M. Asaduzzaman (Narsingdi-1), A.A. Mahmud (Gaibandha-1), M.S. Rahman (Sherpur-1), Jahan Al Mamud (Kushtia&Meherpur-2), M.A.H. Khan (Tangail-1), M. Moniruzzaman (Mymensingh-1), M.S.Rhaman (Rajshahi-1), S.M. Faisal (Ramghar-1), M. J. Uddin (Cumilla-1) concerned Scientists of the other stations of BARI , M.M.H. Molla, M.M. Islam and S. Akhter
Season	: Rabi to Kharif
Date of initiation	: February, 2024
Date of completion	: October, 2024
Expected output/benefit	: Improved Mukhiikachu variety(s) will be identified by the farmers.
Locations	: Narsingdi, Gaibanda, Sherpur, Kushtia, Meherpur, Tangail, Mymensingh, Ramgarh, Cumilla and Rajshahi
Status	: 1st year (New)
Estimated cost	: Tk. 2,00,000/- (20,000/- for each location, No. 10)
Source of fund	: Kachuphasoler ... Kormosuchi, TCRC, BARI
Program proposed from	: TCRC, BARI, Gazipur
Priority	: 1st

Expt. 195 Demonstration of BARI released varieties of Olkachu

Objective	: To study the performance of the improved varieties of Olkachu at farmers' level.
Rationale	: There are two released improved varieties of Olkachu (Elefant foot yam) but only BARI Olkachu-1 has become popular to the farmers. Some local varieties are being also cultivated by the farmers. The newly released variety is not well known to them. So, it is necessary to disseminate these varieties through demonstration.
Materials and Methods	: Farmer(s) will be selected by the OFRD/TCRC scientists of the respective areas. The corms of the released Olkachu varieties will be supplied to the selected farmers.
Crops/variety	: BARI Olkachu 1 and BARI Olkachu 2
Design	: Non replicated
Treatment	: N/A
Replication	: N/A
Plot Size	: The plot size will be 9 m × 9 m
Planting system/spacing	: The plant spacing will be 60 × 60 cm
Fertilizer dose and methods of application	: The crop will be fertilized with a dose of 275-150-225-125-14-10 kg/ha of Urea-TSP-MOP-Gypsum-Zinc sulphate-Boric acid, respectively and 15 t/ha of cowdung. Half of MOP and full dose of TSP, Gypsum, Zinc sulphate, Boric acid and cowdung will be applied in plot during the final land preparation. Rest of MOP and half of urea will be top dressed at 35-45 days after planting (DAP) and the rest half of urea will be applied at 80-90 DAP followed by earthing up and irrigation.
Irrigated/rainfed	: N/A
Data to be recorded	: Name, Father's name and address of farmers with mobile number (ii) Date of planting (iii) Date of harvesting, (iv) No. and wt. of corm and cormel/plant (v) Yield of corm+cormel (t/ha), (vi)

	Disease and insect pest reaction and (vi) Farmers' comments on acceptability.
Investigators	: M.S. Alam, F. Begum, M. Mohiuddin (Kishoregong-1), M.M.H. Molla, M.M. Islam and S. Akhter
Season	: Rabi to Kharif
Date of initiation	: March-April, 2024
Date of completion	: December, 2024
Expected output/benefit	: Improved Olkachu variety(s) will be identified by the farmers.
Locations	: Kishoregonj
Status	: New
Estimated cost	: Tk. 20,000/-
Source of fund	: Kachuphasoler ... Kormosuchi, TCRC, BARI
Program proposed from	: TCRC, BARI, Gazipur
Priority	: 1st

Agronomy Division

Expt. 196 Performance of bushbean with sorghum as intercrop in farmer's field

Objective(s)	: To validate the developed technology of intercropping bushbean with sorghum for higher productivity and monetary advantage in farmers' field
Rationale	: Intercropping is a traditional practice in Bangladesh and it increases total productivity per unit area through maximum utilization of land, labour and growth resources (Ahmed <i>et al.</i> 2013; Islam <i>et al.</i> 2006; Mahfuza <i>et al.</i> 2012). By judicious choice of compatible crops and adopting appropriate planting geometry, inter/intra specific competition may be minimized resulting higher total productivity (Alomet <i>et al.</i> 2013). Canopy architecture of tall stature crop regulates the availability of light on under storied crop (Faruque <i>et al.</i> 2006). Sorghum (<i>Sorghum bicolor</i> L. Moench) is the fifth important crop among the cereals in the world following rice, wheat, maize, and barley in total area planted and production (I. C. Onwuemeet <i>al.</i> , 1993). Sorghum is a un branched and erect cereal crops with wide spacing. Sorghum grain is as nutritious as other cereal grains; contain about 11% water. 340 k/cal of energy, 11.6% protein, 73% carbohydrate and 3% fat by weight (Thimmaiah, 2002, Taylor <i>et al.</i> , 2006 and Yan <i>et al.</i> , 2012). Sorghum is used as food, feed, fodder and fuel. Recently it is getting the special importance by the government of Bangladesh due to huge demand in medicine industry and low water required for cultivation. On the other hand, Bush bean (<i>Phaseolus vulgaris</i> . L) is an important high yielding legume crop and can be used as vegetable and soup. It plays an important role in nutrition. Bush bean contains vitamin A (23%), vitamin C (27%), vitamin K (12%) carbohydrates (5.5%), and protein (3%) (Davis, J.H.Cet. <i>al.</i> 1993). Suitable intercrops, local food habit and market demands as important factor for getting higher benefit. But literature is meager regarding sorghum + bush bean intercropping under different planting systems in Bangladesh condition. By adopting appropriate planting geometry in the intercropping system, the total productivity of the crops can be enhanced (Umrani <i>et al.</i> , 1984). So, this experiment will be conducted to find out suitable planting

systems of sorghum and bush bean intercropping for higher productivity, economic return and national nutritional food security.

Materials and methods : Are as below:

Crop/variety : Sorghum: BARI Sorghum-1, Bush bean: BARI Jharsheem-1

Design : RCBD

i) Treatment : T₁= Sorghum normal row (100%) + 2 row bush bean in between two rows of sorghum (87.5%).
T₂= Sorghum paired row (100%) + 3 row bush bean in between two paired rows of sorghum (56.25%).
T₃= Sole sorghum (60 cm × 20 cm)
T₄= Sole bush bean (30 cm × 5 cm)

ii) Replications : 3

Plot size : 1 bigha

Planting system /spacing : Sorghum normal row: 60cm × 25cm
Sorghum paired row: 30/120/30cm × 25cm

Fertilizer dose and methods of application : **Sole sorghum:** 120-48-75-30-3-1 kg/ha N-P-K-S-Zn-B.
Sole bush bean: 88- 35-53-11-2.2-1.5 kg/ha N-P-K-S-Zn-B.
Intercrop: 120-48-75-30-3-1 kg/ha N-P-K-S-Zn-B + 30 kg /ha (extra).
Sole sorghum: 1/3 N and all other fertilizers as basal. Rest N will be applied at 25 & 45 DAS.
Sole bush bean: All fertilizer and 1/3 N will be applied as basal at the time of final land preparation. Remaining N should be applied as side dress at 20 and 35 DAS under moist soil condition and mixed thoroughly with the soil as soon as possible for better utilization.
Intercrop: 1/3 N and all other fertilizers as basal. Rest N will be applied at 25 & 45 DAS. Additional N (30kg/ha) will be applied in 2 split at 20 and 35 DAS as side dressing to Bush bean.

Irrigated/rainfed : Irrigated

Data to be recorded : Light interception, Yield and yield components, equivalent yield, Land equivalent ratio (LER), competitive ratio (CR), monetary advantage index (MAI), Replacement value of intercropping (RVI), relative crowding coefficient (RCC), Aggressively (A) and economic analysis

Investigator(s) : M. Z. Ali, A. A. Begum, J. A. Chowdhury and M.A.H.S.Jahan

Season : *Rabi*

Date of initiation : November 2023

Date of completion : May 2024

Expected output : Improved productivity and nutritional security

Status : New

Estimated cost : Tk. 40,000/-

Source of fund : BARI

Priority : 1st

Expt. 197 Performance of agronomic management practices of chia in farmer's field

Objective	: To validate the developed technology of chia for higher productivity and monetary advantage in farmers' field
Rationale	: Chia seed is composed of protein (15% -25%), fats (30%-33%), carbohydrates (26%-41%), high dietary fiber (18%-30%), ash (4%-5%), minerals, vitamins, dry matter (90%-93%) and also contains a high amount of antioxidants (Ixtaina <i>et al.</i> , 2008). Another key characteristic of chia seed it does not contain gluten (Bueno <i>et al.</i> , 2010). In Bangladesh, chia is a new crop, but the economic value of chia in international market and even in Bangladesh market is very high. The use of medicinal food from folk medicine to prevent diseases such as diabetes, obesity and cardiovascular problems is now gaining momentum in the globe. Recently, chia seed has become important for human health and nutrition because its high content of ω -3 fatty acid that promotes beneficial health effects (Vuksan <i>et al.</i> , 2010). Normally our farmers practicing different management practices without any scientific knowledge. For this they did not get appropriate yield and become looser economically. Unjudicious use of chemicals also resulting in environmental hazards. This ultimately causes serious health hazards as well as economic losses. Therefore, the present study will be conducted to determine the appropriate management package for chia cultivation in different region as well as to reduce cultivation cost as well as increase farmers' income.
Materials and Crop/variety	: Are as follows Chia: BARI Chia-1
Design	: RCB
i) Treatments	: T ₁ = Recommended package (RP) {Timely sowing (10-15 November sowing)+ seed rate(5 kg/ha) Fertilizer(60-40-50-8 kg/ha of NPKS) + Irrigation (vegetative stage+ flowering+ maturity stage)}
ii) Replications	: 3 (Dispersed)
Plot size	: 1 Bigha
Planting system /spacing	: Line sowing: 30 cm x continuous seeding
Fertilizer dose and methods of application	: 60-40-50-60-8 kg/ha of NPKS, respectively. Half N and all other fertilizers will be applied during final land preparation. Rest half N will be applied at 25-30 DAS
Irrigated/rainfed	: Irrigated
Data to be recorded	: Grain yield (t/ha)
Investigator(s)	: S.S. Kakon, J.A. Chowdhury and M.A.H.S. Jahan
Season	: <i>Rabi</i>
Date of initiation	: November, 2023
Date of completion	: April, 2024
Expt output/benefit	: Increased productivity of chia growing areas
Status	: New
Source of fund	: BARI
Estimated cost	: Tk. 40,000/-
Priority	: 1 st

Expt. 198 On farm validation of Maize -legume strip cropping

- Objective : To validate the developed technology of Maize -legume strip cropping for resource conservation, higher productivity and monetary advantage in farmers' field
- Rationale : Strip intercropping is de-fined as the production of two or more crops within the same field in strips wide enough that each can be managed independently by existing machinery; yet narrow enough that the strip components can interact. Strip cropping is expected to enhance the resilience of the production system, to reduce the risk of income loss during inclement weather (such as long dry spell, heavy rainfall, typhoon, etc.), to increase the biodiversity and to diversify the family's nutrition and food security.Strip cropping is like any other intercropping strategy based on the management of plant interactions to maximize growth and productivity caused by efficient use of plant growth resources such as light, water and nutrients (Hauggaardet *al.*, 2009).Strip cropping help to maintain or improve the status of organic content in the soil, thereby enriching the soil fertility and enabling to develop more stable aggregates in the soil, increase in soil nitrogen, resulting from nitrogen fixation, associated to the legume crops. Again, Large uniform areas of one crop make the agricultural system more vulnerable only one pest insect and fungus need to 'land' and the whole field will be infested unless measures are rapidly taken. This is caused by the fact that natural enemies find it difficult to survive on such a large field: there is too little (alternative) food and there is no shelter.More diversity in a field offers beneficial organism's sufficient food and shelter throughout the year. And this in turn makes life difficult for harmful organisms, resulting these findings it difficult to cause damageto the crops.Strip cultivation can increase the biodiversity in the field. Therefore, this experiment will be conducted to find out suitable strip croppingcombination for resource conservation, higher productivity and monetary advantage in farmers' field
- Materials and methods : Are as bellows
- Crop/variety : **Maize:** BARI Hybrid Bhutta-9
Garden Pea: BARI Motorsuti-3
- Design : RCB
- Treatment : T₁= Maize (4 row) alternate with Garden Pea(8 row).
T₂= Sole Maize (8 row)
- Replications : 3
- Plot size : 9.6m × 7.0m
- Planting system /spacing : Line sowing (Maize: 60 cm × 20 cm; Garden pea: 30cm × 5cm)
- Fertilizer dose and methods of application : **Maize:** 225-60-120-45-15-4-1.6 kg/ha N P K S Mg Zn B. One third of N and all of P, K, S, Mg, Zn and B will be applied as basal during final land preparation. Remaining N will be applied in two equal splits as side dressing at 30 and 50 DAS.
Pea: 45-24-30-12-1.4 kg/ha N P K S Zn. One third of N and all other fertilizers will be applied as basal during final land preparation. Remaining N will be side dressed in two equal splits at 20 and 35 DAS
- Irrigated/rain fed : Irrigated

Data to be recorded	: Soil analysis at initial and after cropping cycle, Crop productivity, Economic Analysis. Yield and yield component, cost benefit analysis
Investigator(s)	: J.A. Chowdhury
Season	: <i>Rabi</i>
Date of initiation	: November 2023
Date of completion	: April 2024
Expt. output	: Increased productivity and economic benefit
Status	: New
Estimated cost	: Tk. 40,000/-
Source of fund	: BARI
Priority	: 1st

Expt. 199 On farm validation of intercropping leafy vegetable with Chilli

Objective	: To validate the developed technology of intercropping leafy vegetable with Chilli for higher productivity and monetary advantage in farmers' field
Rationale	: Intercropping is a traditional practice in Bangladesh and it increases total productivity per unit area through maximum utilization of land, labour and growth resources (Crauford, 2000; Mahfuza <i>et al.</i> , 2012). By judicious choice of compatible crops and adopting appropriate planting geometry, inter/intra specific competition may be minimized resulting higher total productivity (Umrani <i>et al.</i> , 1994). Canopy architecture of tall stature crop regulates the availability of light on under storied crop (Faruque <i>et al.</i> , 2000). Leafy vegetables such as Spinach, red amaranth, raddish, mustard, coriander etc. is a short duration and short stature vegetable. On the other hand, chilli is comparatively tall and long duration crop. Chilli is one of the major spices crops in Bangladesh cultivated in 2, 49,748 acres of land (both winter and summer) with a production of 1,41,177 metric tons (BBS, 2018). It is usually grown as sole and in some cases intercrop at farmer's field in various parts of Bangladesh. Chilli is generally grown with wide row spacing of 60cm, which makes it suitable for intercropping. The developed technology "chilli + leafy vegetable" intercropping can be cultivated together as they have different growth habit and duration. In context, the present study will be conducted to verify the technology (chilli + leafy vegetable intercropping) in farmers' field for increasing productivity, economic return and for adaption chilli + leafy vegetable intercropping instead of sole chilli or sole leafy vegetable for higher productivity and economic return.
Materials and methods	: Are as belows
Crop/variety	: Chilli: BARI Morich-3, Spinach: BARI Spinach- 1, Raddish; BARI Mula-1(or any variety)
Design	: RCB
Treatment	: T ₁ = Two row Spinach (66%) in between two row of chilli (100%) T ₂ = Two row raddish (66%) in between two row of chilli (100%) T ₃ = Sole chilli (60 cm × 50 cm)
Replications	: 3
Plot size	: 1 bigha
Planting system /spacing	: Line sowing as per treatments

Fertilizer dose and methods of application	: Sole chilli& intercrop : 96-45-75-15-1.5-1.4 kg/ha NPKSZnB (based on Chilli dose). All of P, K, S, Zn and B; and half of N will be applied as basal during final land preparation. Remaining N will be applied in three equal splits at 25, 50 and 70 days after planting.
Irrigated/rain fed	: Irrigated
Data to be recorded	: Yield and yield component, cost benefit analysis
Investigator(s)	: J.A. Chowdhury
Season	: <i>Rabi</i>
Date of initiation	: November 2023
Date of completion	: February 2024
Expt. output/benefit	: Determination of suitable intercrop combination for maximum productivity and higher economic return
Status	: New
Estimated cost	: Tk.40,000/-
Source of fund	: BARI
Priority	: 1st

Plant Breeding Division

Expt. 200 Adaptive trials with BARI barley varieties and lines in Southern belt and Barind areas

Objective(s)	: To observe the performance of BARI barley varieties in dry and saline areas To disseminate and popularize BARI barley varieties to the farmers.
Rationale	: Barley is recognized as salt tolerant than other cereals. It is also a low input crop. The crop is tolerant to drought also. BARI has some high yielding varieties including a salt tolerant variety. So, the released varieties could be fitted in southern belt and also in drought areas by which farmers would be benefited to introduce this crop in their cropping pattern.
Materials and methods :	
Crop	: Barley
Design:	: RCBD
Variety	: BARI Barley-7 for Barind area, BARI Barley-8 & BARI Barley-9 for both saline and Barind area
Replications	: 3 dispersed replications
Plot size	: 10m×10m for each entry
Spacing	: Row to row distance 25 cm, continuous sowing
Fertilizer dose and methods of application	: 100:60:40 kg of NPK/ha. Total TSP, MOP and one third of urea as basal, one third of urea would be applied after seedling establishment and rest one third would be applied before heading stage.
Irrigation/rainfed	: Irrigation would be given for seedling establishment
Data to be recorded	: Days to maturity, plant height, grain yield/plot, grain yield (t/ha), salinity, lodging (%), disease, insect reaction and farmers opinion.
Investigators	: M.M. Billah, M.M. Rohman and concerned OFRD scientists of the respective stations
Season	: Rabi
Date of initiation	: 2 nd week of November 2023
Date of completion	: April 2024
Expected output	: Dissemination of BARI barley variety. APA will be achieved.
Location	: Saline areas Satkhira (2 sites), Khulna (2 sites) and Barind tract (2 sites)

Status : New
 Estimated cost : Tk 120,000/-
 Source of fund : BARI
 Priority : First

Expt. 201 Adaptive trials with BARI barley, oat, finger millet and chia varieties in Char areas

Objective(s) : To observe the performance of BARI barley varieties in dry and char areas
 To popularize and disseminate BARI barley varieties to the farmers of dry areas.

