Annual Research Programme 2025-2026

Bangladesh Sugarcrop Research Institute

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2025-2026

Bangladesh Sugarcrop Research Institute
Ishwardi, Pabna

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FOREWORD

It's a great pleasure and pride to present the Annual Research Programme 2025–2026 of the Bangladesh Sugarcrop Research Institute (BSRI). We are delighted to have successfully compiled and published this significant document, which holds critical importance not only for agricultural science but also for sustainable economic development, environmental conservation, and the goal of ensuring safe and sufficient sugar availability for consumers. This aligns with BSRI's vision and mission, contributing meaningfully to the agricultural sector and ultimately enhancing the Gross National Product (GNP) and Gross Domestic Product (GDP) of Bangladesh. As the only pioneering institution dedicated exclusively to sugarcrop research within the National Agricultural Research System (NARS) of Bangladesh, BSRI continues to play a pivotal role in addressing the country's long-standing sugar crisis. This is particularly vital in the context of decreasing arable land and a rapidly growing population. We remain committed to adopting forward-thinking strategies to strengthen our research efforts through innovation-developing modern, stress-tolerant sugarcrop varieties; advocating for hydroxide-and chemical-free sugar and *gur* production; and promoting eco-friendly, bio-organic solutions to combat plant diseases and pests.Our outreach initiatives ensure the effective dissemination of cutting-edge technologies to farmers, reinforcing our national vision of building a sustainable, secure and self-sufficient sugar industry.

This research programme is thoughtfully designed based on the needs identified during the Research Extension Workshop 2025, aligning with national development priorities and current industry trends. The programme development process included collaboration with farmers, sugar mills, NGOs, SMEs, and other key stakeholders. Research priorities were identified through rigorous discussions across BSRI divisions and validated through the collective efforts of internal and external experts.The final structure of this programme is the outcome of three key workshops: the Research Extension Workshop, the Internal Research Review Workshop, and the External Research Review Workshop. We extend our gratitude to all scientists and expert reviewers from various universities and research institutes whose comments and suggestions greatly enriched this document. We are proud to work collaboratively with government bodies, universities, private sector partners, and farming communities to ensure that our research outcomes reach those who need them the most. Looking ahead, BSRI remains steadfast in its mission to accelerate agricultural innovation and development, promote sustainable best practices and contribute to the resilient and efficient production of quality sugar in Bangladesh. We draw inspiration from the dedication, creativity and perseverance of our scientific teams. Their commitment to excellence is the foundation of our continued progress. We invite readers to engage with this research programme, explore our findings, and join us in our efforts to foster a more productive, resilient and sustainable future for sugarcrop cultivation and production.

Finally, I extend my sincere appreciation to all scientists, officers and staff whose wholehearted cooperation made this publication possible. Special thanks go to our funding agency, the Ministry of Agriculture (MoA) and all stakeholders for their continued support. I also acknowledge those involved in the compilation and editing of this document. Together, let us continue to transform knowledge into impactful solutions and build a sustainable safe food production from sugarcrop.

March, 2026

Dr. Kabir Uddin Ahmed
Director General

CONTENTS

BREEDING DIVISION

Rationale

Sugarcane is a highly heterozygous and complex polyploid crop, making it challenging to predict its lifespan. The availability of limited number of germplasms significantly impacts the varietal development program, highlighting the need for effective collection and conservation efforts. The sugar industry is currently in a critical phase, facing numerous unavoidable challenges. As sugarcane cultivation shifts to marginal lands with problematic soils, it encounters various adverse conditions. Thus, continuous efforts are essential to develop superior sugarcane varieties that offer higher yields of cane, sugar, and *gur*, while also exhibiting tolerance to drought, salinity, flooding, and waterlogging. The scarcity of flowering germplasm and the non-synchronization of flowering cycles present major obstacles to hybridization. This situation necessitates the implementation of pollen preservation techniques and photoperiodic treatments to enhance flowering. In addition to sugar and *gur*, the rising demand for chewing cane is increasingly important. Concurrently, breeder seed production for released varieties and the multiplication of nucleus seeds for promising clones are critical needs. Moreover, the varietal improvement of other sugar crops, such as date palm, palmyra palm, stevia and grave, is also essential and requires significant attention. Comprehensive efforts in germplasm collection, characterization, and utilization in the hybridization programs of these allied sugar crops are crucial for future advancements.

LIST OF EXPERIMENTS

PROGRAMME IN DETAILS

PROGRAMME AREA : VARIETAL IMPROVEMENT
1.0 TITLE : HYBRIDIZATION FOR HIGH SUGAR, HIGH YIELD, STRESS TOLERANT, SHORT DURATION AND SELF DETRASH VARIETIES OF SUGARCANE
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : M R Alam, K M R Karim, N A Munna, S N Asha and M A Rahman
NATURE OF STUDY : On-going
DURATION : 2014-
ESTIMATED COST(Tk): 2,10,300/-

1.1 DEFINITION OF THE PROBLEM:

In crops, variety development is a continuous process. Hybridization followed by clonal selection is the principal procedure to develop sugarcane variety. Sugarcane variety with high cane and sugar producing ability is the prime demand of sugarcane variety. Considering this issue, crossing is made among targeted parents to produce large number of F_1 population. Subsequently better, progenies are selected for further evaluation.

1.2 OBJECTIVES:

1. Developing improved varieties of sugarcane in relation to higher cane (>100 t/ha) and sugar (pol% cane >13) yield;
2. Selecting short duration (10 months) and lodging tolerant variety of sugarcane;
3. Selecting stress tolerant variety of sugarcane;
4. Selecting self-detrashing variety of sugarcane and
5. Selecting chewing variety of sugarcane.