Rationale : Barley is a low input crop can be grown drought area. BARI has some high yielding varieties including drought tolerant variety. So, the released varieties could be fitted in in drought areas by which farmers in their cropping pattern.

Materials and methods : Barley: BARI Barley-7 and BARI Barley-9
 Oat: BARI Oat-1; Chia: BARI Chia-1, Fingermillet: BARI raghi-1

Crop/variety : Barley, Oat, Finger millet and Chia

Design : -
 i) Treatment : -
 ii) Replications : 2 Dispersed replications

Plot size : 10m×10m for each entry

Spacing : Row to row distance 25 cm, continuous sowing

Fertilizer dose and methods of application : 100:60:40 kg of NPK/ha. Total TSP, MOP and one third of urea as basal, one third of urea would be applied after seedling establishment and rest one third would be applied before heading stage.

Irrigation/rainfed : Irrigation would be given for seedling establishment

Data to be recorded : Days to maturity, plant height, grain yield/plot, grain yield (t/ha), salinity, lodging (%), disease, insect reaction and farmers opinion.

Investigators : M.M. Billah, S. H. Omy, A.H.Akhi, S. Begum, and concerned OFRD scientist of the respective stations

Season : Rabi

Date of initiation : 2nd week of November 2023

Date of completion : April 2024

Expected output : Dissemination of barley in char area. APA will be achieved.

Location : OFRD Bogura (2 sites, 2 sites finger millet), OFRD Tangail (2 sites), Rangpur (2 sites sites), Faridpur (2 sites), OFRD Manikganj (2 sites) and OFRD Gaibandha (5 sites: Barley 2 sites, Oat 2 sites and Chia 1 site).

Status : New
 Estimated cost : Tk 300,000/-
 Source of fund : BARI

Expt. 202 Up-scaling of BARI foxtail millet and proso millet varieties in Char and Barind areas

Objective(s) : To disseminate and popularize BARI Foxtail millet varieties to the farmers of char areas.

Rationale : Foxtail millet is considered as minor cereals of Bangladesh. It can be cultivated easily with low input in the char areas of Bangladesh. The crop is tolerant to drought. It can play partial role in fulfilling the food

crisis of our country. The farmers of char areas usually use their own local varieties. They are not familiar with BARI foxtail millet varieties. BARI released some high yielding varieties. As foxtail millet can grow well in char lands. So, the released varieties could be fitted in char area.

Materials and methods	: Three (BARI Kaon-4, BARI Kaon-2 and BARI Kaon-3 (dwarf variety).
Crop/variety	: Foxtail millet and proso millet
ii) Replications	: 2 dispersed replications
Plot size	: 100 m ² for each entry
Spacing	: Row to row distance 25 cm, continuous sowing
Fertilizer dose and methods of application	: 45: 30: 20 kg of NPK/ha. Total TSP, MOP and one third of urea as basal, one third of urea would be applied after seedling establishment and rest one third would be applied before heading stage.
Irrigated/rainfed	: Irrigation would be given for seedling establishment
Data to be recorded	: Days to maturity, plant height, grain yield/plot, grain yield (t/ha), lodging (%), disease, insect reaction and farmers opinion.
Investigators	: A.H. Akhi and M.M. Billah, and concerned OFRD scientist in respective station/RARS
Season	: Rabi
Date of initiation	: November 2022
Date of completion	: April 2023
Expected output/Benefit	: BARI foxtail millet and proso millet varieties would be disseminated to the respective areas and Farmers will be benefited. APA will be achieved.
Location	: Rangpur OFRD (2 sites), Tangail (2 sites), Bogura OFRD (2 sites), Sherpur OFRD, Barind, Rajshahi OFRD (2 sites) and OFRD Gaibandha (4 sites)
Status	: New
Estimated cost	: Tk. 240,000/-
Source of fund	: BARI
Priority	: First

Pulses Research Centre

Expt. 203 Evaluation of advanced grass pea genotypes in North and Southern region as a relay crop with two check BARI Kheseri-5 and BARI Kheseri-6

Objective(s)	: To improve the ability of lupin genotypes to adapt to subsoil constraints by selecting for proxy root traits from new and exotic germplasm sources. To identify yield performance of grass pea genotypes as a relay crop. To identify adaptability of grass pea genotypes in the selected areas.
Rationale	: The genus Lathyrus consists of more than 184 herbaceous annual and perennial species suitable for multifaceted sustainable food and feed production system in the arid and semi-arid regions of the world. The grass pea is a promising source of protein nutrition. This crop deserves a sustainable and nutritionally rich status and therefore the rediscovery of its potential as leafy vegetable and seed for nutritional security in reference to the Bangladesh and Indian perspective as relay crop due to overcome the risk next crop. The new high yielding genotypes fit for relay crop using this technology will facilitate farmers and poor people with small to marginal economies in more sustainable way and its introduction to marginal lands with low input could prove it as a highly resilient, climate-smart crop in times to come.

Materials & methods	: Around 8 advanced grass pea genotypes (IGYT-110, IGYT-122, IGYT-123, IGYT-124, IGYT-125, BGP-13009, BGP-13010, and 114585) with two local check (BARI K-5 and BARI K-6) sowing as relay crop with T aman
Variety/Genotypes	: Around 8 advanced grass pea genotypes (IGYT-110, IGYT-122, IGYT-123, IGYT-124, IGYT-125, BGP-13009, BGP-13010, and 114585) with two local check
Design	: RCB design
i) Treatment	: Around 8 advanced grass pea genotypes with two local check
ii) Replications	: two
Plot size	: 10 m ² x 4 m x 4 rows
Planting system	: Broadcasting method
Fertilizer dose and methods of application	: 20:40:20:10 NPKS kg/ha and Fertilizer would be given during final land preparation
Irrigation/Rainfed	: For ensuring germination pre sowing irrigation would be done.
Data to be recorded	: Date of germination, total plant population, Days to 1 st flowering, Days to 50% flowering, Days to maturity, Primary branches/plant, Pod/plant, Seeds/pod, 100 Seed weight, and Yield/ha.
Investigator(s)	: M.M. Rahman, SSO; M.J. Alam, SSO; M.S. Zaman, SSO; and AKMM Alam, PSO, PRSS with a concern scientist of Agronomy Division and specific regions.
Season	Rabi, 2023-24
Date of initiation	: First week of November, 2023
Date of completion	: Last week of February, 2024
Expected output	: Grass pea genotypes will be selected as a for relay crop
Location	: PRSS, Gazipur, RARS, Barisal and OFRD, Ishurdi, Pabna
Status	: 1st year
Estimated Cost	: Tk. 80,000/-
Source of fund	: PRSS, BARI, Gazipur and PRC, Ishurdi
Program Proposed	: PRSS, BARI, Gazipur
Priority	: 1st

Expt. 204 Yield and ODAP content variation of advanced grass pea genotype in saline and drought prone areas in Bangladesh.

Objective(s)	: Therefore, it may be possible to improve the ability of lupin genotypes to adapt to subsoil constraints by selecting for proxy root traits from new and exotic germplasm sources. To identify saline and drought tolerant grass pea genotypes. To identify yield and ODAP content variation of among the genotypes in selected areas.
Rationale	: The genus <i>Lathyrus</i> consists of more than 184 herbaceous annual and perennial species suitable for multifaceted sustainable food and feed production system in the arid and semi-arid regions of the world. The grass pea is a promising source of protein nutrition. However, its cause due to the presence of neurotoxin content (β -N-oxalyl-l- α , β diaminopropionic acid, β -ODAP. The high protein contents in leaves with ~90% digestibility make it sustainable super food to beat protein malnutrition in future. This crop deserves a sustainable and nutritionally rich status and therefore the rediscovery of its potential as leafy vegetable and seed for nutritional security in reference to the Bangladesh and Indian perspective. The new low ODAP content and high yielding cultivars using this technology will facilitate farmers and

poor people with saline and drought prone areas could prove it as a highly resilient, climate-smart crop in times to come.

Materials & methods	:	Around 10 advanced grass pea genotypes with a check BARI kheseri 3 will be tested using optimized methodology.
Variety/Genotypes	:	Around 10 advanced grass pea genotypes (IGYT-110, IGYT-122, IGYT-123, IGYT-124, IGYT-125, BGP-13009, BGP-13010, 116690, and 114585) with a local check BARI Kheseri-3.
Design	:	RCBD
i) Treatment	:	Around 10 advanced grass pea genotypes with a check
ii) Replications	:	3 (three)
Plot size	:	4 rows x 4 m
Planting system	:	Line sowing with line to line distance 40 cm and plant to plant distance 10 cm.
Fertilizer dose and methods of application	:	20:40:20:10 NPKS kg/ha and Fertilizer would be given during final land preparation
Irrigation/rainfed	:	For ensuring germination pre sowing irrigation would be done.
Data to be recorded	:	Date of germination, Percent germination; Days to 1 st flowering, Days to 50% flowering, Days to maturity, Primary branches/plant, Pod/plant, Seeds/pod, 100 Seed weight, ODAP content, Yield/Plot and Yield/ha
Investigator(s)	:	M.M. Rahman, SSO; M.J. Alam, SSO; M.S. Zaman, SSO; M.M. Hossen, SO; Concern scientists of specific areas and AKMM Alam, PSO
Season	:	Rabi, 2023-24
Date of initiation	:	First week of November, 2023
Date of completion	:	Last week of February, 2024
Expected output/benefit	:	Yield and ODAP content variation of grass pea genotypes will be found in selected areas.
Location	:	PRSS, Gazipur, drought (OFRD, Barind) areas and saline (Khulna/Sathkhira) areas
Status	:	1st year
Estimated Cost	:	Tk. 80,000/-
Source of fund	:	PRSS, BARI, Gazipur
Program Proposed from	:	PRSS, BARI, Gazipur
Priority	:	1 st

PROJECT IV: INTEGRATED FARMING

JUSTIFICATION

In integrated farming studies, effort is being made to package the available/proven technologies of the component sub-systems in whole farm perspectives to develop integrated farming system modules for different environment and clientele groups to improve whole farm system operation to maximize farm productivity, farmers' income and farm resource use efficiency as well as for eventual transfer of these modules to the target farmers.

*Three distinct phases of Integrated Farming Research and Development are identified. **The 1st phase** involves generation/development and validation of location/clientele specific technologies for different enterprises of each sub-system, which is being done through continuous efforts in FSRD approach for a substantially long period of time at each site. **The 2nd phase** involves the development of Integrated System Modules through integration of technologies developed/ validated in 1st phase with the available farm resources in the context of farmers' needs and priorities. **The 3rd phase** involves dissemination /transfer the system modules to the target farmers.*

Expt. 205 Integrated Farming for Improving Livelihood of Resource Poor Farm Households in a Participatory Approach

- Objectives** : 1. Optimization of homestead land use for the availability of vegetable round the year
2. Utilization of family labour and inclusion of new and profitable technologies as Income Generating Activities (IGA).
3. Improvement of human nutrition by supplying required vitamin A, C, iron, calcium and thiamin
4. Incorporation of leguminous crops in the existing cropping pattern
5. Strengthen linkage among researchers, extension agents and farmers to expedite technology transfer process.
- Rationale** : BARI is conducting research on different discipline through its 22 programs and 16 divisions. Those programs and divisions are generating a good number of technologies including new cultivars/different management techniques/ machines etc. for the farmers of Bangladesh. However, before transferring those to extension agencies/NGOs and farmers they need On-Farm verification/test or fine-tuning to fit into the farmers existing socio-agro-economic environments. Moreover, through On-Farm trial valuable farmers feed-back is obtained to modify technology or to develop new technology. BARI has given this noble responsibility to OFRD to test those developed On-Station technologies directly to the farmers' field. Some technology developed by NARS Institute on farming system which will be verified at different locations for dissemination of the technology.
- Procedure/Methods** : **Step 1. Identification of proven/recommended technologies:** A comprehensive list of all packages of recommended technologies of crops, livestock, fisheries and other components of the farming system for specific location/environment will be prepared to help selection of appropriate technologies for intervention.
- Step 2. Selection of cooperator farmer:** The cooperator farmers representing small and marginal holdings with farming as major profession, sizable homestead under single ownership will be selected at each site. The number of farmers selected at different sites ranged from 4 to 6.
- Step 3. Accounting of pre-intervention status:** The pre-intervention status of the selected farms to be evaluated through case studies. In the process, the existing farm resources, assets, liabilities, existing farming practices and technologies used, level of input use and outputs obtained, performances of enterprises, farm income and expenditure, etc. to be assessed for each farm.
- Step 4. Analysis of existing system and selection of technologies for intervention:** Based on the pre-intervention status, the system performance to be analyzed in the context of existing biophysical and socio-economic environment of the farm and constraints and potentials will be identified. To ensure maximum utilization of existing farm resources, alternate/new packages of technologies for different enterprises to be identified and finally selected on the basis of farmers' option. It may be mentioned that in the intervention plan, some of the farmer's earlier adopted practices to be retained while some new practices replaced the traditional practices. To use the unexploited resources/opportunities, a large number of new practices will be also included.
- Step 5. Implementation of intervention and performance evaluation:** After finalizing the proposed interventions, the farmers will be motivated through all possible ways to utilize their own resources to adopt the interventions. However, in implementing some new technologies, a few critical inputs will

be provided free of cost and/or on credit. Throughout the implementation period, regular technical support should be provided on as and when necessary and the performance of interventions will be monitored regularly and necessary data will be collected directly using standard methods.

Data to be recorded	:	<ul style="list-style-type: none"> • Disposal pattern of vegetable and fruits (month-wise): i) own consumption, ii) distribution to relatives & iii) yearly gross margin (income) • Calorie intake by the members of the family (nutritional status) • Employment opportunity
Indication of success	:	<ul style="list-style-type: none"> • Improving rural livelihoods for resource poor male and female farmers through sustainable use of all available resources through farming systems research and development. • Application of integrated systems approach, would benefit the women farmers through involvement in farming activities e.g. fruits and vegetable production, poultry, dairy and goat raising, fish production etc. and marketing of agricultural products, processed items, and suitable off-farm/non-farm activities for income generation. • Reduction of nutrient deficiency of the farm households through integrated homestead gardening.
Investigator(s)	:	Concerned scientist of respective sites
Expected output/benefit	:	<ul style="list-style-type: none"> • Resource poor farm households' income, nutritional status, employment and social status will be enhanced. Productivity of farm unit will be increased through integrated/holistic approach. • Income generation round the year through scientific use of land for crops, ponds for fisheries and proper utilization of homestead area for vegetables, quick growing fruit plants. • Modern farming systems will be demonstrated; beneficiaries will gather sufficient knowledge on modern agro-farming with appropriate proven technologies for improve crop husbandry, livestock and fisheries. • Awareness about environment friendly technologies and sustainable agricultural development would be raised. • The ultimate purpose of the project would increase the production, income, employment opportunity, nutrition, etc. and ultimately enhance livelihood status of the target farmers towards poverty elimination.
Season	:	Round the year
Date of initiation	:	2012
Status	:	On-going
Estimated cost	:	Tk. 18,00,000/-
Source of fund	:	BARI
Location	:	FSRD sites of Rangpur, Barind (Rajshahi), Pabna, Faridpur, Noakhali, Patuakhali, Sylhet, Tangail, and Sherpur
Investigators	:	Concerned scientists of respective sites.
Priority	:	1 st

PROJECT V:

SOCIOECONOMIC STUDIES

JUSTIFICATION

Farming in Bangladesh is mainly at subsistence level. The socio-economic condition of the farm households has a portance in the national economic development. Improvement of agriculture is to increase the human productivity and their resource potential needed to develop the socio-economic environment at the rural households. For these, socio-economic study provides research feedback related to adaptability of a new technology in a farmers' field, biological and socioeconomic constraints, benchmark information for establishment of a new project and potentiality of a technology in the selected area of the country. Impact assessment, crop production, resource use efficiency, profitability and adoption related survey will be conducted in different areas of Bangladesh during the year of 2023-24.

Expt. 206 Adoption Status of Mustard in Cumilla Region

Objectives	: To estimate the rate of adoption of respective varieties To document productivity and profitability of respective varieties of crop; To know the causes of adoption and non-adoption of respective varieties To estimate factors affecting the adoption of respective varieties of crop.
Rationale	: Mustard cultivation is gradually increasing in the country. Farmers' interest in mustard cultivation is increasing due to government policy support and the introduction of high yielding cultivars. Farmers also grow BARI and BINA and local improved varieties of mustard. There is a lack of accurate information on which mustard variety is being cultivated more in which area and which variety has or is getting more acceptances at the farmer level. Many times due to lack of information, it is difficult to adopt a proper plan, so it is necessary to conduct an adaption survey on mustard. Therefore, it is important to know the information about which variety is more acceptable to the farmers, why it is being cultivated more. Along with that, the survey work has been undertaken to know how much the farmer is benefiting from the mustard cultivation and whether it has any social impact.
Materials and methods	: A total of 300 sample farmers from 3 district viz. Cumilla, Chandpur and Brahmanbaria of which 100 farmers from each district will be selected for the present study. Data will be collected from each farmer by the prepared questionnaire, FGD and KII method. Collected data will be analysed by using descriptive and statistical method.
Crop/variety	: Adopted mustard varieties in the region
Data to be recorded	: As per questionnaire
Investigator (s)	: M. Jamal Uddin, PSO, M. A. Hossain, PSO & M. Anwar, CSO, OFRD
Season	: Kharif 1&2
Date of initiation	: November, 2023
Date of completion	: May 2024
Expected output	: Percentage of mustard adoption and constraint will be identified
Location	: Cumilla, Chandpur and Brahmanbaria
Status	: New
Estimated cost	: Tk. 50000/-
Source of fund	: BARI
Priority	: 1st

Expt. 207 Adoption and cost effectiveness of vegetables production under raised bed systems in Patuakhali

Objectives	: To know the adoption status of vegetables production in raised bed systems. To estimate cost and return of vegetables production in raised bed and To identify constrains of vegetables production in raised bed at farm level
Rationale	: A regular tidal water erosion, heavy rains, varying degrees of soil and water salinity in coastal areas, lack of water in the dry season, heavy silty clay soil, etc. are the scenario of coastal area. Except rice, vegetables and fruits production are very limited in these areas. The limited number of vegetables produced in this area does not meet the minimum portion of the demand. The small and marginal farmers do in hardship work with the crops produced in these conditions. High value vegetables and high yielding fruits are grown in monsoon season. Vegetables and fruit trees are irrigated from the canal water during the dry season. However, the raised bed vegetables system is getting popularity in the Southern region day by day. Farmers are growing bitter gourd, sponge gourd, ridge gourd, sweet gourd etc. in raised bed by getting more profit in a short time. Farmers do not keep records of their production. No effort has been given yet before to consolidate the relevant information on cost and return of raised bed vegetable production in the study area. Therefore, the present study is undertaken to meet up the above objectives.
Materials and methods	: A total of 60 sample farmers will be selected for the present study. Data will be collected from each farmer by the prepared questionnaire and this collected data will be analysed by using descriptive and statistical method.
Investigator	: M. Akhtar Hossain, PSO and M. M. Anwar, CSO OFRD, BARI.
Date of initiation	: January 2024
Date of completion	: March 2024
Expected output	: Production cost, Profitability and policy guideline related information will be documented
Location	: OFRD, Patuakhali
Status	: New
Estimated cost	: Tk. 70000/-
Source of fund	: BARI
Priority	: First

Expt. 208 Quantifying farmers' preferences for cropping systems intensification in haor ecosystem of Bangladesh

Objectives	: To quantify farmers' preferences of options for fallow land replacement with promising cropping patterns practiced by farmer in study area; To analyze whether farmers' preferences are conditioned by investment requirements on input use and/or expected net revenues; To investigate how the heterogeneity in preferences can be attributed to farmer and/or farm characteristics, institutional, and biophysical factors; and To quantify farmers' willingness to invest in different intensification options.
Rationale	: Bangladesh is among the poorest countries in the world, is highly vulnerable to climate change, malnutrition and hunger. Thereby, climate change is an important issue for the country special reference to the haor ecosystem of Bangladesh. Climate variability is likely to dominate climate change in the region at least up to 2050 (Moors <i>et al.</i> , 2014). It is argued that coping with climate variability (i.e. coping with the extreme floods, storm surges and

droughts already experienced) is likely to prepare the country for climate change. Exacerbating the situation, Bangladesh's population of 170 million is expected to grow to 215.4 million by 2050 (Kabir *et al.*, 2015). The increasing population and economic development will increase demand and competition for water resources, exacerbating an already difficult position. Therefore need to take an initiative for the haor ecosystem which aims to lift agricultural productivity and hence rural welfare by increasing cropping intensification. Economic analysis is needed to estimate the farmers' preferences and practices for cropping systems intensification in haor ecosystem.

Materials and methods	:	A total of 200 sample farmers will be selected from Kishoreganj and Netrakona district (100 sample farmers from each district). Purposive and multistage stratified random sampling technique will be applied for selecting samples. Data will be collected from primary and secondary sources. Collected data will be analysed by descriptive and statistical method.
Investigator(s)	:	Dr. Mst. Esmat Ara Begum, SSO, Dr. Md. Maniruzzaman, PSO and Dr. Md. Mazharul Anwar, CSO, OFRD
Date of Initiation	:	July 2023
Date of completion	:	June 2024
Expected output	:	Farmers' preferences of options for fallow land replacement with promising cropping patterns practiced will be identified. Investment costs and risks alongside potential benefits will be examined. Farmers' investment decisions will be explored. Primary data will be collected. The outputs of this report will provide information to support implementation of the Bangladesh Delta Plan 2100 (GED, 2018) which identified the haor and flash flood areas as a hotspot for development; and the Master Plan for integrated agricultural development prepared by the Government of Bangladesh (MoA and FAO, 2013).
Location	:	Kishoreganj and Netrokona
Status	:	New
Estimated cost	:	Tk. 100000/-
Source of fund	:	BARI
Priority	:	First

Expt. 209 Productivity and Profitability of Summer Green Chilli in Selected Areas of Bangladesh

Objectives	:	To know the agronomic practices of summer chilli cultivation. To estimate cost and return of summer chilli cultivation at farm level. To determine the causes and effect of price hike in off season and To suggest some policy guideline for increasing off-season chilli cultivation in Bangladesh.
Rationale	:	Chilli has been used for centuries both as a culinary spice and for its medicinal properties. In terms of nutritional value, chilli is a good source of vitamins and minerals. It is rich in vitamin C, which is essential for a strong immune system and collagen production. It also contains significant amounts of vitamin A, which is important for vision, skin health, and immune function. Chilli also provides dietary fibre, which aids in digestion and

helps prevent constipation. It is low in calories and fat, making them a healthy addition to a balanced diet. Moreover, it is a good source of potassium, which contributes to proper muscle and nerve function, as well as blood pressure regulation. Chilli was cultivated in an area of 96804 hectare during 2018-19, with a total production of 149473 metric tons (BBS, 2020). Chilli is usually cultivated in winter in Bangladesh and the price is 52 Tk/kg (BBS, 2022) during harvesting in winter. As the production of summer chilli is relatively low, the price of chilli increased during this time, which was up to 500-1000 Tk/kg this year. Therefore, increasing the production of summer chillies is very important in the socio-economic context of the country. Earlier some socio-economic studies have been done on different aspect in different locations for winter chilli cultivation but no study on summer chilli till now. Hence this study will be conducted on productivity and profitability of summer chilli in Bangladesh.

- Materials and methods : A total of 120 sample farmers from four district viz. Kishoreganj, Mymensingh Bogura, Rangpur, of which 30 farmers from each district will be selected for the present study. Data will be collected from each farmer by the prepared questionnaire, and this collected data will be analysis by using descriptive and statistical method.
- Investigator : Dr. M Mohiuddin SSO, M. Akhtar Hossain, PSO and M. M. Anwar, CSO OFRD
- Date of initiation : July'2023
- Date of completion : June' 2024
- Expected output : Increase production, economic return and policy guideline
- Location : Kishoreganj, Mymensingh, Bogura, Rangpur.
- Status : New
- Estimated cost : Tk. 100000/-
- Source of fund : PARTNER Project, BARI Part
- Priority : First

Expt. 210 Study on the impact of farming system research activities of BARI

- Objectives : To know the socio-economic profile of the adaptor and non-adaptor respondents.
 To assess the activities of farming system research in respect to different component
 To assess the socioeconomic impact of adopting different components.
 To identify the problems and to make some policy recommendations.
- Rationale : Farming system is a resource management strategy to achieve economic gains and sustained production to meet diverse requirement to farm household while presenting resources base and maintaining a high-level environment quality (Lal and Miller, 1990). Farming system consists of several enterprises like cropping system, dairying, poultry,

fishery etc. These enterprises are interrelated with each other. A part of end product and wastes of one enterprise are used as inputs in others. The waste of dairying like dung, urine, etc. is used for preparation of FYM, which is an input in cropping systems. The straw obtained from the different crops is used as fodder for cattle. Thus, different enterprises of farming systems are highly interrelated. The goal of farming research system is to develop sustainable land use systems which will optimize the farm resource use, minimize degradation with consideration to regenerative capacity and increase income and employment for farm families and promote quality of life and environment. Several studies conducted on farming systems showed that farming system approach is better than conventional farming. The outcome of the present investigation is of immense importance to evolve, develop and implement the location specific farming systems in study area as well as the area with similar situations elsewhere. It will help farmers, academicians and policy makers to decide the strategies which will lead to overall development of agriculture in the region.

- Materials and Methods : The study will be conducted in 13 FSRD sites. Purposive sampling technique will be used to collect farm level data. A total of 468 farmers taking 12 adopter and 24 non-adopter from each site will be selected for interview. The collected data will be coded, edited, summarized, tabulated and analyzed to fulfill the objectives of the study. The profitability will be estimated using gross margin, net return and benefit cost ratio analysis. Probit model will be used to determine the adoption level.
- Data to be collected : Socioeconomic profile, Farming system research activities, Cost and return
Employment, income and poverty situations, Problems etc.
- Investigator(s) : Nasima Akter, S; M.Sayedur Rahman, PSO; M.Akhtar Hossain, PSO; M. Mohiuddin, SSO and M.Mazharul Anwar,CSO, OFRD and concerned scientist of respective location.
- Season : Rabi
- Date of initiation : July, 2022
- Date of completion : June, 2024
- Expected output/benefit : The study will provide useful information about impact of different farming systems components which will be helpful for the policy makers to take necessary policy in technological interventions for improving profitability.
- Location : All FSRD sites
- Status : 2nd year
- Estimated cost : Tk. 2,60,000/-
- Source of fund : BARI
- Priority : 1st

Expt. 211 Socioeconomic study on profitability and marketing of Summer Tomato in selected areas of Bangladesh

Objectives	: To estimate the cost and return of summer tomato production. To identify marketing channels of summer tomato marketing. To document the constraints in the production and marketing of summer tomato.
Rationale	: Tomato is an important and popular vegetable in Bangladesh. Cultivation and availability of tomato are limited in summer season. The prevailing temperature in our country during summer and rainy season is high and unfavorable for winter tomato cultivation. Due to demand of tomato during summer season the market price is very high even some businessmen stored winter tomato for selling purposes during summer season. The rate of sustainable growth of summer tomato production depends on its relative profitability. So, it is important to know the level of financial profitability and existing marketing system of summer tomato at farm level. This information would be helpful to researchers, govt. and non govt. organization as well as donor agencies for its improvement.
Materials and methods	: A total of 240 sample farmers from six locations viz. Khulna, Jashore, Faridpur, Pabna, Bogura, Rangpur of which 40 farmers from each location will be selected for the present study. Data will be collected from each farmer by the prepared questionnaire, and this collected data will be analysis by using descriptive and statistical method.
Data to be collected	: Socioeconomic profile, Cost and return, Marketing System, Problems etc.
Investigator(s)	: Dr. M. Mazharul Anwar CSO, M.Akhtar Hossain, PSO, OFRD, Gazipur, Prodip Hajong, SO, RARS, Jessore and concerned scientist of respective location.
Season	: Kharif
Date of initiation	: August, 2022
Date of completion	: February, 2023
Expected output/benefit	: Production, profitability and marketing related information will be explored.
Location	: OFRD, Khulna, Jashore, Faridpur, Pabna, Bogura and Rangpur
Status	: 2 nd year
Estimated cost	: Tk. 120,000/-
Source of fund	: BARI
Priority	: First

Project VI: Transfer of Technology

Expt. 212 Pilot Production Program of oilseeds, pulses, spices, vegetables, and cereal crops in Rajshahi region

- Objectives** : To popularize BARI released crop varieties among the farmers' To increase production and benefit the farmers economically. Capacity building in food production. To increase the amount of nutrients in the food chain.
- Rationale** : BARI (Bangladesh Agricultural Research Institute) is the largest multi-crop research institute conducting research on various types of crops, such as grains, tubers, pulses, oilseeds, vegetables, fruits, spices, flowers, etc. Besides diversity development, the institute conducts research in areas such as soil and crop management, disease and pest management, water management and irrigation, development of farm machinery, improvement of crop and farming system management, post-harvest handling and processing, and socio-economic studies of production.
- Processing, marketing, and consumption. Recently Bangladesh Agricultural Research Institute has developed various new varieties from different crop centers. All varieties are high yielding and fetch high prices in the market. So the farmer will benefit if he cultivates BARI varieties. Moreover, some varieties are resistant to diseases and insects. So these varieties need to be spread among the farmers. Therefore, the present study will be adopted.