1.3 METHODOLOGY:

After pollen viability test targeted flowering varieties/clones will be selected to set cross. The male parents will be removed two weeks after crossing. Hybrid seeds will be harvested, weighed and stored in deep-freeze. Later on, test sowing of the hybrid seeds will be performed in the glass-house in the month of July-August. On the basis of test sowing result, viable seeds will be sown cross wise. The seedlings attaining a height of 2"-3" will be transplanted in cell-u-pak tray in the seedling nursery bed for a height of 9"-12". Then each of them will be transplanted in the field in furrow at 50cm distance. At maturity, segregating population will be selected on the basis of different characteristics such as number of millable cane, height, thickness, crack, aerial root, solidness, leaf colour, disease and pest infestations. Then the selected clones will be planted in first line trial i. e. 1m × 4m test stage against one standard variety. Next year, selection will be made considering the same characteristics including field brix%. Only the good appearing clones showing equal or better field brix compare with the check variety will be selected for advancement. The selected clones will be planted in the second line trial at 4m × 4m test stage against one/two check variety. In the next year, the clones will be evaluated based on mentioned characteristics including juice analysis and estimated cane yield. The clones showing good chewing qualities will also be selected from this stage. Only the clones showing equal or better performance in comparison to the check variety will be selected for next trial.

TREATMENT : Based on synchronization of flowering, different crosses will be made with different targets considering the following parents.

A. High yield potential parents:

1. Isd 16	11. Co 642	21. I 507-85	31. I 103-96	41. I 163-01
2. Isd 28	12. Co 1148	22. I 19-86	32. I 108-96	42. I 12-02
3. Isd 32	13. CP 44-101	23. I 144-86	33. I 131-96	43. I 50-02
4. Isd 38	14. CP 69-1052	24. I 322-86	34. I 33-97	44. I 223-06
5. Isd 39	15. CP 85-1432	25. I 291-87	35. I 64-98	45. I 157-07
6. Isd 40	16. CPI 38-80	26. I 294-87	36. I 59-98	46. I 164-07
7. BSRI Akh 43	17. CPI 96-80	27. I 273-91	37. I 98-98	47. I 167-07
8. BSRI Akh 45	18. POJ 2878	28. I 216-92	38. I 36-00	48. I 290-08
9. BC_2	19. I 101-66	29. I 157-94	39. I 107-01	49. I 295-08
10. BC_5	20. I 33-78	30. I 14-96	40. I 108-01	50. I 73-09

B. High sucrose content parents:

1. BC_5	11. I 156-97	21. I 44-01	31. SC 5b
2. Co 635	12. I 162-97	22. I 68-01	32. SC 6b
3. Cp82-1172	13. I 98-98	23. I 77-01	33. NSM (TC)
4. CPI 38-80	14. I 486-99	24. I 95-01	34. I 21-05
5. I 134-70	15. I 21-00	25. I 140-01	35. I 23-05
6. I 144-86	16. I 36-00	26. I 55-02	36. I 74-05
7. I 1-97	17. I 92-00	27. I 64-02	37. Isd 40
8. I 33-97	18. I 133-00	28. I 98-02	38. BSRI Akh 43
9. I 128-97	19. I 17-01	29. I 100-02	39. BSRI Akh 45
10. Isd 38	20. I 23-01	30. I 193-02	40. BSRI Akh 48

C. Salinity tolerant parents:

1. Isd 24	7. BSRI Akh 43	13. I 121-09	19. I 26-02
2. Isd 28	8. BSRI Akh 45	14. I 144-86	20. Khailajhuri
3. Isd 32	9. BSRI Akh 46	15. I 204-08	
4. Isd 38	10. CPI 228-80	16. I 71-07	
5. Isd 39	11. Poj 2878	17. I 72-04	
6. Isd 40	12. I 108-08	18. I 433-99	

D. Drought tolerant parents:

I 137-96	I 446-99	I 57-78	I 142-01	Isd 36
I 255-06	I 48-07	Sc 4b	I 146-08	Isd 37
I 74-05	I 99-09	I 220-92	FR 97-45	Isd 38
BC_5	Cp 5268	I 282-08	Co1158-T3	Isd 39
SC1g	SC11d	I 72-04	I 200-07	Isd 40
I 204-01	I 107-04	Co 642	Isd 20	BSRI Akh 45
SC8g	Cp 75-361	I 51-0 6	Isd 28	
IC2e	Sc 2d	I 322-86	Isd30	
I 91-79	I 293-08	I 21-05	Isd 32	
I 72-00	I 290-08	I 95-01	Isd 35	

E. Early maturing parents:

1. Isd 16	7. Isd 33	13. Sc 8d	19. I 61-07
2. Isd 21	8. Isd 35	14. I 136-00	20. I 140-01
3. Isd 22	9. Isd 39	15.17-01	21. I 77-01
4. Isd 24	10. Isd 40	16.CP 50-70 TC	22. I 41-96
5. Isd 27	11. BSRI Akh 43	17. 82-1089 T1,T2,T6	
6. Isd 30	12. BSRI Akh 45	18. Isd 16 (4) TC	

F. Self-detrashing parents

1. CP 44-101	6. Co 642	11. IC 4d	16. SC 13d	21. I 145-09
2. I 162-04	7. CP 52-68	12. I 163-01	17. I 59-98	22. I 233-05
3. I 142-01	8. I 216-92	13. I 523-85	18. I 48-05	23. Isd 19
4. I 33-99	9. I 117-98	14. I 32-97	19.I 90-09	24. I 295-08
5. CPI 38-80	10. M 05-188	15. I 21-00	20.I 235-09	25. I 33-07

DESIGN: Augmented

DATA TO BE RECORDED:

1. Germination count (%)
2. No. of tillers/ha
3. No. of millable cane/ha
4. Cane height (m) and diameter (cm)
5. Field brix (%)
6. Pol% cane
7. Recoverable sucrose content (%)
8. Flowering record
9. Pollen viability (%)
10. Estimated cane yield (t/ha)

1.4 WORK ELEMENTS:

1. Flowering record
2. Determination of pollen fertility (%)
3. Parent selection
4. Cross setting
5. Fuzz collection
6. Recording seed weight (gm)
7. Seed storing
8. Seed sowing
9. Raising of seedling in nursery bed
10. Seedling transplanting in the field
11. Crosswise mortality count of seedling in the field
12. Evaluation and selection in original seedling
13. Plantation of clones in different test stages and yield trials
14. Recording of germination and tillering
15. Recording of pest and disease incidence
16. Evaluation of clones for different agronomical characters and sucrose content
17. Estimated yield data collection

1.5 TIME SCHEDULE:

Sl. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
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17																

1.6 ECONOMIC IMPACT:

Selected clones will help to develop varieties with higher cane, sugar and *gur* production.

1.7 EFFECT ON ENVIRONMENT: Friendly to environment.

1.8 UTILIZATION OF RESEARCH RESULTS:

Selected clones will be planted in next stages for further screening for variety development.

2.0 TITLE : **COLLECTION, CHARACTERIZATION AND CONSERVATION OF INDIGENOUS AND EXOTIC GERMPLASM OF SUGAR CROPS**

LOCATION : BSRI, Ishwardi, Pabna and QS, Gazipur

INVESTIGATORS : M A Rahman, N A Munna, H M Tarique, M M Alam, S N Asha, , M M Rahman, K M R Karim and M R Alam

NATURE OF STUDY : On-going

DURATION : 2001-

ESTIMATED COST(Tk): 1,73,000/-

2.1 DEFINITION OF THE PROBLEM:

Successful plant breeding programme depends on the collection, evaluation, conservation and utilization of germplasm. Therefore, it is needed to collect and conserve exotic and indigenous sugar crops germplasm regularly.

Different sugar crops germplasm generally resembles each other in their appearance but they are morphologically different. Characterization of germplasm means the description of the materials for determining the magnitude of genetic diversity, variety identification, gap filling, studying the relationship of species and in the establishment of core collection. It also provides an indication of the value of each germplasm accession and an important basis for gene bank management. It is precondition for taking any crossing programme. Without characterization no breeding programme can be successful. If characterization is done properly, breeders can proceed in right direction, i.e., it helps the breeders to take correct decision in crossing programme. On the other hand, a wrong to characterization leads the breeders in wrong direction. As a result, the whole programme goes in vain. Hence, in short, characterization and documentation is must for a successful breeding programme.

2.2 OBJECTIVES:

1. Collecting, characterizing and evaluating indigenous and exotic germplasm for using as parent materials and commercial varieties;
2. Assessing the genetic diversity and
3. Identifying and documenting the accessions.

2.3 METHODOLOGY:

At Quarantine Station, Joydebpur Imported germplasm from abroad are to be evaluated for three generations. In case of sugarcane germplasm after quarantine formalities, the materials are to be brought at BSRI and planted in 1m × 4m plot for further evaluation in the field condition. For local collection, the germplasm will be collected in the month of September-October from different parts of the country. Before collection, the sugar crops growing area of the country will be listed down. Later on, the collected area will be sealed out in the list to avoid the duplication of germplasm. The collected materials will be labeled with local name, location, date of collection, flowering habit, etc. The collected exotic and local germplasm will be planted at Ishwardi to multiply and to evaluate different characteristics. The sugarcane germplasm will be characterized in the month of September-December of next year. After characterization selected new sugarcane germplasm will be planted in a furrow of 3m long with 18 two-eyed setts. Thus, the germplasm will be conserved in the germplasm bank of BSRI. The germplasm showing promising for commercial cultivation will be multiplied for further evaluation and the flowering materials will be planted in breeding nursery to use in hybridization programme. This germplasm will be planted in a furrow of 10m long with 30 three-budded setts. Other sugar crops like date palm, palmyra palm, stevia will be planted in the field following standard distance.

For characterization, selected sugarcane germplasm will be planted in a separate plot during November-December. Characterization of the same will be done in IPGR descriptive manner so that the estimates of all the attributes will reflect the true value of the accessions. Morphological characterization will be based on the physical attributes of a plant. For this purpose, characterization data sheet will be used. The sugarcane germplasm will be characterized at 7-8 months and 10-12 months after planting. Data will be taken from 10 stalks in each accession.

TREATMENT: Not applicable

DATA TO BE RECORDED FOR SUGARCANE:

a) Data to be recorded at 7-8 months after planting:

1. Stool
2. Leaf blade
3. Leaf sheath
4. Auricle
5. Dewlap
6. Ligule
7. Stalk
8. Bud

b) Data to be recorded at 10-12 months after planting:

1. Lodging tendency
2. Stalk length
3. Internode length
4. Internode diameter
5. Solidness
6. Internode cross section
7. Internode cross section colour
8. Brix
9. Inflorescence data
10. Pollen fertility.

DATA TO BE RECORDED FOR DATE PALM:

a) Morphology data
b) Flower and fruit data

2.4 WORK ELEMENTS:

1. Plantation of collected germplasm
2. Germination count
3. Tiller count
4. Observation on reaction to pests and diseases In case of Sugarcane

5. Data recording after 7-8 months of plantation (e.g. shoot, leaf blade, bud etc.)
6. Determination of Brix (%) and chewing qualities
7. Data recording after 10-12 months of plantation (e.g. lodging tendency, stalk length, internode number etc.
8. Yield data at harvest

2.5 TIME SCHEDULE:

Sl.	2025				2026											
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→													
2					→											
3						→	→									
4	All over the season															
5												→	→			
6														→	→	
7															→	
8														→	→	

2.6 ECONOMIC IMPACT: Diverse parent materials will help for improving variety.

2.7 EFFECT OF ENVIRONMENT: Friendly to the environment.

2.8 UTILIZATION OF RESEARCH RESULTS:

The collected germplasm will be preserved in the germplasm bank of BSRI, and flowering individuals will be utilized in the hybridization programme. Following a series of evaluations, promising germplasm may be released as new varieties. Morphological characterization of the germplasm will serve as a valuable tool in resolving identification challenges among sugar crop varieties that appear similar in the field. Therefore, the knowledge and ability of extension workers and plant breeders to correctly identify varieties will be essential for effective planning and implementation of the hybridization programme.