Materials

Crop	Variety	Area (ha)	Implementation office
Mustard	BARI Sarisha-14	5	OFRD, Region-1, BARI, Shyampur, Rajshahi
	BARI Sarisha-17	5	
	BARI Sarisha-18	4	
Sesame	BARI Till-5	1	
	BARI Till-6	1	
Lentil	BARI Masur-8	10	
Chickpea	BARI Chola-9	1	
	BARI Chola-11	1	
Blackgram	BARI Mash-3	3.5	
	BARI Mash-4	0.5	
Pea	BARI Mator-3	4	
Potato	BARI Alu-25	2	
	BARI Alu-37	2	
	BARI Alu-40	2	
	BARI Alu-62	2	
	BARI Alu-79	2	
Summer tomato	BARI hybrid tomato-8	0.75	
	BARI hybrid tomato-11	0.75	
Brinjal	BARI Begun-12	0.25	
Bottle gourd	BARI Lau-4	0.15	
Onion	BARI Piaz-4	1	
	BARI Piaz-5	1	
	BARI Piaz-6	0.25	
Chia	BARI Chia-1	0.13	
Mustard	BARI Sarisha-14	8	OFRD, BARI, Rangpur
	BARI Sarisha-17	6	
	BARI Sarisha-18	2	
Groundnut	BARI Chinabadam-9	10	
	BARI Chinabadam-11	5	

Sesame	BARI Til-5	0.5		
	BARI Til-6	0.5		
Blackgram	BARI Mash-3	9		
Khesari	BARI Khesari-6	7		
Potato	BARI Alu-25	5		
Sweet potato	BARI Misti Alu-12	4		
	BARI Misti Alu-16	1		
	BARI Misti Alu-17	1		
Summer tomato	BARI Hybrid Tomato-8	1		
	BARI Hybrid Tomato-11	1		
Sweet gourd	BARI Mistikumra-1	2		
	BARI Mistikumra-2	3		
Brinjal	BARI Begun-12	0.5		
Onion	BARI Pij-4	3		
Turmeric	BARI Halud-4	0.5		
Foxtail millet	BARI Kaun-2	8		
Millet	BARI Cheena-2*	14		
Chia seed	BARI Chia-1*	1		
Mango	BARI Aam-4 (Hybrid)	0.5		
	BARI Aam-13	0.5		
	BARI Malta-1	0.5		
Mustard	BARI Sarisha-14	4		OFRD, BARI, Gaibandha
	BARI Sarisha-17	3		
Sunflower	BARI Sunflower-3	2		
Groundnut	BARI Chinabadam-9	10		
	BARI Chinabadam-11	5		
Sesame	BARI Til-6	1		
Lentil	BARI Masur-8	5		
Blackgram	BARI Mash-3	2		
Khesari	BARI Khesari-6	3		
Potato	BARI Alu-25	3		
	BARI Alu-90	1		
Sweet potato	BARI Misti Alu-12	1 (BARI-8)		
	BARI Misti Alu-16	1		
	BARI Misti Alu-17	1		
Sweet gourd	BARI Mistikumra-1	1 (BARI hybrid-1)		
	BARI Mistikumra-2	1 (BARI hybrid-2)		
Onion	BARI Pij-4	2		
	BARI Pij-6	3		
Foxtail millet	BARI Kaun-2	35		
Proso millet	BARI Cheena-1	5		
	BARI Cheena-2*	5		
Mustard	BARI Sarisha-14	4	Bogura	
	BARI Sarisha-17	3		
	BARI Sunflower-3	1		
Groundnut	BARI Chinabadam-9	7		
	BARI Chinabadam-11	5		
Sesame	BARI Til-5	1		
	BARI Til-6	8		
Lentil	BARI Masur-8	5		
Blackgram	BARI Mash-3	7		
Khesari	BARI Khesari-6	1		
Potato	BARI Alu-25	2		
	BARI Alu-90	1		

Sweet potato	BARI Misti Alu-17	0.5	
Tomato	BARI Hybrid Tomato-11	1.5	
Bt Brinjal	BARI Bt Begun-4	1	
Onion	BARI Piaj-5	0.5	
	BARI Piaj-6	7	
Garlic	BARI Rashun-1	1	
Turmeric	BARI Halud-4	0.5	
Black cumin	BARI Kalozira-1	0.5	
Foztail millet	BARI Kaun-2	5	
Proso millet	BARI Cheena-1	1	
	BARI Cheena-2*	1	
Mango	BARI Aam-4 (Hybrid)	0.13	
	BARI Aam-11	0.13	
	BARI Aam-13	1.3	
Mustard	BARI Sarisha-17	5	
	BARI Sarisha-18	3	
Summer tomato	BARI Hybrid Tomato-8	0.2	
	BARI Hybrid Tomato-11	0.25	
Bottle gourd	BARI Lau-4	0.2	
Brinjal	BARI Begun-12	0.2	
Bitter gourd	BARI korola-3	0.2 (BARI-2)	
Onion	BARI Piaj-4	0.2	
Garlic	BARI Rashun-1	0.2	
Mustard	BARI Sarisha-14	6	
	BARI Sarisha-17	6	
	BARI Sarisha-18	4	
Sesame	BARI Til-5	5	
	BARI Til-6	5	
Lentil	BARI Masur-8	15	
Chickpea	BARI Chola-5	10	
	BARI Chola-11	2	
Mungbean	BARI Mug-6	1	
Blackgram	BARI Mash-3	6	
Barley	BARI Barley-7	0.5	
	BARI Barley-10*	0.5	
	BARI Sorghaum-1	0.5	
Mustard	BARI Sarisha-14	8	
	BARI Sarisha-17	8	
	BARI Sarisha-18	2	
	BARI Sarisha-20	1	
Groundnut	BARI Chinabadam-9	1	
Sesame	BARI Til-5	1	
	BARI Til-6	5	
Lentil	BARI Masur-8	10	
Blackgram	BARI Mash-3	5	
Field pea	BARI Motor-3	1	
Khesari	BARI Khesari-6	1	
Potato	BARI Alu-40	1 (BARI-41)	
Summer tomato	BARI Hybrid Tomato-8	1	
	BARI Hybrid Tomato-11	2	
Brinjal	BARI Begun-12	0.5	
Onion	BARI Piaj-4	1	
Garlic	BARI Rashun-1	1	
Turmeric	BARI Halud-4	0.5	
Black cumin	BARI Kalozira-1	0.5	
Foxtail millet	BARI Kaun-2	0.5	
Proso millet	BARI Cheena-2*	0.5	

Dinajpur

Barind

Pabna

Barley	BARI Barley-10*	0.5	
Mango	BARI Aam-4 (Hybrid)	0.18	
	BARI Aam-13	0.1	
	BARI Aam-17	0.1	

*- depend on seed availability

Season : 2023-24
Date of initiation : November, 2023
Date of completion : November, 2024
Expected output : Disseminate BARI technologies and produce good quality seed at farmer's level
Location : Rajshahi
Estimated cost : Tk. 4,00,000/-
Source of Fund : PARTNER Project
Priority : First

Expt. 213 Pilot Production of cereals, pulses, oilseeds and spices crop in char areas of Gaibandha

Objective : To boost farmer productivity and economic return by popularizing BARI released crop types at farm level
Rationale : BARI developed different crop varieties and management approaches were evaluated in the farmers field in the previous years and compare their performances with farmers cultivated varieties as well as production practices. If there is any improvement regarding recent technology (both varietal and management approaches) for at least two successive years, then it is considered to be a new technology for large scale production. Last few years different improved variety of cereals, pulses, oilseeds, vegetables, and spices crops performed well in the farmer's field. Hence the production programs of different crops/varieties were undertaken.

Materials and methods:

Crop/variety : Foxtail millet (var. BARI Kaon-2), Proso-millet (var. BARI Cheena-1), Barley (var. BARI Barley-7), Mustard (var. BARI Sarisha-14,18), Sunflower (var. BARI Surjamukhi-3), Sesame (var. BARI Til-4), Groundnut (BARI Chinabadam-8/9), Lentil (var. BARI Mashur-8), Grass pea (var. BARI Khesari-3), Blackgram (var. BARI Mash-3), Sweet potato (BARI Mistialu-16/17)
Plot size : Foxtail millet: 10 ha, Proso millet: 5 ha, Barley: 2 ha, Mustard: 10 ha, Sunflower: 2 ha, Sesame: 2 ha; Groundnut: 10 ha, Lentil: 5 ha, Grass pea: 3 ha, Black gram: 2 ha, Sweet potato: 2 ha
Planting system : Line sowing/Broadcasting
Fertilizer dose application : As per FRG, 2018
Irrigated/rainfed : Irrigated
Data to be recorded : Date of all operations, yield, Farmer's opinion, pest incidence
Investigator(s) : Abdullah-Al-Mahmud, PSO, Md. Jahangir Alam, SSO and Mohammad Shohel Rana, SO
Season : Rabi 2023-24 and kharif I 2024
Date of initiation : October 2023
Date of compilation : September 2024
Expected output : Seed/grain yield of said crop and farmer's income will be increased
Location : MLT site, Fulchari, Saghata Gaibandha
Status : New

Estimated cost : Tk. 300000/-
 Source of fund : PARTNER Project
 Priority : 1st

Expt. 214 Pilot production program of mustard varieties at Pabna region

Objective : To popularize BARI developed mustard varieties and to increase the production of mustard.

Rationale : Mustard is an important oil seed crops in Bangladesh. BARI has developed many Mustard varieties having high yield potential. Among the varieties BARI Sarisha-14, BARI Sarisha-17 and BARI Sarisha-18 are high yielding promising varieties. The Mustard oil is not only used for cooking purpose but also is used for hair dressing, body massing and for different types of pickles preparation. It also has medicinal uses. The production program of BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-18 and BARI Sarisha-20 is undertaken to increase the production of oil seed crops and to popularize variety among the farmers in different areas of Bangladesh.

Materials & methods :

Crop/Variety : Mustard (BARI Sarisha-14, BARI Sarisha-17, BARI Sarisha-18 and BARI Sarisha-20)

Planting system : Broadcasting

Fertilizer dose : Urea-TSP-MoP-Gypsum-ZnSO₄-Boric acid-250-170-85-150-5-10kg ha⁻¹, respectively.

Methods of application : As per BARI *Krishi Projukti Hatboi*, 2021

Irrigation/rainfed : Irrigated

Area : BARI Sarisha-14: 20 ha, BARI Sarisha-17: 25 ha, BARI Sarisha-18: 10 ha and BARI Sarisha-20: 1 ha

Data to be recorded : Dates of all operations
 Yield and yield contributing characters.
 Disease and insect incidence
 Cost and return analysis
 Farmer's opinion

Investigator : Concern scientist of OFRD, Pabna

Season : Rabi

Date of initiation : 1st week of November, 2023

Expected output : Mustard production will be increased and farmers will be benefited.

Location : MLT site, Atghoria, FSRD site Gangarampur and MLT site Sirajganj

Status : New

Estimated cost : Tk. 2,50,000/-

Source of fund : PARTNER Project

Priority : 1st

Expt. 215 Pilot production program of relay lentil at Pabna region

Objective	: To establish relay cropping of lentil as a viable technology under changing climate to reduce yield gap due to late planting and up scaling of the technology.
Rationale	: In Bangladesh, pulses play a vital role in agriculture as well as in human diets. Now a days national pulse production within rice-based system is declining dramatically day by day because of competition with the other winter crops like wheat, maize, <i>Boro</i> rice, potato, and vegetables. But the demand of pulses is increasing continuously. As a source of plant protein, the reduction of pulses production is a major concern of the government. Lentil (<i>Lens culinaris</i> L.) is one of the most important winter pulses grown in Bangladesh. It plays an important role in human diet and improves soil fertility by fixing atmospheric nitrogen. The lentil is a crop which can provide both biomass and seed at a time. Lentil can be fitted into the Boro-Mungbean-T. Aman cropping pattern. Recently Bangladesh Agricultural Research Institute (BARI) has developed and released some high yielding varieties of lentil. It should need to disseminate these newly released lentil varieties at farmers' field. The approach of relay cropping of lentil with T. aman rice was tested through block production aiming to assess field performance of relay cropping as well as greater adoption of high yielding variety at the farmer's level.
Materials & methods	: BARI Masur-8
Planting system	: Broadcasting
Fertilizer dose	: The fertilizers were applied @ 37-08-20-13 kg N-P-K-S ha ⁻¹ .
Methods of application	: Entire amount of all fertilizers will be applied after harvesting of T. Aman rice.
Area	: 12 ha
Data to be recorded	: Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	: Concern scientist of OFRD, BARI, Pabna
Season	: Rabi
Date of initiation	: November, 2023
Expected output	: BARI Masur-8 would be disseminated and farmers will be benefited.
Location	: MLT site Atghoria
Status	: New
Estimated cost	: Tk. 1,00,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 216 Pilot production program of relay field pea at Pabna region

Objectives	: To increase the productivity of field pea crop. To popularize BARI variety among the farmers.
Rationale	: Pea (<i>Pisum sativum</i>) is well known as a vegetable and one of the important legumes in Bangladesh. The green pods and immature seeds are rich in vitamin and have a balanced amino acid composition. The crops become popular for their high nutritive value and good taste. It contains 15-35% protein, 20-25% starch, 4-10% sugar, 0.6-1.5% fat and 2-4% minerals (Makasheva, 1983). Furthermore, this crop could fix atmospheric nitrogen (Delfin et al., 2008) and short duration maturity period which made it preferable crop for resource poor farmers in dry

land areas of the tropics and subtropics. N₂-fixation under normal soil fertility condition by garden pea valued 60-65 kg ha⁻¹ (*KrishiprojuktiHatboi*, 2021). The approach of relay cropping of field pea with T. aman rice was tested through block production aiming to assess field performance of relay cropping as well as greater adoption of high yielding variety at the farmer's level.

Materials & methods	: BARI Motor-3
Planting system	: Broadcasting
Fertilizer dose	: Urea-TSP-MoP-Gypsum-Boron-40-90-45-55-10 kg ha ⁻¹ , respectively.
Methods of application	: Entire amount of all fertilizers will be applied after harvesting of T. Aman rice.
Area	: 2.5 ha
Data to be recorded	: Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	: Concern scientist of OFRD, BARI, Pabna
Season	: Rabi
Date of initiation	: November, 2023
Expected output	: BARI Motor-3 would be disseminated and farmers will be benefited.
Location	: MLT site Atghoria
Status	: New
Estimated cost	: Tk. 75,000/-
Source of fund	: PARTNER
Priority	: 1 st

Expt. 217 Pilot production program of Summer Hybrid Tomato varieties in Pabna region

Objective	: To disseminate and popularize the BARI released summer hybrid Tomato at on-farm level
Rationale	: Tomato is a popular vegetable in Bangladesh and mainly grown in winter season. Its cultivation is limited in the summer season. The prevailing temperature in our county during summer and rainy season is high and not favorable for Tomato cultivation. But demand and market price of Tomato during summer and rainy season is very high. In the meantime, BARI has developed some hybrid summer Tomato varieties viz. BARI Hybrid Tomato 8, BARI Hybrid Tomato 10 and BARI Hybrid Tomato 11 which are able to produce flower and fruits even under high temperature. For that reason, summer hybrid Tomato cultivation is increase day by day in different areas of Bangladesh, in that continuity many farmers of Gopalganj area showed their interest to cultivate summer Tomato. Therefore, this study was undertaken to evaluate the performance of BARI developed summer hybrid Tomato varieties in Gopalganj region.
Materials and methods	
Materials	: BARI Hybrid Tomato 8 and BARI Hybrid Tomato 11
Area	: BARI Hybrid Tomato 8: 1 ha and BARI Hybrid Tomato 11: 2 ha
Plant spacing	: 60cm × 40cm
Fertilizer dose	: 253-90-125-22-5.5-2 kg N-P-K-S-Zn-B ha ⁻¹ with 10 t ha ⁻¹ CD
Fertilizer application methods	: Half of the quantity of cow dung, half amount of P and entire amount of S and B will be applied during final land preparation. The remaining half of cow dung and P are to be applied during pit preparation before a week of planting. The entire N and K are to be applied in 3 equal instalments of 21, 35 and 50 days after seedling transplanting.

Planting date	: Seed sowing- 1 st week of July 2023 Planting- 1 st week of August 2023
Data to be recorded	: Days to 50% flowering, Days to 1 st and last harvest, No. of fruits/plant, Individual fruit weight (g), Yield/plant (kg) and per hectare (ton), Virus infestation (%), Bacterial wilt infestation (%), Other insect/disease problem, Farmer's reaction
Investigator (s)	: Concern scientist of OFRD, BARI, Pabna
Season	: Kharif
Date of initiation	: July, 2023
Location	: MTL site Atghoria, Pabna
Status	: New
Estimated cost	: Tk. 3,50,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 218 Pilot production program of blackgram in the farmers' field at Pabna

Objectives	: To popularize and disseminate BARI Mash-3 variety in the farmers' field. To increase yield and farmers' income
Rationale	: Blackgram (<i>Vigna mungo</i> L.) is one of the major pulse crops in Bangladesh. Among the pulses it stands fourth both in acreage and production after lentil, lathyrus, mungbean in Bangladesh. Blackgram contributes about 11 % of the total pulse production in Bangladesh (BARI, 1998). The seed of this crop contains about 25% protein. The crop is generally cultivated for human consumption, fodder for cattle and green manuring to improve soil health. The crop is grown in two different seasons e.g., Kharif 1 and Kharif 2 seasons in Bangladesh. The Pulses Research Centre of BARI already developed four varieties of blackgram to meet the demand of pulse crops in Bangladesh. Therefore, the present study was undertaken to popularize and disseminate BARI Mash-3 among the farmers to promote its adoption in summer season.
Materials and Methods	
Crop	: Blackgram
Variety	: BARI Mash-3
Area	: 5 ha
Planting system	: Broadcasting
Fertilizer dose and methods of application	: The fertilizers were applied @ 37-08-20-13 kg N-P-K-S ha ⁻¹ . All amounts of all fertilizers will be applied after harvesting of T. Aman rice.
Irrigated/Rainfed	: Irrigated
Data to be recorded	: Dates of all operation Yield and yield contributing characters Major disease and pest incidence Economic analysis Farmers option
Investigator(s)	: Concern scientist of OFRD, BARI, Pabna
Season	: Kharif, 2022
Date of initiation	: August, 2023
Date of completion	: October, 2023
Expected output	: Blackgram yield will be increased and farmers will be benefitted.
Location	: MLT site Atghoria/Sujanagar
Status	: New
Estimated cost	: Tk. 1,00,000/-
Source of fund	: PARTNER Project

Priority : 1st

Expt. 219 Pilot production program of sesame varieties at Pabna region

Objective : To increase the production of oil seed crops.
Rationale : Sesame is an important oil seed crops in Bangladesh. BARI has developed some sesame varieties having high yield potential. Among the varieties BARI Sesame-4, BARI Sesame-5 and BARI Sesame-6 are high yielding promising varieties. The Sesame oil is not used only for cooking purpose but also is used for hair dressing, body massing and for different types of pickles preparation. It also has medicinal uses. The production program of BARI Sesame-4, BARI Sesame-5 and BARI Sesame-6 will be undertaken to increase the production of oil seed crops and to popularize variety among the farmers in different areas of Bangladesh.