3.0 TITLE : PRESERVATION OF SUGARCANE POLLEN AND EVALUATION OF POLLEN VIABILITY FOR CROSS SYNCHRONIZATION
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : N A Munna, H M Tarique, S N Asha and M A Rahman
NATURE OF STUDY : On-going
DURATION : 2022-2027
ESTIMATED COST(Tk): 32,600/-

3.1 DEFINITION OF THE PROBLEM:

Genetic improvement of sugarcane through bi-parental crosses is being limited due to a lack of flower synchronization between parents. For this reason, floral synchronization is essential while crossing sugarcane. The main methodologies that are being practiced to overcome this problem are: Stepwise planting of accesses, photoperiod control, and application of inducers. However, these operations have shown low efficiency and/or high handling costs. In that case, an alternative method that can help to carry out asynchronous crosses between sugarcane plants with non-coincidental flowering is the conservation of sugarcane pollen. Likewise, there is little information in the literature regarding the survivability of pollen and the length of time pollen remains viable when subjected to low-temperature conservation. Considering this issue, the conservation methodology and feasibility assessment of sugarcane pollen with the objective of making crossroads between asynchronous sugarcane varieties will be performed.

3.2 OBJECTIVES:

1. Viability assessment of stored sugarcane pollen for cross synchronization;
2. Optimizing pollination technique and identifying potential storability of sugarcane pollen and
3. Determining compatibility upon crossing with preserved pollen.

3.3 METHODOLOGY:

Twelve sugarcane clones of three genotypes will be selected, including both wild genotypes like *Saccharum spontaneum* and *Erianthus arundinaceus*, and cultivated genotypes *Saccharum officinarum*.

a) Pollen collection

The flowering season is the preferred period for carrying out pollen collection. To collect pollen, the inflorescences will be harvested in the morning, preferably between 7 and 8 am to prevent dehydration from exposure to the sun and high temperatures. For collection of pollen, inflorescences whose anthers will mature 1/3 of the panicle and releasing pollen naturally in air will be chosen. The stems of the inflorescences will be cut with a minimum length of 100 cm, and immediately sent to the laboratory. For favoring anthesis in the central or basal portion of these panicles, they will be kept in nutrient solution for a period of up to 24 hours. Pollen collection will be done immediately after pollen dehiscence. Before storing, the pollen grains will be packed in 100 mL glass stopper flasks, which will be kept open in glass desiccators with 1 kg of silica gel blue at 4°C for 1 h period for dehydration.

b) Storage of pollen:

The collected pollen will be stored in petri dishes. Afterwards, the petri dishes will be closed and stored at 3°C (37.4°F) and -20°C (O° F) temperatures.

c) Viability:

The pollen viability will be analyzed by means of cytological labeling with 2% lugol solution (1 g of iodine, 2 g of potassium iodide and 100 ml of distilled water.

The count of stained and non-stained pollen grains allows estimating the percentage of viable pollen through the formula:

$$\text{Pollen viability (\%)} = \frac{\text{Number of stained pollen grains}}{\text{Number of total pollen grains}} \times 100$$

d) Crossing with stored pollen:

Crossing will be carried out with preserved pollen. The bottle containing preserved pollen will be taken out from the freezer and kept in the shade and at room temperature (24°C) for fifteen minutes, to thaw, before pollination of panicles with the respective parents. Pollination will be done with the aid of a brush or by spraying with a concentration by pouring the pollen into a bag of paper with the panicles. After cross setting the fuzz will be collected and stored for further germination test.

TREATMENTS:

A) Pollen source

1. *Saccharum officinarum*
2. *Saccharum spontaneum*
3. *Erianthus arundinaceus*

B) Preservation technique

1. 3°C temperature
2. -20°C temperature
3. Ambient condition at room temperature

C) Pollination technique

1. Dusting
2. Spraying

DESIGN: RCB

DATA TO BE RECORDED:

1. Flowering time
2. Pollen viability (%) at 30 days intervals
3. No. of crosses
4. Fuzz produced/cross (gm)

3.4 WORK ELEMENTS:

1. Collection of sugarcane pollen
2. Recording pollen collection date
3. Dehydration of pollen in pre-storage
4. Preservation of pollen in different preservation units
5. Recording pollen storage date
6. Assessment of the stored pollen viability
7. Recording pollen viability at 60 days interval
8. Cross setting using viable preserved pollen
9. Recording cross no. /variety
10. Recording the number of crosses/Variety

3.5 TIME SCHEDULE:

Sl. No.	2025					2026						
	A	S	O	N	D	J	F	M	A	M	J	J
1	→	→										
2	→	→	→									
3		→	→									
4		→	→	→								
5				→	→	→						
6				→	→	→	→					
7				→	→	→	→					
8					→	→	→	→				
9						→	→	→	→			
10						→	→	→	→	→	→	

3.6 ECONOMIC IMPACT: Pollen preservation and crossing with preserved pollen will increase the scope of hybridization and thereby will help to develop improved variety of sugarcane.

3.7 EFFECT ON ENVIRONMENT: Environment will not be affected as the experiment will be conducted in controlled condition.

3.8 UTILIZATION OF RESEARCH RESULTS: Stored pollen will be utilized in hybridization for improved variety development.

4.0 TITLE : VARIETAL IMPROVEMENT OF SUGARCANE THROUGH INDUCED MUTATION
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : M A Rahman, H M Tarique, M R Alam, N A Munna, M M Alam, S N Asha and K M R Karim
NATURE OF STUDY : On-going
DURATION : 2005-
ESTIMATED COST(Tk): 28,300/=

4.1 DEFINITION OF THE PROBLEM:

Radiation is an important tool for producing mutant variety. Many workers reported that it is possible to produce red rot resistant mutant variety of sugarcane by irradiating of setts, callus and fuzz with gamma rays. Jagathesan (1973) conducted yield trial with irradiated material and reported some mutants to have early high sucrose and resistance to red rot. T.S. Khairwal *et al.* (1984) developed red rot resistant mutant by gamma rays and EMS. In Bangladesh, red rot is a serious disease of cane for which many outstanding varieties are being degenerated. Besides, there are some abiotic stress tolerant varieties with low sucrose content. To overcome these problems irradiation may be the alternate breeding approach.

4.2 OBJECTIVES:

1. Developing sugarcane variety having high sucrose content and
2. Developing sugarcane varieties tolerant to red rot and smut diseases.

4.3 METHODOLOGY: Irradiation and selection of sugarcane mutants in different generations (MV_1, MV_2, MV_3, MV_4 & MV_5).

Development of sugarcane mutant through gamma irradiation

Fuzz of eight selfed parents will be treated with gamma rays at variable (8.77-17.54Gy) doses from Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh. After germination, when the seedlings become strong enough, they will be transplanted in the field as MV_1 generation at a distance of 70 cm from one another. Before transplanting, a basal fertilizer dose will be applied and normal cultural practices will be done. Twelve months after planting the good-looking clones will be selected for further evaluation for MV_2 and successive generations.

TREATMENT:

Fuzz of five crosses will be irradiated with different doses of gamma rays (8.77-17.54Gy).

DATA TO BE RECORDED:

1. Naturally red rot resistant mutant (MV_1, MV_2, MV_3, MV_4 & MV_5 generation)
2. No. of tillers after 150 days
3. Morphological abnormalities, if any
4. Date of flowering
5. Disease symptoms, if any
6. Resistant mutant after inoculation of red rot pathogen
7. Field brix (%)

4.4 WORK ELEMENTS:

1. Selection and plantation of mutants
2. Germination counts at 90 days
3. Tiller count at 150 days
4. Record of morphological abnormalities
5. Red rot inoculation
6. Recording disease symptoms, if any
7. Flowering record
8. Field brix record and chemical analysis
9. Selection of desirable mutants

4.5 TIME SCHEDULE:

Sl. No.	2025				2026										
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→													
2				→											
3							→								
4							→								
5										→					
6												→			
7													→		
8														→	
9														→	

4.6 ECONOMIC IMPACT:

It is expected to develop a better mutant from each of the irradiated genotypes having high yield and sugar with red rot resistant and non-flowering habit which will improve the economic condition of the farmers as well as of the country.

4.7 EFFECT OF ENVIRONMENT: Friendly to environment.

4.8 UTILIZATION OF RESEARCH RESULTS:

Seed canes of the newly developed variety(s) will be distributed to mills and non-mill zones for commercial cultivation with a view to increasing cane, sugar and *gur* production.

5.0 TITLE : PHOTOPERIODIC REGULATION OF FLOWERING IN SUGARCANE
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : H M Tarique, N A Munna, M M Alam, S N Asha and M A Rahman
NATURE OF STUDY : On-going
DURATION : 1997-
ESTIMATED COST(Tk): 67,300/-

5.1 DEFINITION OF THE PROBLEM:

Flowering is directly related with the hybridization process. At BSRI, about 1165 sugarcane germplasm are being maintained in the germplasm bank of which nearly 75% germplasm do not flower at all. Moreover, among the flowering ones, some are flowering early and some are late. Hence, the induction of flower in non-flowering germplasm and synchronization of the flowering germplasm for successful hybridization programme deserve continuous study.

5.2 OBJECTIVES:

1. Inducing flower at early in mid and late flowering genotypes;
2. Inducing flower at late in early flowering genotypes;
3. Inducing flower in sparse flowering genotypes and
4. Synchronizing the flowering time of different genotypes.

5.3 METHODOLOGY:

Selected germplasm will be given photoperiodic treatment. All the germplasm will be planted in drum having 20" height and 16" diameter in the last week of November. Before plantation the drums will be filled up with a media composed of soil, pressmud and sawdust (3:2:1). Recommended doses of fertilizers and insecticides will be applied. Cultural practices will be done as per requirement. All the germplasm in drum will be placed on rail cart in the last week of April and will be given photoperiodic treatment as follows:

a) ADVANCEMENT OF FLOWERING IN MID AND LATE FLOWERING VARIETIES/CLONES:

A number of 21 germplasm (12 mid-flowering and 9 late-flowering groups) will be given a constant photoperiodic treatment of 12.45 hrs for 30 days from starting. After 30 days treatment, day length will be reduced @ 1min. per day for mid-flowering group until it reaches to 11.30 hrs photoperiodic length. The 11.30 hrs photoperiodic treatment will be continued until natural day length reaches 11.30 hrs and then, stopped treatment and marched to natural day length. The photoperiodic treatment will be started at 3rd week of August for late and mid-flowering group.

b) DELAYING FLOWERING OF EARLY FLOWERING VARIETIES/CLONES:

A number of 21 germplasm will be given photoperiodic treatment of 12.30 hrs constant treatment for 30 days in two chambers. The treatment will be started in the first week of August. After 30 days treatment, day length will be reduced 1.5 minutes per day until they reach 11.30 hrs photoperiodic length. The 11.30 hrs photoperiodic treatment will be continued until natural day length reaches 11.30 hrs.

TREATMENTS:

1. Control
2. 11.30 hrs day length
3. 12.30 hrs day length
4. 12.45 hrs day length
5. 13.00 hrs day length
6. 13.50 hrs day length
7. 0.45 minute reduction/day
8. 1 minute reduction/day

DESIGN: RCBD

DATA TO BE RECORDED:

1. Flowerable stalk/stool
2. Flowering stalk/stool
3. Pollen viability (%)
4. Flowering time
5. No. of crosses
6. Fuzz produced/cross (gm)

5.4 WORK ELEMENTS:

1. Germplasm plantation in drum
2. Starting photoperiodic treatment in time
3. Increment of day length of photoperiodic treatment
4. Reduction of day length of photoperiodic treatment
5. Recording flower initiation date
6. Recording flower emergence date
7. Pollen fertility test (%)
8. Recording the number of flowerable stalks/variety
9. Recording the number of flowering stalks/variety.
10. Recording the number of crosses/variety

5.5 TIME SCHEDULE:

Sl. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→													
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5.6 ECONOMIC IMPACT:

Photoperiodic treatment will increase the scope of hybridization and thereby will help the development of improved variety of sugarcane.

5.7 EFFECT ON ENVIRONMENT:

Environment will not be affected as the experiment will be conducted in controlled condition.