Materials & methods :
Crop/Variety : Sesame (BARI Til-4, BARI Til-5 and BARI Til-6)
Planting system : Broadcasting
Fertilizer dose : Urea-TSP-MoP-Gypsum-ZnSO₄-Boric acid-250-170-85-150-5-10kg ha⁻¹, respectively.

Methods of application : As per BARI *KrishiProjuktiHatboi*, 2021
Irrigation/rainfed : Irrigated
Area : BARI Til-4: 3 ha, BARI Til-5: 2 ha and BARI Til-6: 6 ha
Data to be recorded : Dates of all operations
Yield and yield contributing characters
Disease and insect incidence
Cost and return analysis
Farmer's opinion

Investigator : Concern scientist of OFRD, Pabna
Season : Kharif-I
Date of initiation : 1st week of April, 2024
Expected output : Sesame production will be increased and farmers will be benefited.
Location : MLT site, Atghoria and Sujanagar, Pabna
Status : New
Estimated cost : Tk. 1,00,000/-
Source of fund : PARTNER Project
Priority : 1st

Expt. 220 Pilot production program of groundnut at Pabna region

Objective : To increase the production of oil seed crops.
Rationale : Groundnut is an important oil seed crop in Bangladesh. BARI has developed some groundnut varieties having high yield potential. Among the varieties BARI Chinabadam-9 is a high yielding promising variety. Groundnut is eaten as snack throughout the country. It is also used widely as an important ingredient in bakery items. Groundnut oil can be used for cooking purposes as an alternative to other vegetable oils. There are Char lands in Pabna where BARI groundnut varieties can be disseminated among the farmers. The production program of BARI Chinabadam-9 will be undertaken to increase the production of oil seed crops and to popularize the variety in Char areas of Pabna.

Materials & methods :
Crop/Variety : Groundnut (BARI Chinabadam-9)
Planting system : Dibbling

Fertilizer dose	: As per FRG 2018
Methods of application	: As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	: Irrigated
Area	: 01 ha
Data to be recorded	: Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	: Concern scientist of OFRD, Pabna
Season	: Kharif-I
Date of initiation	: 1 st week of April, 2024
Expected output	: Groundnut production will be increased, and farmers will be benefited.
Location	: MLT site Sujanagar, Pabna
Status	: New
Estimated cost	: Tk. 50,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 221 Pilot production program of relay grass pea at Pabna region

Objective	: To increase the production of pulse crops.
Rationale	: Grass pea is an important pulse crop in Bangladesh. BARI has developed some grass pea varieties having high yield potential. Among the varieties BARI Khesari-5 and BARI Khesari-6 are high yielding promising varieties. Grass peas are eaten as pulse and its plant is eaten as a leafy vegetable in the country. Its plant and husk are also used as foods for the livestock. Traditionally there are grass pea growing in Pabna where BARI grass pea varieties can be disseminated among the farmers. The production program of grass pea will be undertaken to increase the production of pulse crops and to popularize the variety in pulse growing areas of Pabna.
Materials & methods	:
Crop/Variety	: Grass Pea (BARI Khesari-5 and BARI Khesari-6)
Planting system	: Broadcasting
Fertilizer dose	: As per FRG 2018
Methods of application	: As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	: Irrigated
Area	: BARI Khesari-5: 2.5 ha and BARI Khesari-6: 01 ha
Data to be recorded	: Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	: Concern scientist of OFRD, Pabna
Season	: Rabi
Date of initiation	: 1 st week of November, 2023
Expected output	: Grass pea production will be increased and farmers will be benefited.
Location	: MLT site Atghoria, Pabna
Status	: New
Estimated cost	: Tk. 50,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 222 Pilot production program of potato at Pabna region

Objective	:	To increase the production of tuber crops.
Rationale	:	Potato is the most important tuber crop in Bangladesh. BARI has developed more than 100 potato varieties having high yield potential. Among the varieties BARI Alu-41 is a high yielding promising variety. This variety has potential in Pabna. Therefore, a pilot production program is taken in the areas where BARI Alu-41 can be disseminated among the farmers.
Materials & methods	:	
Crop/Variety	:	Potato (BARI Alu-41)
Planting system	:	Dibbling
Fertilizer dose	:	As per FRG 2018
Methods of application	:	As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	:	Irrigated
Area	:	01 ha
Data to be recorded	:	Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	:	Concern scientist of OFRD, Pabna
Season	:	Rabi
Date of initiation	:	1 st week of November, 2023
Expected output	:	Potato production will be increased and farmers will be benefited.
Location	:	FSRD site Gangarampur, Pabna
Status	:	New
Estimated cost	:	Tk. 50,000/-
Source of fund	:	PARTNER Project
Priority	:	1 st

Expt. 223 Pilot production program of brinjal at Pabna region

Objective	:	To increase the production of vegetable crops.
Rationale	:	Brinjal is one of the most important and popular vegetables in Bangladesh. BARI has developed many brinjal varieties having high yield potential. Among the varieties BARI Begun-12 is a high yielding promising variety. This variety has potential in Pabna. Therefore, a production program of BARI Begun-12 will be undertaken to increase the production of brinjal and to popularize the variety in vegetable growing areas of Pabna.
Materials & methods	:	
Crop/Variety	:	Brinjal (BARI Begun-12)
Planting system	:	Transplanting
Fertilizer dose	:	As per FRG 2018
Methods of application	:	As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	:	Irrigated
Area	:	0.5 ha
Data to be recorded	:	Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis

	Farmer's opinion
Investigator	: Concern scientist of OFRD, Pabna
Season	: Rabi
Date of initiation	: 1 st week of November, 2023
Expected output	: Brinjal production will be increased, and farmers will be benefited.
Location	: MLT site Kashinathpur
Status	: New
Estimated cost	: Tk. 60,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 224 Pilot production program of onion at Pabna region

Objective	: To increase the production of spice crops.
Rationale	: Onion is one of the major spices in Bangladesh. BARI has developed six onion varieties having high yield potential. Among the varieties BARI Piaj-4 is a high yielding promising variety. There is a huge area coverage of onion in Pabna. The farmers cultivate local and commercial varieties in these areas. Therefore, a production program of BARI Piaj-4 will be undertaken to increase the production of onion and to popularize the variety in onion growing areas of Pabna.
Materials & methods	:
Crop/Variety	: Onion (BARI Piaj-4)
Planting system	: Transplanting
Fertilizer dose	: As per FRG 2018
Methods of application	: As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	: Irrigated
Area	: 1 ha
Data to be recorded	: Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	: Concern scientist of OFRD, Pabna
Season	: Rabi
Date of initiation	: 1 st week of November, 2023
Expected output	: Onion production will be increased, and farmers will be benefited.
Location	: MLT site Sujanagar, Pabna
Status	: New
Estimated cost	: Tk. 1,00,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 225 Pilot production program of zero tillage garlic at Pabna region

Objective	: To increase the production of spice crops.
Rationale	: Garlic is one of the major spices in Bangladesh. BARI has developed four garlic varieties having high yield potential. Among the varieties BARI Rashun-1 is a high yielding promising variety. There is a huge area coverage of garlic in Pabna. The farmers cultivate local varieties in these areas. Therefore, a production program of BARI Rashun-1 will be undertaken to increase the production of garlic and to popularize the variety in garlic growing areas of Pabna.

Materials & methods	:	
Crop/Variety	:	Garlic (BARI Rashun-1)
Planting system	:	Dibbling
Fertilizer dose	:	As per FRG 2018
Methods of application	:	As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	:	Irrigated
Area	:	1 ha
Data to be recorded	:	Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	:	Concern scientist of OFRD, Pabna
Season	:	Rabi
Date of initiation	:	1 st week of November, 2023
Expected output	:	Garlic production will be increased and farmers will be benefited.
Location	:	MLT site Atghoria, Pabna
Status	:	New
Estimated cost	:	Tk. 50,000/-
Source of fund	:	PARTNER Project
Priority	:	1 st

Expt. 226 Pilot production program of turmeric at Pabna region

Objective	:	To increase the production of spice crops.
Rationale	:	Turmeric is one of the major spices in Bangladesh. BARI has developed five turmeric varieties having high yield potential. Among the varieties BARI Halud-4 is a high yielding promising variety. The farmers cultivate local turmeric varieties in Pabna. Therefore, a production program of BARI Halud-4 will be undertaken to increase the production of turmeric and to popularize the variety among the turmeric growers in Pabna.
Materials & methods	:	
Crop/Variety	:	Turmeric (BARI Halud-4)
Planting system	:	Line sowing
Fertilizer dose	:	As per FRG 2018
Methods of application	:	As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	:	Irrigated
Area	:	0.5 ha
Data to be recorded	:	Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	:	Concern scientist of OFRD, Pabna
Season	:	Kharif-1
Date of initiation	:	1 st week of April, 2024
Expected output	:	Turmeric production will be increased and farmers will be benefited.
Location	:	FSRD site Gangarampur, Pabna
Status	:	New
Estimated cost	:	Tk. 80,000/-
Source of fund	:	PARTNER Project
Priority	:	1 st

Expt. 227 Pilot production program of black cumin at Pabna region

Objective	:	To increase the production of spice crops.
Rationale	:	Black cumin is one of the most valuable spices in Bangladesh. BARI has developed one black cumin variety. Compared to the local varieties BARI Kalozira-1 is a high yielding promising variety. The farmers cultivate local black cumin varieties in Pabna. Therefore, a production program of BARI Kalozira-1 will be undertaken to increase the production of black cumin and to popularize the variety among the black cumin growers in Pabna.
Materials & methods	:	
Crop/Variety	:	Black cumin (BARI Kalozira-1)
Planting system	:	Broadcasting
Fertilizer dose	:	As per FRG 2018
Methods of application	:	As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	:	Irrigated
Area	:	0.5 ha
Data to be recorded	:	Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	:	Concern scientist of OFRD, Pabna
Season	:	Rabi
Date of initiation	:	1 st week of November, 2023
Expected output	:	Black cumin production will be increased and farmers will be benefited.
Location	:	MLT site Atghoria, Pabna
Status	:	New
Estimated cost	:	Tk. 40,000/-
Source of fund	:	PARTNER Project
Priority	:	1 st

Expt. 228 Pilot production program of foxtail millet at Pabna region

Objective	:	To increase the production of minor cereal crops.
Rationale	:	Foxtail millet is one of the most resilient minor cereals in Bangladesh. BARI has developed four foxtail millet varieties. Compared to the local varieties BARI Kaun-2 is a high yielding promising variety. The farmers cultivate local foxtail millet varieties in Pabna. Therefore, a production program of BARI Kaun-2 will be undertaken to increase the production of foxtail millet and to popularize the variety among the foxtail millet growers in Pabna.
Materials & methods	:	
Crop/Variety	:	Foxtail millet (BARI Kaun-2)
Planting system	:	Broadcasting
Fertilizer dose	:	As per FRG 2018
Methods of application	:	As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	:	Irrigated
Area	:	0.5 ha
Data to be recorded	:	Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis

	Farmer's opinion
Investigator	: Concern scientist of OFRD, Pabna
Season	: Rabi
Date of initiation	: 1 st week of November, 2023
Expected output	: Foxtail millet production will be increased and farmers will be benefited.
Location	: MLT site Sujanagar, Pabna
Status	: New
Estimated cost	: Tk. 25000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 229 Pilot production program of proso millet at Pabna region

Objective	: To increase the production of minor cereal crops.
Rationale	: Proso millet is one of the most resilient minor cereals in Bangladesh. BARI has developed two proso millet varieties. Compared to the local varieties BARI Cheena-2 is a high yielding promising variety. The farmers cultivate local proso millet varieties in Pabna. Therefore, a production program of BARI Cheena-2 will be undertaken to increase the production of proso millet and to popularize the variety among the proso millet growers in Pabna.
Materials & methods	:
Crop/Variety	: Proso millet (BARI Cheena-2)
Planting system	: Broadcasting
Fertilizer dose	: As per FRG 2018
Methods of application	: As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	: Irrigated
Area	: 0.5 ha
Data to be recorded	: Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	: Concern scientist of OFRD, Pabna
Season	: Rabi
Date of initiation	: 1 st week of November, 2023
Expected output	: Proso millet production will be increased and farmers will be benefited.
Location	: MLT site Sujanagar, Pabna
Status	: New
Estimated cost	: Tk. 25,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 230 Pilot production program of barley at Pabna region

Objective	: To increase the production of minor cereal crops.
Rationale	: Barley is one of the most resilient minor cereals in Bangladesh. BARI has developed ten barley varieties. Compared to the local varieties BARI Barley-10 is a high yielding promising variety. The farmers cultivate local barley varieties in Pabna. Therefore, a production program of BARI Barley-10 will be undertaken to increase the production of barley and to popularize the variety among the barley growers in Pabna.
Materials & methods	:
Crop/Variety	: Barley (BARI Barley-10)
Planting system	: Broadcasting

Fertilizer dose	: As per FRG 2018
Methods of application	: As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	: Irrigated
Area	: 0.5 ha
Data to be recorded	: Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	: Concern scientist of OFRD, Pabna
Season	: Rabi
Date of initiation	: 1 st week of November, 2023
Expected output	: Proso millet production will be increased and farmers will be benefited.
Location	: MLT site Sujanagar, Pabna
Status	: New
Estimated cost	: Tk. 25,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 231 Pilot production program of Mango at Pabna region

Objective	: To increase the production of fruit crops.
Rationale	: Mango is the major fruit in Bangladesh. BARI has developed 18 mango varieties having high yield potential. Among the varieties BARI Aam-4 (hybrid), BARI Aam-13 and BARI Aam-17 are high yielding promising varieties. Therefore, the production program of BARI Aam-4, BARI Aam-13 and BARI Aam-17 is undertaken to increase the production of mango and to popularize these varieties among the farmers in different areas of Pabna.
Materials & methods	:
Crop/Variety	: Mango (of BARI Aam-4, BARI Aam-13 and BARI Aam-17)
Planting system	:
Fertilizer dose	: As per FRG 2018
Methods of application	: As per BARI <i>Krishi Projukti Hatboi</i> , 2021
Irrigation/rainfed	: Irrigated
Area	: BARI Aam-4: 0.18 ha, BARI Aam-13: 0.1 ha and BARI Aam-17: 0.1 ha
Data to be recorded	: Dates of all operations Yield and yield contributing characters Disease and insect incidence Cost and return analysis Farmer's opinion
Investigator	: Concern scientist of OFRD, Pabna
Season	: Kharif-II
Date of initiation	: 1 st week of July, 2024
Expected output	: Mango production will be increased and farmers will be benefited.
Location	: FSRD site Gangarampur, Pabna
Status	: New
Estimated cost	: Tk. 70,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 232 Production program of mango using BARI developed technologies at farmers mango orchard

Objectives	: To increase sustainable yield of mango To introduce modern mango production technologies
Rationale	: Mango (<i>Mangifera indica</i>) is a popular and nutritious fruit in sub-tropical Asian countries like Bangladesh. The taste and aroma has made it the king of fruits. Mango is generally cultivated in north-western region in Bangladesh like Rajshahi, Chapainawabganj, Naogaon, Dinajpur district. Faridpur has favorable weather condition to produce mango. In 2020-21, 1339-acre orchard in Faridpur produced 2259 ton of mango. Besides orchard, 5823-ton mango was produced in homestead. Average yield of mango in Bangladesh is 10.5 t ha ⁻¹ whereas average yield of mango in orchards of Faridpur is only 4.2 t ha ⁻¹ , which is quite frustrating (BBS Yearbook 2021). This may be due to lack of knowledge about proper management practices of mango orchards. Hence, this study will indicate the conspicuous difference between conventional practice and modern technologies and motivate farmers to adopt modern technologies. In long term, it will help to increase the yield of mango in Faridpur region.
Crop/variety	: Himsagar, Amrapali
Plot size	: 16m×16m
Planting system/spacing	: 4m×4m
Fertilizer dose and methods of application (kg plant ⁻¹)	T ₁ = Farmer's dose T ₂ = Urea-TSP-MoP-Gypsum-Zinc sulphate- Boric acid: 0.875-0.437-0.350-0.350-0.17-0.35 with 35Kg Cowdung. All fertilizers along with half urea and half MoP will be applied in mid-September. Other half of urea and MoP will be applied in two equal splits, one during mid-march and another one before harvest.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Dates of all operation, Yield and yield contributing characters, Major disease and insect incidence, Cost and return, Farmers' opinion
Investigator (s)	: Concerned scientists of OFRD, Faridpur
Season	: <i>Kharif 2</i>
Date of Initiation	: August 2023
Date of completion	: July 2024
Expected output	: Total production and income will increase by at least 20%
Location	: FSRD site, Faridpur
Status	: 1 st
Estimated cost	: Tk. 50,000/-
Source of fund	: PARTNER Project
Priority	: 1 st

Expt. 233 Production Program of BARI Crop varieties at farmers field under AEZ 12

Objective	: To popularize the BARI developed crop varieties in AEZ 12
Rationale	: BARI has developed different high yielding varieties of oat, barley, onion, lentil, grasspea, mustard, sunflower, sesame and groundnut crop. Last few years different improved variety of cereal, pulses and oilseeds crops performed well in the farmer's field Faridpur, Rajbari and Madaripur. These crop varieties will be produced in the farmer's field in a large scale.
Materials and Methods	

Crop/variety	: Onion bulb (BARI Piaz-4), Oat (BARI Oat-1), Barley (BARI Barley-9), Mustard (BARI Sarisha-19), Sesame (BARI Til-6) and Brinjal (BARI Begun-12)
Plot size	: Onion bulb: 1 ha, Oat: 1ha, Barley-1 ha, Mustard: 4 ha, Maskalai-2ha, Sesame-2ha
Planting system/spacing	: Line or broadcasting
Fertilizer dose and methods of application	: Onion bulb: N140 P60 K60 S30 Zn3 B1.5 kg ha-1 All of P, S, Zn and B, and half of N and K will be applied as basal during final land preparation. Remaining N and K will be applied in two equal splits at 25 and 50 DAP under moist soil condition and mixed thoroughly with the soil. Oat: 80-30-50-10-3-1 kg of N-P-K-S-Zn-B ha-1 Half of N and all of P, K, S, Zn and B will be applied at the time of final land preparation. Rest half N will be top dressed in two equal splits at 30 to 35 days after sowing (DAS) and 55-60 DAS after irrigation Barley: 80-30-50-10-3-1 kg of N-P-K-S-Zn-B ha-1 Half of N and all of P, K, S, Zn and B will be applied at the time of final land preparation. Rest half N will be top dressed in two equal splits at 30 to 35 days after sowing (DAS) and 55-60 DAS after irrigation. Mustard: N120P36K40S15Zn2B1kg ha-1 Half of N and full amount of P, K, S, Zn and B will be applied as basal during final land preparation. The remaining N will be applied as top dress at the time of flower initiation stage (25 DAS) Sesame: N100P40K40S20Zn3B2kg ha-1 Half of N and full amount of P, K, S, Zn and B will be applied as basal during final land preparation. The remaining N will be applied as top dress at 25-30 days after sowing.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield, Farmer's opinion, pest incidence
Investigator (s)	: Concerned scientists of OFRD, Faridpur
Season	: Rabi 2023-24 and kharif I 2024
Date of Initiation	: October 2023
Date of completion	: August 2023
Expected output	: Seed/grain yield of said crop and farmer's income will be increased
Location (s)	: FSRD site, Faridpur, MLT site of Rajbari and Madaripur
Status	: New
Estimated cost	: Tk. 100,000
Source of fund	: PARTNER
Priority	: 1st

Expt. 234 Production Program of BARI Crop varieties at farmers field in Gopalganj region

Objective	: To popularize the BARI developed crop varieties in Gopalganj region
Rationale	: BARI has developed different high yielding varieties of Bt Brinjal, Mustard, Potato, Brinjal, Onion, Bottle gourd and Groundnut crop. Last few years different improved variety of these crops performed well in the farmer's field of Gopalganj region. So, varieties of these crops will be produced in the farmer's field in a large scale.
Materials and Methods	
Crop/variety	: Bt Brinjal (BARI Bt Begun-4), Mustard (BARI Sarisa-18), Potato (BARI Alu-72), Brinjal (BARI Begun-12), Onion (BARI Piaz-5), Bottle gourd (BARI Lau-4) and Groundnut(BARI Chinabadam-10)
Plot size	: 0.4 – 4ha (As required)

Planting system/spacing	: Line or broadcasting
Fertilizer dose and methods of application	: BARI Bt Begun-4: N-P-K-S-Zn-B at the rate of 220-90-125-20-2-1 kg ha ⁻¹ . One third MoP and full amount of others fertilizers except urea will be applied during final land preparation. Remaining two third MoP will be divided into three split and applied at 20 days after planting (DAP), at first flowering and first fruiting stage. Urea will be applied in four equal installments at 20 DAP, at first flowering, first fruiting and continuous fruiting stage. BARI Sarisha-18: N120P36K40S15Zn2B1kg ha ⁻¹ Half of N and full amount of P, K, S, Zn and B will be applied as basal during final land preparation. The remaining N will be applied as top dress at the time of flower initiation stage (25 DAS) BARI Alu-72: N-P-K-S-Zn-B @138-40-100-18-1.7-3.6 kg ha ⁻¹ , respectively. Half of N fertilizer and full amount of all others fertilizers will be applied as basal during final land preparation. Rest of the urea will be applied at 20 and 45 days after planting as top dressing. BARI Begun-12: N-P-K-S-Zn-B at the rate of 220-90-125-20-2-1 kg ha ⁻¹ . One third MoP and full amount of others fertilizers except urea will be applied during final land preparation. Remaining two third MoP will be divided into three split and applied at 20 days after planting (DAP), at first flowering and first fruiting stage. Urea will be applied in four equal installments at 20 DAP, at first flowering, first fruiting and continuous fruiting stage. BARI Piaz-5: Cowdung- 10 t ha ⁻¹ and N-P-K-S @120 -54-75- 20 kg ha ⁻¹ , respectively (as for FRG, 2018). The entire quantity of cowdung, P, K, S and 1/2 N fertilizer will be applied during land preparation. Remaining half of N fertilizer will be applied in two equal splits, 25 and 50 days after transplanting.. BARI hybrid tomato-8: Cowdung 10t ha ⁻¹ and N-P-K-S-Zn-B @ 253, 90, 125, 22, 5.5 and 2 kg ha ⁻¹ , respectively. Half of cowdung and full amount of TSP, half of MoP were applied as basal during final land preparation. The remaining half of cowdung was applied during pit preparation. The whole amount of urea and remaining MoP were applied at 10, 25 and 40 days after transplanting. BARI Lau-4: Cowdung 5.0 t ha ⁻¹ and N-P-K-S-Zn-B @ 81-30-87.5-18.18-4.31-1.70 Kg ha ⁻¹ in the form of urea, TSP and MoP, Gypsum, Zinc & Boron, respectively. Half of cowdung and full amount of TSP, half of MoP were applied as basal during final land preparation. The remaining half of cowdung was applied during pit preparation. The whole amount of urea and remaining MoP were applied at 10, 25 and 40 days after BARI Chinabadam-10: N-P-K-S-Zn-B @ 48-48-30-36-2-1.5 kg ha ⁻¹ . Half amount of urea and whole amount of TSP, MP, gypsum and boric acid were applied during final land preparation. The rest half urea was top dressed at the initial stage of peg developments.
Irrigated/rainfed	: Irrigated
Data to be recorded	: Date of all operations, yield, Farmer's opinion, pest incidence
Investigator (s)	: Concerned scientists of OFRD, Gopalganj
Season	: Rabi, 2023-24 and Kharif-I, 2024
Date of Initiation	: October 2023
Date of completion	: August 2023
Expected output	: Seed/grain yield of said crop and farmer's income will be increased
Location (s)	: MLT sites of OFRD, Gopalganj
Status	: New

Estimated cost : Tk. 300,000
 Source of fund : PARTNER
 Priority : 1st

Expt. 235 Production program of BARI Lau-4

Objective : To introduce BARI Lau-4 in farmers' level
 Rationale : Most of the Farmers cultivate commercial hybrid bottle gourd. They spend more money to buy seeds of hybrid bottle gourd. Besides, this hybrid bottle gourd is not platable. On the other hand, BARI Lau-4 is a platable and year-round cultivated variety. This variety is high yielding and market price is higher. So, if the farmer cultivates BARI Lau-4 they will be benefited. Considering this the production of BARI Lau-4 should be increased. Therefore, the present study will be undertaken.

Materials and Methods :
 Plot size : 800 m²
 Planting system : Pit sowing: 4.0m × 4.0m
 Fertilizer dose and application method : FRG, 2018
 Irrigation/ rainfed : Irrigated
 Data to be recorded : Dates of all operation, yield and yield contributing characters, major disease and insect incidence, cost and return analysis, farmers' opinion

Investigators : M H Rahman and K U Ahammad
 Season : Kharif-II and Rabi
 Date of initiation : July 2023
 Date of completion : May 2025
 Expected output : Production of BARI Lau-4 will be increased at farmer's level
 Location : MLT site, Monirampur, Narail and Jhenaidah
 Status : New
 Estimated cost : Tk. 90,000/-
 Source of fund : BARI
 Priority : 1st

Expt. 236 Production program of BARI Begun-12

Objective : To introduce BARI Begun-12 in farmers' field
 Rationale : Very recently Bangladesh Agricultural Research Institute has developed a brinjal variety named BARI Begun-12. This variety produces a big size brinjals. It is high yielding and market price is higher. So, if the farmer cultivates BARI Begun-12 they will be benefited. Considering this the production of BARI Begun-12 should be increased. Therefore, the present study will be undertaken.

Materials and Methods :
 Planting system : Line sowing: 1m × 80cm
 Fertilizer dose and application method : FRG, 2018
 Irrigation/ rainfed : Irrigated
 Data to be recorded : Dates of all operation, yield and yield contributing characters, major disease and insect incidence, cost and return analysis, farmers' opinion

Investigators : M H Rahman and K U Ahammad
 Season : Rabi
 Date of initiation : October 2023

Date of completion : June 2025
 Expected output : BARI Begun-12 will be introduced at farmer's level
 Location : MLT site, Monirampur, Jhenaidah and Narail
 Status : New
 Estimated cost : Tk. 30,000/-
 Source of fund : BARI
 Priority : 1st

Expt. 237 Production program of BARI Borboti-2

Objective : To introduce BARI borboti-2 in farmers' field
 Rationale : Recently Bangladesh Agricultural Research Institute has developed a yard long bean variety which is BARI Borboti-2. This is a dwarf type variety. This variety used to be cultivated as like as mung bean. This variety is high yielding and market price is higher. So, if the farmer cultivates BARI Borboti-2 they will be benefited. Considering this the production of BARI Borboti-2 should be increased. Therefore, the present study will be undertaken.

Planting system : Line sowing: 40m × 20cm
 Fertilizer dose and application method : FRG, 2018
 Irrigation/ : Irrigated
 Data to be recorded : Dates of all operation, yield and yield contributing characters, major disease and insect incidence, cost and return analysis, farmers' opinion
 Investigators : M H Rahman and K U Ahammad
 Season : Kharif
 Date of initiation : February 2024
 Date of : May 2025
 Expected output : BARI Borboti-2 production will be increased at farmer's level
 Location : MLT site, Monirampur, Jhenaidah and Narail
 Status : New
 Estimated cost : Tk. 30,000/-
 Source of fund : BARI
 Priority : 1st

Expt. 238 Production program of BARI Bt Begun-4

Objective : To evaluate the performance of Bt brinjal under the farmers' field condition
 Rationale : Brinjal (*Solanum melongena*) is one of the most important and popular vegetables in Bangladesh. It's grown widely round the year throughout the country. The crop is damaged severely by the notorious insect called Brinjal Fruit and Shoot Borer (BFSB). Due to this insect, the damage ranges from 30-70% depending upon the locality and edaphic conditions. For controlling this pest, farmers frequently applied large quantities of insecticides, but the success is very poor. It has been reported that brinjal received insecticides 60-180 times in a season for controlling its major pest BFSB. It is a serious concern of human health and environment. BARI has developed four Bt brinjal varieties *i.e* BARI Bt begun 1, BARI Bt begun 2, BARI Bt begun 3 and BARI Bt begun 4 which are resistant to BFSB and friendly for human health and environment. to evaluate the performance of Bt brinjal varieties under

the farmers' field condition and to popularize the varieties among the farmers to promote their adoption in different areas of Bangladesh.

Materials and Methods	:	
Planting system	:	Line sowing: 1m × 80cm
Fertilizer dose and application method	:	FRG, 2018
Irrigation/rainfed	:	Irrigated
Data to be recorded	:	Dates of all operation, yield and yield contributing characters, major disease and insect incidence, cost and return analysis, farmers' opinion
Investigators	:	M H Rahman and K U Ahammad
Season	:	Rabi
Date of initiation	:	October 2023
Date of completion	:	June 2025
Expected output	:	BARI Bt Begun-4 will be introduced at farmer's level
Location	:	MLT site, Monirampur and Jhenaidah
Status	:	New
Estimated cost	:	Tk. 40,000/-
Source of fund	:	BARI
Priority	:	1 st

Expt. 239 Pilot Production of oilseeds and aroid in Cumilla Region-1

Objective	:	To raise productivity and economic return by adopting BARI released crop varieties at farm level
Rationale	:	BARI developed different crop varieties and management approaches were evaluated in the farmers field in the previous years and compare their performances with farmers cultivated varieties as well as production practices. If there is any improvement regarding recent technology (both varietal and management approaches) for at least two successive years, then it is considered to be a new technology for large scale production. Last few years different improved variety of cereals, pulses, oilseeds, vegetables, and spices crops performed well in the farmer's field. Hence the production programs of different crops/varieties were undertaken.
Materials and methods:	:	N/A
Crop/variety	:	Mustard (var. BARI Sarisha-14, 17& 18), Sesame (var. BARI Til-6) and Soybean (var. BARI Soybean-6) and aroid (var. BARI Panukachu-1)
Plot size	:	Mustard variety each for 2 ha and others for 1 ha
Planting system	:	Line sowing/Broadcasting
Fertilizer dose application	:	As per FRG, 2018
Irrigated/rainfed	:	Irrigated
Data to be recorded	:	Date of all operations, yield, Farmer's opinion, pest incidence
Investigator(s)	:	M. Jamal Uddin, PSO, OFRD, Cumilla and other relevant Scientist of OFRD
Season	:	Rabi 2023-24 and kharif I 2024
Date of initiation	:	October 2023
Date of compilation	:	September 2024
Expected output	:	Seed/grain yield of said crop and farmer's income will be increased
Location	:	Cumilla

Status : New
 Estimated cost : Tk. 100000/-
 Source of fund : PARTNER Project
 Priority : 1st

Expt. 240 Production Program of BARI Crop/fruit varieties at farmers field in Cumilla Region

Objective : To popularize the BARI developed crop/fruit varieties in Cumilla region
 Rationale : BARI has developed different high yielding varieties of crops and fruits. In Cumilla region, there is high demand of some promising crop/fruit variety which needs to be upscale for raising productivity and farmer's income.
 Materials and Methods : N/A
 Crop/variety : Mustard (BARI Sarisha-20), Sesame (BARI Til-6), Okra (BARI Dheros-2), Sponge gourd (BARI Dondul-1), Bottlegourd (BARI Lau-4), Country bean (BARI Sheem-7), Ridge gourd (BARI Jhinga-2), Aroid (BARI Mukhikachu-2), Potato (BARI Alu-25 & 40), Tomato (BARI Tomato-17), Brinjal (BARI Begun-10 & 12), Sunflower (BARI Surjamukhi-3), Yard long bean (BARI Barboti-1 & 2), Danta (BARI Danta-1) and Mango (BARI Aam-3, 4, 8, 11)
 Plot size : Ranges from 20 decimal to 50 decimal for each variety of each crop.
 Planting system/spacing : Line or broadcasting or as per design of crop.
 Fertilizer dose and methods of application : As per FRG, 2018
 Irrigated/rainfed : Irrigated/rainfed
 Data to be recorded : Date of all operations, yield, farmer's opinion, pest incidence
 Investigator (s) : M. Jamal Uddin, PSO, OFRD, Cumilla and other relevant Scientist of OFRD
 Season : Rabi 2023-24 and kharif I 2024
 Date of Initiation : October 2023
 Date of completion : August 2023
 Expected output : Seed/grain yield/fruit yield of said crop and farmer's income will be estimated
 Location (s) : MLT site of OFRD Cumilla
 Status : New
 Estimated cost : Tk. 200,000/-
 Source of fund : BARI
 Priority : 1st

Expt. 241 Pilot Production Program of BARI Sarisha-18

Objectives : To introduce BARI Sarisha-18 in farmers' field
 Rationale : Bangladesh's agricultural land is becoming insufficient for oilseed crops as the major farmlands are utilized for the cultivation of food crops and other cash crops. Mustard/rapeseed oil remains the main oilseed crop. The main oils produced in Bangladesh are rapeseed oil (54%), soyabean oil (10%) and coconut oil (9%). But the production of cooking oil is very low. BARI Sarisha-18 is proved as good quality cooking oil with very low presence of uric acid. So, the production program is undertaken to create new area for canola (Sarisha-18) production.