5.8 UTILIZATION OF RESEARCH RESULTS:

The effective photoperiod length will be used to induce flower in sparse and non-flowering germplasm and also to synchronize the flowering time of different flowering germplasm for effective crossing thereby widening the scope of hybridization. crossing thereby widening the scope of hybridization.

6.0 TITLE : INVESTIGATING THE FLOWERING BEHAVIOUR AND BREEDING POTENTIAL OF SUGARCANE GERMPLASM
LOCATION : BSRI and RSRS, Thakurgaon
INVESTIGATORS : N A Munna, M R Alam, K M R Karim, S N Asha, N Chowdhury and M A Rahman
NATURE OF STUDY : On-going
DURATION : 2024-
ESTIMATED COST(Tk): 21,000/-

6.1 DEFINITION OF THE PROBLEM:

Effective genetic improvement of crops relies on the proper functioning of reproductive parts. Sugarcane presents unique challenges due to its high heterozygosity and complex polyploid genetic structure. Notably, there is considerable variation in the flowering habits of wild and cultivated sugarcane species. Again, a significant obstacle in sugarcane breeding is the induction and synchronization of flowering and crossing of sugarcane. Flowering of sugarcane genotypes is important for the breeding program, but flowering is highly affected by environmental conditions. Flowering in sugarcane involves stages like initiation, flagging, emergence, and pollen shedding. Each stage requires specific physiological and environmental conditions, including day length, humidity, and temperature. Deviations from these conditions can inhibit flowering. In the germplasm, some clones flower rarely, while others flower profusely or produce inflorescences that do not emerge. Sugarcane plants also show varying pollen viability each year, making it essential to understand flowering behavior for effective breeding management. Therefore, this study has been undertaken to study the flowering habits of the wild and cultivated species, specifically examining how the environment affects flowering patterns, regularity, timing, intensity, and pollen viability, thereby enhancing breeding efficiency and promoting sustainable sugarcane production in regions with variable climates.

6.2 Objectives:

1. Identification of flowering patterns of sugarcane germplasm;
2. Assessing the breeding potential of sugarcane germplasm and
3. Using the potential germplasm in crossing program for developing a variety.

6.3 METHODOLOGY:

This study aims to evaluate the breeding potential of 200 parental sugarcane clones and 10 wild sugarcane clones, with twenty clones assessed each year. The selected clones will be planted at two locations BSRI and Thakurgaon for multi-location evaluation. Data on flowering will be collected at key developmental stages. The Elongation Stage will be measured by counting the days from mid-October to the start of flag leaf formation. The Flag Leaf Stage will be measured by counting the days from the beginning of flag leaf formation to full flag leaf emergence. The full Emergence Stage will be tracked by counting the days from tip emergence to the full extension of the inflorescence. Finally, the Percentage of Flowering will be determined by dividing the number of flowering stalks by the total number of stalks and multiplying by 100.

a) Weather data:

Temperature, day length, and relative humidity are the key environmental variables influencing the timing of sugarcane flowering and pollen viability. To address the fact, daily averages of minimum and maximum temperature, day length, and relative humidity will be recorded during flower development phases.

b) Data of Flowering propensity:

Data on flowering propensity will be collected from the clones, focusing on the number of flowered canes and the total number of canes. Each clone's flowering performance will be evaluated and scored on a 1–5 scale to categorize their propensity: very low (≤10% flowered canes), low (11–30%), medium (31–60%), high (61–80%), and very high (>80%). This scoring system will facilitate a systematic comparison of flowering potential across different clones.

c) Pollen functionality and Germination Assessment of the flower

To evaluate pollen viability, anthers from matured but unopened spikelets will be squashed in a 10% iodine solution. The resulting slides will be examined under a light microscope to determine the percentage of viable pollen. Varieties with less than 10% viable pollen will be treated as female parents while those with more than 10% viable pollen will be treated as male. For pollen tube germination assessment, an in vitro germination medium will be prepared, consisting of one liter of water, 300 mg calcium nitrate, 100 mg boric acid, 100 mg magnesium sulfate, and 300 g sucrose. This medium will be autoclaved, stored in small flasks, and used as needed. Pollens will be collected in the early morning, sieved, and cultured in individual petri dishes per genotype. The cultures will be maintained at 25°C and 95% relative humidity for 30 minutes. The percentage of germination will be calculated based on the total number of pollen grains.

After pollen viability test targeted flowering clones will be selected to set the desired cross. The resultant fuzz will be collected and stored under optimal conditions for future germination testing.

TREATMENT: Not applicable

DATA TO BE RECORDED:

1. Days to Elongation stage
2. Days to Inflorescence tip emergence
3. Days to Inflorescence full emergence
4. Date of flowering initiation
5. Date of flowering
6. % Pollen viability
7. % Pollen tube germination
8. Frequency of male flowers
9. Frequency of female flowers
10. Flowering Propensity
11. Record temperature, rainfall, and photoperiod at flowering time
12. Flower size, shape, and number of florets

13. Flowering time
14. Length of the flowering period
15. Assess the type and structure of flowers produced (e.g. spikelets, panicles).

6.4 WORK ELEMENTS:

1. Documentation of breeding germplasm
2. Flowering record
3. Record temperature, Relative humidity, and photoperiod at flowering time
4. Laboratory determination for pollen viability %
5. Laboratory determination for pollen tube germination%
6. Assessment of the type of flower produced
7. Cross setting
8. Fuzz collection
9. Assess the seed set for each cross

6.5 TIME SCHEDULE:

Sl.	2025				2026											
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→														
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6.6 ECONOMIC IMPACT:

Better understanding of sugarcane flowering will help in better hybridization program which in turn will improve the breeding program and ultimately the higher cane and sugar production of the country through development of improve variety of sugarcane.

6.7 EFFECTS OF ENVIRONMENT: Friendly to the environment.

6.8 UTILIZATION OF RESEARCH RESULTS:

The selected flowering germplasm will be used in hybridization for successful breeding program.