Procedure/Methods
 Crop/Variety : Mustard: BARI Sarisha-18
 Planting system : Broadcasting
 Area : 1 ha
 Fertilizer dose : As per recommendation based on FRG/2018
 Data to be recorded : Yield and yield attributes
 Season : 2023-24
 Date of initiation : November, 2023
 Expected output : Produce good quality cooking oil (Sarisha-18) at farmer's level
 Status : 1st year
 Estimated cost : Tk. 60,000/-
 Source of Fund : BARI
 Location : MLT site, Sayestagonj
 Investigators : Concerned scientist of OFRD, Sylhet
 Priority : First

Expt. 242 Pilot production program of BARI Sarisha- 14, BARI Sarisha- 17 and BARI Sarisha- 18

Objectives : 1. To popularize the BARI developed mustard variety in Sylhet region
 2. To increase oilseed production and farmer's income
 Rationale : Bangladesh has an acute shortage of oil seeds in respect of its demand. Lack of suitable high yielding mustard varieties are major reasons of this deficit. The farmers of Sylhet area generally grow local mustard variety after harvest of T. Aman rice. The yield potentiality of this local variety is very low. Furthermore, farmers sow mustard after harvest of long duration local T. Aman rice and hence, get a very low yield due to late planting and increase in soil salinity. Oil Seed Research Centre of BARI has developed some high yielding mustard varieties. Therefore, this program is undertaken.
 Materials and Methods :
 Crop /Variety : Mustard: BARI Sarisha- 14, BARI Sarisha- 17 and BARI Sarisha- 18
 Replication : -
 Land area : 4 ha
 Sowing time : November, 2023
 Fertilizer dose : As per recommendation based on FRG/2018
 Data to be collected ; Dates of all operations, Yield and yield attributes, Major disease and pest incidence, Economic analysis, Farmers' opinion & Soil salinity
 Expected output : Increased oil seed production and cropping intensity in the Sylhet area
 Status : New
 Date of initiation : November, 2023
 Estimated cost : Tk. 60000/-
 Source of fund : BARI
 Location : FSRD site, Kamalbazer and MLT sites Jagannathpur/ Sayestagonj/Kulaura (Kamalgonj)
 Investigator (s) : PSO, OFRD, Sylhet

Expt. 243 Pilot production program of BARI Panikachu-1

Objectives : To introduce BARI Panikachu-1 in farmers' field

Rationale : Taro (*Colocasia esculenta* L.), also called Panikachu in Bangladesh, is an aqua edible aroid belonging to the family Araceae that contains 106 genera and more than 1500 species (Wilson and Siemonsma, 1996; Paul et. al., 2011). It is one of the most important tuber crops in Bangladesh commercially grown in all parts of the country during the summer season (Mondal *et al.*, 2011). The crop has good potential for production in the wet season and can survive a certain period in floodwater. They are rich in calcium, phosphorus, iron, vitamin C, thiamine riboflavin and niacin which are important constituents of human diet (Holland et al., 1991). Most of the araceae plants or plant parts (leaf, petiole, rhizome, corms, stolon, flowers, etc.) are used directly or indirectly in Bangladesh for animal and human beings in different ways (Saha and Hussain, 1983). Demand of aroids in Bangladesh is increasing year after year, but its yield per unit area is very low. It is a popular crop in Sylhet area but many farmers grow local varieties. Yield potentiality of the local variety is low and susceptible to different pest and diseases. BARI has developed three panikachu varieties, of them BARI Panikachu-1 (Latiraj) is released as high yielding variety in 1998. The present study was therefore undertaken to study adaptability and to introduce BARI Panikachu-1 to increase yield as well as income of farmers.

Procedure/Methods

Crop/Variety : Aroid: BARI Panikachu-1

Planting system : Line

Area : 1 ha

Fertilizer dose : As per recommendation based on FRG/2018

Data to be recorded : Yield and yield attributes

Season : Kharif

Date of initiation : February, 2024

Expected output : Medium low fallow land will be utilized and variety will be disseminated.

Status : 1st year

Estimated cost : Tk. 40,000/-

Source of Fund : BARI

Location : MLT site, Sayestagonj

Investigators : Concerned scientist of OFRD, Sylhet

Priority : First

Expt. 244 Pilot production program of Sesame

Objectives : To introduce BARI Til-5 in farmers' field

Rationale : Til (*Sesamum indicum*) is an important oil crop in Bangladesh. In terms of acreage, it is next to mustard. In Bangladesh, 38,866 hectares of land (2003-04) are cultivated under sesame with a production of 25,000 metric tons of seed showing a yield of 640 kg/ha (BBS, 2004). It can be cultivated both in kharif and rabi seasons. The main regions are greater Faridpur, Barishal, Rangamati, Dinajpur, Pabna, Khulna, Dhaka, Mymensingh, and

Comilla. The seed on an average consists of 47% oil and 20% protein (Rahman, 1976). BARI has developed some sesame varieties and their performances at farmer's field are satisfactory. However, these varieties were not tested in Sylhet condition. But before suggesting the suitable varieties for Sylhet, their agro-economic performances need to be tested in the farmer's field. So, this trial was under taken to evaluate the performance of BARI developed sesame varieties in the farmer's field of Sylhet region.

Procedure/Methods

Crop/Variety	: Sesame: BARI Til-5
Planting system	: Broadcast
Area	: 1 ha
Fertilizer dose	: As per recommendation based on FRG/2018
Data to be recorded	: Yield and yield attributes
Season	: Kharif
Date of initiation	: February 2024
Expected output	: Increase sesame production and income of farmer.
Status	: 1 st year
Estimated cost	: Tk. 40,000/-
Source of Fund	: BARI
Location	: MLT site, Sayestagonj
Investigators	: Concerned scientist of OFRD, Sylhet
Priority	: First

Expt. 245 Production program of BARI Sarisha-20

Objectives	: To introduce BARI Sarisha-20 in farmers' field
Rationale	: Bangladesh's agricultural land is becoming insufficient for oilseed crops as the major farmlands are utilized for the cultivation of food crops and other cash crops. Mustard/rapeseed oil remains the main oilseed crop. The main oils produced in Bangladesh are rapeseed oil (54%), soyabean oil (10%) and coconut oil (9%). It is needed to disseminate new mustard variety to the farmers.

Procedure/Methods

Crop/Variety	: Mustard: BARI Sarisha-20
Planting system	: Broadcasting
Area	: 60 dec
Fertilizer dose	: As per recommendation based on FRG/2018
Data to be recorded	: Yield and yield attributes
Season	: 2023-24
Date of initiation	: November, 2023
Expected output	: Produce good quality cooking oil (Sarisha-20) at farmer's level
Status	: 1 st year
Estimated cost	: Tk. 40,000/-
Source of Fund	: BARI
Location	: MLT site, Jagannathpur
Investigators	: Concerned scientist of OFRD, Sylhet
Priority	: First

Expt. 246 Production program of Sesame

- Objectives : To introduce BARI Til-6 in farmers' field
- Rationale : Til (*Sesamum indicum*) is an important oil crop in Bangladesh. In terms of acreage, it is next to mustard. In Bangladesh, 38,866 hectares of land (2003-04) are cultivated under sesame with a production of 25,000 metric tons of seed showing a yield of 640 kg/ha (BBS, 2004). It can be cultivated both in kharif and rabi seasons. The main regions are greater Faridpur, Barishal, Rangamati, Dinajpur, Pabna, Khulna, Dhaka, Mymensingh, and Comilla. The seed on an average consists of 47% oil and 20% protein (Rahman, 1976). BARI has developed some sesame varieties and their performances at farmer's field are satisfactory. However, these varieties were not tested in Sylhet condition. But before suggesting the suitable varieties for Sylhet, their agro-economic performances need to be tested in the farmer's field. So, this trial was undertaken to evaluate the performance of BARI developed sesame varieties in the farmer's field of Sylhet region.

Procedure/Methods

- Crop/Variety : Sesame: BARI Til-6
- Planting system : Broadcast
- Area : 100 dec
- Fertilizer dose : As per recommendation based on FRG/2018
- Data to be recorded : Yield and yield attributes
- Season : Kharif-1
- Date of initiation : February 2024
- Expected output : Increase production and income of farmer.
- Status : 1st year
- Estimated cost : Tk. 60,000/-
- Source of Fund : BARI
- Location : MLT site, Jagannathpur
- Investigators : Concerned scientist of OFRD, Sylhet
- Priority : First

Expt. 247 Production program of BARI Bottle gourd variety

- Objectives : To introduce BARI Lau-4 in farmers' field
- Rationale : Bottle gourd [*Lagenaria siceraria* (Mol.) Stand.] is a popular winter vegetable in Bangladesh. It belongs to the family Cucurbitaceae. The cultivated species is commonly known as bottle gourd or white flowered gourd. The climatic condition of winter in Bangladesh favours better growth and yield of bottle gourd. Bottle gourd is widely cultivated throughout the country. In sylhet region, acute crisis of vegetable during summer season due to heavy rainfall. On-farm trial proved that BARI Lau-4 is a good summer variety successfully grown in sylhet region. So, the production program has been undertaken.

Procedure/Methods

- Crop/Variety : Bottle gourd: BARI Lau-4
- Planting system : Pit method
- Area : 100 dec
- Fertilizer dose : As per recommendation based on FRG/2018
- Data to be recorded : Yield and yield attributes

Season	: Kharif
Date of initiation	: February, 2024
Expected output	: Increase vegetable production and income of farmer.
Status	: 1 st year
Estimated cost	: Tk. 60,000/-
Source of Fund	: BARI
Location	: MLT site, Kulaura
Investigators	: Concerned scientist of OFRD, Sylhet
Priority	: First

Expt. 248 Production program of BARI Alu- 72 and BARI Alu-73

Objectives	: 1. To popularize the BARI developed mustard variety in Sylhet region 2. To increase potato production and farmer's income
Rationale	: Bangladesh has an acute shortage of potato in respect of its demand. Lack of suitable high yielding mustard varieties are major reasons of this deficit. The farmers of Sylhet area generally grow local potato variety after harvest of T. Aman rice. The yield potentiality of this local variety is very low. Furthermore, farmers sow potato after harvest of long duration local T. Aman rice and hence, get a very low yield due to late planting and increase in soil salinity. Tuber Crops Research Centre of BARI has developed some high yielding potato varieties. Therefore, this program is undertaken.
Materials and Methods	:
Treatments	: Potato variety: BARI Alu 25 and BARI Alu 40
Replication	: Block
Land area	: 100 dec.
Sowing time	: November, 2023
Fertilizer dose	: As per recommendation based on FRG/2018
Data to be collected	; Dates of all operations, Yield and yield attributes, Major disease and pest incidence, Economic analysis & Farmers' opinion Soil salinity
Expected output	: Increased potato production and cropping intensity in the Sylhet area
Status	: New
Date of initiation	: November, 2023
Estimated cost	: Tk. 80000/-
Source of fund	: BARI
Location	: FSRD site, Kamalbazer
Investigator (s)	: PSO, OFRD, Sylhet

Expt. 249 Production program of BARI Sunflower variety

Objectives	:	To introduce BARI surjomukhi-3 in farmers' field
Rationale	:	Bangladesh's agricultural land is becoming insufficient for oilseed crops as the major farmlands are utilized for the cultivation of food crops and other cash crops. The main oils produced in Bangladesh are rapeseed oil (54%), soyabean oil (10%) and coconut oil (9%). But the production of cooking oil is very low. BARI surjomukhi-3 is proved as good quality cooking oil with very low presence of uric acid. So, the production program is undertaken to create new area for (BARI surjomukhi-3) production.
Procedure/Methods		
Crop/Variety	:	Sunflower: BARI surjomukhi-3
Planting system	:	Line sowing
Area	:	60 dec
Fertilizer dose	:	As per recommendation based on FRG/2018
Data to be recorded	:	Yield and yield attributes
Season	:	Robi
Date of initiation	:	November, 2023
Expected output	:	Produce good quality cooking oil (BARI surjomukhi-3) at farmer's level
Status	:	1 st year
Estimated cost	:	Tk. 60,000/-
Source of Fund	:	BARI
Location	:	MLT site, Kulaura
Investigators	:	Concerned scientist of OFRD, Sylhet
Priority	:	First

Rapporteurs Report

Technical Session-I: Improvement of Cropping Systems

1. The name of crops and varieties with management practice to be mentioned in the report.
2. If possible more than one alternate cropping patterns should be tested against one existing cropping pattern
3. Average price of the output to be considered during cost and return analysis.
4. Boro rice should not be replaced by other crops under Boro-Fallow-T. Aman cropping pattern.
5. Cropping patterns in unstable charlands should be selected based on the local ecological situation (drought, rainfall, flash flood, river erosion etc.).
6. Context and justification of the replacement of the crops/varieties and advantage over existing pattern should be mentioned.
7. Turnaround time should be mentioned in cropping pattern experiments.
8. In cropping system experiments, MBCR to be calculated; not BCR.
9. Well defined format for report writing to be followed.
10. Factors related to the sustainability of the developed technologies should be considered.
11. In cropping pattern experiments the term “improvement” to be used when variety is changed and the term “development” to be used when new crop is included.
12. In the southern coastal region, BRRRI dhan52 should be used instead of BRI dhan49.
13. It was suggested not to include bulb onion production after mustard in Mustard-Onion-T. Aman cropping pattern.
14. Discussion with farmers should be done before program planning.
15. For technology adoption availability of seeds is the most important factor.
16. MBCR is not only the indicator of profitability of a technology.
17. Impact study can be done withdrawing of input supply.
18. Incorporation of mustard in Fallow-Boro-T. Aman should be emphasized.
19. Food security and government priority should be considered during program planning.
20. Not only yield but also soil, nutrition, farmers’ preference, market demand etc. should be considered during program planning.
21. Why farmers let his land fallow in a cropping pattern should be investigated.
22. Inclusion of legume crops or crop residue incorporation is important for maintenance of soil health.
23. Success story of a technology to be documented through video clipping.
24. Emphasis should be done on unfavorable ecosystem.
25. Simple treatment should be designed in mixed cropping experiment.
26. Different index should be used in report preparation of inter/mixed cropping experiments.
27. OFRD can validate/disseminate intercropping or mixed cropping technologies developed by Agronomy division or ORC.
28. Mature technology on ICS developed by Agronomy division should be emphasized.
29. Number of replication in On-Farm experiments to be at least six and error df of an experiment should be at least 6.
30. Number of treatments to be minimized for good management of an experiment in farmers’ field.
31. Wide variation of yield in different years should be explained. If it is observed experiment should be repeated for the next year.
32. Report presentation can be done based on unfavorable ecosystems (haor, charland, saline area, drought prone area and hill).

33. Research report can be presented by respective scientist or a program leader can be formed who will lead the experiments from planning to reporting and he will present the report.
34. In ICS program scientists from entomology, pathology and soil science division may be involved.
35. All formula and references to be placed at the end of the report as appendix.
36. One year result cannot be recommended for large scale production, at least two years result is needed.
37. In conclusion research findings should be highlighted first.
38. BCR cannot be calculated from variable cost in component technology.

**Technical Session II: i) On-Farm Soil Fertility Management
ii) On-Farm Trials with Advanced Lines and Technologies**

1. Abstract and conclusion should be precise
2. Objectives should be reflected in the conclusion section
3. Use farmer practice instead of absolute control
4. In case of fertilizer calculation – no need to show up to decimal point
5. In Zn deficient soil – only B was applied
6. Oat – recheck farmer practice
7. Bulb yield will be considered for showing Garlic yield
8. In case of lentil, the term ‘grain yield’ would be used as seed yield and the term ‘straw yield’ would be used as stover yield
9. Initial and post soil analysis after three years are important
10. For pH data – one decimal point is enough to mention
11. In case of vermicompost – what was the source of vermicompost
12. Experiment-3 : Maize yield reduction (approx. 30 %) in 2nd yr
13. Brinjal (50 % NPK) should check
14. Long-term experiment should be carried out by multidisciplinary scientists
15. In case of economic analysis – no need statistical analysis
16. It is important to write 17 % B instead of 20 % B
17. 1.5 kg/ha boron should be applied to sunflowerSunflower is good responsive to B as pollination is hampered due to lack of B
18. The yield of rice at Gazipur CA experiment is showing 9.4 t/ha which is required to be checked
19. It is need to be checked the N rates as rice crop is prone to lodge by application of N170 kg/ha
20. It is important to clear the source of N, P and K
21. Absolute control should not be mentioned
22. Soil pH become high by burning rice straw
23. Soil moisture data is important for vermicompostIn case of IPNS experiment, it is important to give final soil properties after completion of three years period
24. The residual effects of mungbean crop will be checked in cropping pattern experiments
25. Some reports are over two pages, which should be maintained
26. Research should be undertaken to address the issues of 6 hotspots
27. It is important to use FRG instead of STB
28. BARI released varieties should be used instead of local varieties in Garlic-Brinjal Experiment
29. The experiment must run in 3rd year if the yield differs from 1 yr and 2nd yr
30. Nowadays we have to do our research using Khamari Apps
31. Crop wise rice equivalent yield and MBCR to be given
32. After two years cycle, pooled analysis for year 2 to be given
33. Nutrient adjustment to be given before starting Expt 2 and after 2 years cycle

34. Yield of crop to be given in row in case of cropping pattern and whole pattern
35. LSD value to be given instead of lettering
36. BCR calculation is necessary but availability to be ensured and justified
37. Bt brinjal, recommended fertilizer + 50 % NPK additional gave higher fruit yield. Is it justified to increase dose where recommended fertilizer is high?
38. Fertilizer dose based on FRG/2018 to be rational

39. Coffee – Disease and pest infestation percentage – it is necessary to consult entomologist and pathologist to collect data
40. Yield of each variety should be shown separately
41. The availability of seed of potato varieties should be on time
42. Gross margin and TVC of sorghum is not needed for varietal trial
43. Pest infestation should be recorded for varietal trial with crop duration, sowing and harvesting date
44. Pest incidence monitoring in Adaptive trial of potato could be a good approach by different locations
45. Regional yield trial of pulse crops to be under the observation of PRC and OFRD
46. Oilseed crop (mustard, sesame, sunflower and groundnut) should be given emphasis to expand in char areas to minimize the deficit
47. Chilli and onion to be given preference to grow this crop in char areas
48. Turmeric var. BARI Halud-4 to be most promising one so large scale dissemination to be done where applicable
49. Barley varieties trial should be uniform in all sets
50. Varietal trial of barley with only one variety should go for production program rather than on-farm trial
51. BARI Kaon 2/3 and BARI Cheena-1 to be disseminated at more char areas
52. Any title of the experiment should be decided in the programme planning season
53. Problem of any variety of crops to be addressed

Technical Session-III:i) Integrated Farming
ii) Socioeconomic Studies
iii) Transfer of Technology

1. Session chair suggested the contribution of BARI in GDP should be calculated
2. Haor ecosystem should be included under farming systems research
3. Farming systems research should be continue from core fund of BARI with all the components.
4. Fallow land areas should be shown in power point presentation for cropping pattern experiment.
5. Clear and representative good quality pictures should be added in power point presentation.
6. Yield increase data should be presented in percentage.
7. The production, selling price before and after need to be checked in Faridpur.
8. Yield increase data should be presented in percentage.
9. Dr. Jamal, OFRD, Cumilla can help to formulate farming system formulation through farming system analysis tools.
10. Different success stories videos OFRD activities should be presented.
11. Report title, presenter name and presentation time should be mentioned.
12. Dragon fruit, Chia seed, Quinoa can be produced in the homestead areas.
13. Mature technologies should be supplied to DAE for dissemination.
14. Measures should be taken so that farming system activities sustains without support.
15. Not only quantitative but also qualitative data should be presented for farming systems research.

16. Body Mass Index, stunting and wasting data of stakeholders should be recorded for integrated farming research. .
 17. Rice Equivalent Yield of coastal areas should be checked.
 18. BIRTAN report may be followed to find out nutrients content of foods.
 19. The term of safe food instead of organic food should be used.
 20. Pie chart should be used only for presenting percentage data.
 21. The yield of BARI Sarisha-18 should be checked.
 22. Cost and return should be used instead of economic analysis.
 23. Quality research work of OFRD should be published in scientific journals with appropriate economic analysis.
 24. More training programs should be arranged for the development of scientists.
 25. Large scale research work regarding Charland and Haor should taken by OFRD.
 26. SOCIOECONOMIC STUDIES
 27. Title of the adoption of hybrid tomato report should be corrected.
 28. Adoption rate of summer tomato should be mentioned for all the districts.
 29. Methodology is not clear for nano fertilizer survey report.
 30. Nano fertilizer is not available in Bangladesh so the nano fertilizer related research work should not be taken.
 31. Fund should be insured for fruitful survey works.
 32. Coriander leaf related research work should be taken including the BARI varieties.
 33. Summer tomato seed should be produced by OFRD.
 34. Yield variation causes should be explained.
 35. Sample number of survey should be at least 30 for each district
- TRANSFER OF TECHNOLOGY
36. Seedling number of Bandorban should be checked.
 37. Yield variation should be explained.
 38. Diseases and insect infestation should be mentioned properly in research report and presentation.
 39. The yield of BARI Gom-33 at Bagerhat should be checked.
 40. Negative impression of the farmers should be mentioned in the report and presentation.
 41. BARI Felon should be piloting in Chittagong and Cox's Bazar.
 42. Lentil performs better as relay crop against sole cropping of lentil.
 43. Bt brinjal seed production and other management should be done in proper time. At the end, the session chair thanked the participants for their active participation in the workshop.
 44. He also gave thanks to all presenters for maintain their allocated time and participants of their patience hearing & cordial discussion.

Technical session IV & V: Program Planning

1. More heat tolerant tomato varieties should be developed and disseminated throughout the country.
2. Future forecasting of the land use regarding crop production may be done by APSIM modeling and it should be continued to identify and estimation of a cropped area/cultivable land under the fragile ecosystem.
3. APSIM modeling should be carried out on BARI mandated crops with specific objectives and satellite images should be used to detect upper catena for BARI mandate crops in haor areas.
4. A sufficient supply of quality planting materials should be ensured before the dissemination of technology/ies among the farmers.
5. Duplication of the research work should be avoided and discarded.
6. Floating bed technology should be designed/improved based on farmers' existing practices and Floating bed should be prepared by hyacinth and mixed with soil at rabi season.
7. Short duration rice should be selected in cropping pattern and demonstrated in block.
8. Garlic cultivation in floating beds should be popularized through largescale dissemination.

9. New research program should be taken on seaweed multiplication, uses and processing.
10. Farmers innovation should be documented regarding crop production, processing, and post-harvest operations.
11. Zero tillage Potato cultivation should be limited to a small scale for home consumption only and the title of the experiment should be corrected.
12. Proven technology should be identified and documented for the six fragile ecosystems.
13. Experiments should be taken on watermelon cultivation in haor areas during the off season.
14. MBCR or BCR should be calculated in modeling experiment.
15. The observation of the nutrition survey should be categorized.

OFRD, Manikganj

1. The title of the experiment should be corrected as “Performance of early bulking potato varieties as intercrop with winter hybrid maize at Manikganj”. The suggested spacing of potato and maize will be 60 cm x 25 cm and 75 cm x 25 cm.
2. In case of cropping pattern development study, variety BRRI Dhan98 and BARI Hybrid Maize -16 will be included instead of BRRI Dhan48 and commercial hybrid maize, respectively.
3. Sowing time of Bitter gourd seeds should be one month early in case of Bitter gourd trial.

OFRD, Tangail

4. For development of cropping pattern 2/3 cropping patterns should be tested including T. aman rice instead of four crops-based cropping patterns.
5. A comprehensive evaluation trial including all local varieties around the country and imported MB-2 variety should be conducted at Tangail, Narsingdi and Sylhet to develop variety.
6. Program should be taken for upscaling BARI varieties of Sweet gourd, Sesame and other suitable crops in Char areas.
7. Fallow land of char areas should be brought under cultivation of suitable crops.
8. Mix cropping and relay cropping experiment should be designed with the consultation of Agronomy Division.
9. Three sowing time like early, optimum and late can be considered for Capsicum trial.
10. Sowing time of BARI Begun-12 should be adjusted with location specific planting time (September to November).
11. Pilot production program with BARI Sajina-1 should be conducted at homestead/roadside instead of trial with local variety.
12. Hybrid BARI variety should be included in case of on-farm trial with pointed gourd.
13. Fruit orchard should be established with the guidance of CSO, Fruits Division, HRC, BARI.

OFRD, Mymensingh

14. The experiment “Effect of variety and size of cormel on corm production of gladiolus” will be dropped.
15. In case of irrigation trial with coffee, crop growth stage should be reviewed and measurement of water should be done.
16. In case of relay cropping trial, the title will be corrected as “Relay cropping of Tomato+ Sweet gourd with Cabbage”.
17. The trial “Effect of different sowing date on BARI Sarisha-18” will be dropped.
18. The trial “Effect of intercropping on pod borer infestation in yard long bean with brinjal” will be dropped.

19. The trial “Management of cutworm in aroid” will be dropped.
20. Observation trial on BARI summer onion varieties should be considered instead of trail with winter onion varieties.
21. The experiment “Effect of biodegradable mulching on purple sweet potato variety” will be dropped.

OFRD, Patuakhali

22. In case of sunflower experiment, the title will be corrected as “Effect of variety and sowing date on sunflower”. Sowing date should be designed with 7 days interval.
23. In case of cropping pattern trial, the title will be “Development of cropping pattern Spinach-Bitter gourd-T. Aman rice against Fallow-Fallow-T. Aman cropping pattern”.
24. The title of Mungbean trial will be corrected as “Effect of sowing window on mungbean in coastal saline soils of Bangladesh”.

OFRD, Barishal

25. Mustard relaying with T. aman rice technology should be taken under pilot production instead of experimentation with mustard varieties and sowing methods.
26. On-Farm trial of Black gram varieties can be considered for Patuakhali/Barishal region.
27. In case of Sorjan based experiment, BARI Misti Alu-16, 17, pit crop and pulse crop should be included. Hog plum will be replaced by Golden apple in the title.
28. The experiment “Performance of mungbean as intercropped with watermelon” can be considered as observation trial.

OFRD, Bhola

29. Experiment on intercropping should be designed with the consultation of Agronomy Division.

OFRD, Faridpur

30. Incase of integrated nutrient management experiment, STB dose will be included instead of Khamari Mobile Apps and Farmers practice will be included instead of control.
31. The experiment “Effect of different plant growth regulators on chilli in Faridpur” will be dropped.
32. The trial “Effect of different doses of selective herbicide on Sesame production” will be dropped. Application of recommended dose of herbicide is suggested for sesame.
33. BJRI developed jute variety should be included in the experiment “Improvement of grasspea (zero tillage)-Jute-T. aman in Madaripur”.
34. The experiment “On-Farm trial of Safflower variety in riverine island in Faridpur” will be dropped.

OFRD, Gopalganj

35. The word **newly released** will be deleted from the title of the experiment of adaptive trial of sweet potato in Gopalganj region.

OFRD, Khulna

36. Upscaling program should be taken on alternate furrow irrigation for potato instead of validation trial.
37. Pilot production program should be undertaken to popularize BARI Elephant foot yam varieties instead of adaptive trial.

38. Proper review is needed prior to design any research work.

39. The experiment “Intercropping cauliflower with Bt brinjal variety in coastal region” will be dropped.

General comments/Suggestions

- Mature technologies of Agronomy Division will be validated through On-Farm Research Division.
- Previous work should be reviewed before designing new experiment.
- Smart technology development (Nano technology, Robotics) can be addressed in future research.
- Quality of research work should be improved instead of quantity.
- Technologies should be fine-tuned as per field level feedback.
- Research work should be strengthened to increase shelf life of fruits (Mango, Guava, Jujubee).
- Research work should be aligned with farmers problems.
- BARI and BRRI should develop linkage for coordinated research work.
- BRRI can work together with OFRD, BARI.
- Priority research on stress tolerant variety development and upscaling at farmers’ field.
- PARTNER Project will open greater scope for wide scale adoption of BARI varieties at farmers’ field.

বার্ষিক কর্মসম্পাদন চুক্তি, ২০২৩-২৪ (সেকশন-৩)
সরেজমিন গবেষণা বিভাগ

কর্মসম্পাদন ক্ষেত্র	ক্ষেত্রের মান	কার্যক্রম	সূচক	সূচকের মান	একক	লক্ষ্যমাত্রা
[১] ফসলের উৎপাদন ও উৎপাদনশীলতা বৃদ্ধি	৩৫	১.১ বিভিন্ন ফসলের উচ্চফলনশীল/পুষ্টিসমৃদ্ধ/ প্রতিকূল পরিবেশ সহনশীল ইত্যাদি জাত ও প্রযুক্তি উদ্ভাবন ১.২ উদ্ভাবিত জাত এবং প্রযুক্তির সম্প্রসারণ	১.১.৩ উদ্ভাবিত অন্যান্য প্রযুক্তি (সেচের দক্ষতা বৃদ্ধি, হাইড্রোপনিক, শারীরতাত্ত্বিক ইত্যাদি)	সংখ্যা	৫	১০
			১.২.১ প্রশিক্ষিত কৃষক	সংখ্যা	৫	৪৫০
			১.২.৩ স্থাপিত প্রদর্শনী	সংখ্যা	৭	১৫০
			১.২.৪ আয়োজিত সেমিনার/ওয়ার্কশপ	সংখ্যা	২	১
			১.২.৫ আয়োজিত মাঠ দিবস/র্যালী	সংখ্যা	৩	১০
			১.২.৬ হস্তান্তরিত জাত	সংখ্যা	৩	৫
			১.২.৭ হস্তান্তরিত প্রযুক্তি	সংখ্যা	৫	১০
			১.২.৮ বার্ষিক গবেষণা রিপোর্ট প্রকাশিত	সংখ্যা	২	১
			১.২.৯ লিফলেট, নিউজলেটার, বুকলেট, জার্নাল ইত্যাদি প্রকাশিত	সংখ্যা	৩	৩
[২] কৃষি উপকরণের সহজলভ্যতা ও সরবরাহ বৃদ্ধিকরণ	২০	২.২. ব্রিডার, ভিত্তি, প্রত্যাশিত ও মানঘোষিত বীজ উৎপাদন, প্রত্যয়ন, সংরক্ষণ এবং বিতরণ	২.২.২ উৎপাদিত মানঘোষিত বীজ	কেজি	৫	৩০০০
			২.২.৩ উৎপাদিত চারা/কলম/কাটিং	সংখ্যা	৫	১০০০০
			২.২.৫ বিতরণকৃত মানঘোষিত বীজ	কেজি	৫	৩০০০
			২.২.৬ বিতরণকৃত চারা/কলম/কাটিং	সংখ্যা	৫	১০০০০
[৩] কৃষি ভূসম্পদ ব্যবস্থাপনার উন্নয়ন ও রক্ষণাবেক্ষণ	১০	৩.১ মাটি, পানি, সার ব্যবস্থাপনা ও উন্নয়ন	৩.১.৩ জৈবসার (কম্পোস্ট ও ভার্মিকম্পোস্ট) উৎপাদিত	কেজি	৫	১৫০০০
			৩.১.৪ (কম্পোস্ট ও ভার্মিকম্পোস্ট) বিতরণকৃত	কেজি	৫	১৫০০০
[৪] কৃষি পণ্যের সরবরাহ, প্রক্রিয়াজাতকরণ ও অভ্যন্তরীণ বাজারে বিপণন ও রপ্তানীতে সহায়তা	৫	৪.২ ফসল উৎপাদন ও বাজারজাতকরণে আর্থ-সামাজিক গবেষণা	৪.২.১ ফসল উৎপাদনের লাভ-ক্ষতি বিশ্লেষিত	সংখ্যা	৫	৩