7. 0 TITLE : EVALUATION OF PROMISING CLONES UNDER DIFFERENT YIELD TRIALS AT VARYING AGRO-CLIMATIC CONDITIONS

LOCATION : BSRI, Ishwardi; RSRS, Gazipur; RSRS, Thakurgaon, Rajshahi; Carew & Co., and Joypurhat

INVESTIGATORS :

BSRI, HQ	M A Rahman
RSRS, Gazipur	Station-in-Charge and N A Munna
RSRS, Thakurgaon	Station-in-Charge and M M Alam
RJSM	Station-in-Charge and M R Alam
Carew & Co.	Station-in-Charge and H M Tarique
JSM	Station-in-Charge and M M Alam

NATURE OF STUDY : On-going

DURATION : 2010-

ESTIMATED COST(Tk): 3,30,519/-

7.1 DEFINITION OF THE PROBLEM:

Environment has a tremendous influence on the manifestation of a variety. A variety may not be suitable for all locations. Considering the fact, the trial has been designed to conduct at different agro-ecological conditions for suitability study of selected clones.

7.2 OBJECTIVES:

1. Determining the performance of the clones under varying agro-climatic conditions;
2. Selecting location specific variety and
3. Determining the ratooning potential of the clones.

7.3 METHODOLOGY:

The clones selected from second line trial (4m x 4m stage) will be planted in Preliminary Yield Trial (PYT) at two locations with three replications against one/two check varieties. The plot size will be maintained 4m × 4m. In the same year, the materials will be given to the Pathology Division for screening against red rot disease through artificial inoculation.

Chemical analysis of the clones will be performed at BSRI. Based on different agronomical characters such as germination, tiller, pol % cane, millable cane, yield and disease reaction, the promising clones will be selected for the Advanced Yield Trial (AYT). Only the clones showing equal or better performance with the check varieties will be advanced to AYT. In this trial, the clones will be planted in 6m × 5m plot with four replications at two locations against one/two check variety(s). Simultaneously, the pathology division will also plant the selected clones for pathological test as before. Based on agronomical characters, yield, pol % cane and disease status report, the superior clones will be selected for Zonal Yield Trial (ZYT)-I. The clones showing equal or better performance compare to the check varieties will be selected only. In ZYT-I, the clones will be planted in 6m × 8m plot with three replications against the check varieties.

The selected clones will be supplied to the pathology, entomology, agronomy and physiology divisions to evaluate the performance in their respective fields. Based on yield, pol % cane, disease and pest infestation only the superior clones compare with the check varieties will be advanced to the Zonal Yield Trial (ZYT)-II. In trial (ZYT-I), clones will be kept as ratoon at two locations to observe their rationing potentiality. Maintaining the similar plot size with three replications and same check the clones will be planted at five locations in ZYT-II, and the clones will be maintained as ratoon for second year to see their ratooning ability. Unless any serious disease infection occur in any clone all of them will be advanced to ZYT-III at six locations for further evaluation keeping the same plot size and replication as in ZYT-I and II. Selected clones having high sucrose content and resistance against diseases will be advanced to proposed variety trial (PVT) at seven locations for further evaluation keeping the same plot size and replication as in ZYT-I and II. The promising clones under PVT may be evaluated by the members of the Field Evaluation Team of Seed Certification Agency (SCA). Based on maturity, the clones will be categorized as early, mid and late maturing. Upon approval by National Seed Board (NSB), the clone(s) will be released as variety for cultivating all over the country or in specific location.

DESIGN: RCBD

DATA TO BE RECORDED:

1. Germination count (%)
2. No. of tillers/ha
3. No. of millable cane/ha
4. Cane height (m) and diameter (cm)
5. Field brix (%)
6. Recoverable sucrose content (%)
7. Cane yield/ha

7.4 WORK ELEMENTSS:

1. Plantation of clones in different test stages and yield trials
2. Recording of germination and tillering
3. Recording of pest and disease incidence
4. Evaluation of clones for different agronomical characters and sucrose content
5. Harvesting and yield data collection

7.5 TIME SCHEDULE:

Sl. No.	2025				2026												2027	
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
1			→	→	→													
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3							→	→	→	→	→	→	→					
4														→	→	→	→	
5																→	→	

7.6 ECONOMIC IMPACT:

Newly developed varieties will help in increasing cane and sugar yield and thereby will generate high income of farmers as well as the country.

7.7 EFFECT ON ENVIRONMENT: Friendly to environment

7.8 UTILIZATION OF RESEARCH RESULTS:

Seed canes of the developed variety(s) will be distributed to mills and non-mill zones for commercial cultivation to increase the sugar and *gur* production of the country. The newly developed variety(s) will be distributed to the model farmers of the mills and non-mill zones for commercial cultivation. Hence, newly developed variety(s) will be utilized for higher cane, sugar and *gur* production of the country.

8.0 TITLE : BREEDER SEED MULTIPLICATION OF PROMISING CLONES/VARIETIES OF SUGARCANE
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : M A Rahman, H M Tarique, M M Alam and M R Alam
NATURE OF STUDY : On-going
DURATION : 1980-
ESTIMATED COST(Tk): 28,300/=

8.1 DEFINITION OF THE PROBLEM:

In sugarcane, advanced clones are required to be evaluated by the Breeder, Entomologist, Pathologist, Agronomist and Soil chemist in their respective field. Advanced clones are used for setting up of different experiments and are also supplied to different sugar mills for nucleus seed programme. To meet up the demand, it is required to multiply the advanced clones/seed materials in successive generations.

8.2 OBJECTIVES:

1. Producing breeder seeds of potential varieties and clones;
2. Maintaining purity of existing varieties and
3. Distributing quality seeds to different stakeholders.

8.3 METHODOLOGY:

The selected clones from PYT, AYT, ZYT-I, ZYT-II ZYT- III and released varieties (as breeder seed) will be multiplied at BSRI, Ishwardi and RSRS, Thakurgaon farm. Normal cultural practices will be done as per requirement. Recommended dose of fertilizers and insecticides will be applied. The Pathologist and Entomologist of BSRI will inspect and clean the multiplied seed cane at different times.

8.4 WORK ELEMENTS:

1. Clonal selection from different yield trials
2. MHAT of clones under ZYT-II and released varieties
3. Clonal plantation
4. Inspection of seed plot by the Pathologist and Entomologist
5. Recording the number of affected stools roughed out
6. Distribution of seed cane

8.5 TIME SCHEDULE:

Sl. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→	→													
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3			→	→												
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5							→	→	→	→	→	→	→	→		
6															→	→

8.6 ECONOMIC IMPACT:

Use of clean seed will minimize the disease and pest infestation. As a result, cane and sugar yield will be increased which in turn will improve the economic condition of the farmers as well as of the country.

8.7 EFFECT OF ENVIRONMENT: Friendly to environment.

8.8 UTILIZATION OF RESEARCH RESULTS:

The multiplied seed canes will be distributed to different divisions for testing in their respective field and will be used for setting up of different yield trials at BSRI as well as in sugar mills farm. Clean seed canes will be distributed to different sugar mills for planting in nucleus seed plot. Besides, clean seed canes of newly released varieties will be produced at BSRI for distribution to mills and non-mill zones.

9.0 TITLE : CHARACTERIZATION OF STEVIA GERMPLASM
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : S N Asha, M R Alam, N A Munna and M A Rahman
NATURE OF STUDY : On-going (Modified)
DURATION : 2019-
ESTIMATED COST(Tk): 18,000/-

9.1 DEFINITION OF THE PROBLEM:

Stevia rebaudiana, a non-caloric natural sweetener is currently the available substitute to sugar. It has emerged as a promising sweetener due to its natural sweetness and potential health benefits. It is becoming popular in Bangladesh day by day, due to its zero-calorie sweetening agent. Studies for the selection and improvement of adapted genotypes are considered important for stevia cultivation in the country. Therefore, stevia breeding programs to obtain new cultivars with desirable and stable chemical profiles may improve the quality of raw materials for the industry. The genetic variability of spontaneous populations can be identified and used in breeding programs to increase the production and quality of steviol glycosides.

9.2 OBJECTIVES:

1. Evaluating the collected accessions of stevia and characterizing their genetic divergence and
2. Evaluating biomass accumulation and physiological indices for assessing its breeding potential.

9.3 METHODOLOGY:

The BSRI stevia accessions will be used for morphology study. The polybag seedling will be prepared from stem cutting and then transplanted to the main field maintaining spacing 50cm×50cm. Irrigation, fertilizer application, weeding, staking, and other necessary intercultural operations will be practiced as and when required. Diseases and pest infestation will be recorded throughout the growing period. Morphological characterization will be done after two months of transplantation. Harvesting will be done at two splits, after 114 days of transplanting (first cut) at 5cm above the base and after 84 days of first harvest (second cut), when 5% of the plants shows flowering.

DATA TO BE RECORDED:

1. Plant height (cm)
2. No of branches/plant (primary, secondary, tertiary)
3. No of leaves
4. Leaf stem ratio
5. Leaf shape
6. Leaf size
7. Juvenile period (days)
8. No of corymbs
9. Flowering time
10. Leaf yield (green leaves)
11. Leaf dry weight (g)

9.4 WORK ELEMENTS:

1. Seedling raising of collected stevia germplasm
2. Plantation in main field
3. Morphological data collection
4. 1st cut and data collection (At 114 DAT)
5. 2nd cut and data collection (After 84 days of 1st cut)
6. Data analysis and reporting

9.5 TIME SCHEDULE:

Sl. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
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9.6 ECONOMIC IMPACT:

Diverse parent materials will help for improving variety which in turn will improve the economic condition of the farmers as well as of the country.

9.7 EFFECT OF ENVIRONMENT: Friendly to environment.

9.8 UTILIZATION OF RESEARCH RESULTS:

Collected germplasm will be preserved in the germplasm bank of BSRI and flowering ones will be used for future hybridization programme of stevia. The promising germplasm will be released as variety for commercial cultivation.

10.0 TITLE : IMPROVEMENT OF DATE PALM USING ARTIFICIAL POLLINATION
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : M R Alam, N A Munna, M M Alam, H M Tarique, L Rahman and M A Rahman
NATURE OF STUDY : On-going (Modified)
DURATION : 2019-
ESTIMATED COST(Tk): 12,500/-

10.1 DEFINITION OF THE PROBLEM:

Variety development of a crop is a continuous process. Hybridization followed by selection is the principal procedure to develop variety. Local date palm (*Phoenix sylvestris*) is well adapted in Bangladesh and use only juice production though it has huge fruit bearing capacity. The fruit or pulp layer of local date palm is not as thick as Arabian date palm (*Phoenix dactylifera*). That's why, it has no market demand. But in our country both the date palm juice and fruit of Arabian date palm (Khejur) have high demand. To meet up the market demand and get benefit from local and Arabian date palm, artificial hybridization will be made among targeted parents to produce fruit and juice bearing progenies.

10.2 OBJECTIVES:

1. Improving local date palm for quality juice and fruit yield.

10.3 METHODOLOGY:

Date palm sexes are borne by separate individuals. The unisexual flowers are pistillate (female) and staminate (male) in character. The male palm produces the pollen and the female palm produces the fruit. The flower stalks are produced from the axils of the leaves. The inflorescence consists of a long stout spathe which, on bursting, exposes many thickly crowded floral branchlets which are stout and short in male, and long and slender in female. The male flowers are borne single and are waxy white, while the female flowers are borne in clusters of three and are yellowish green in colour. Parentage of local and improve (Arabian) date palm for this experiment will be selected from BSRI date palm garden in the month of January-March 2026 at the flowering period. In case of differing in flowering time of male and female plant, then pollen will be collected and preserved in the laboratory for using artificial pollination. Before breaking the spathe (inflorescence of female flower) will be covered to protect out crossing and wait for its natural breaking. Then, the pollen of improve date will be applied to female flowers of local date and vice versa (*Phoenix sylvestris* × *Phoenix dactylifera* and *Phoenix dactylifera* × *Phoenix sylvestris*). Artificial pollination will be performed by dusting pollen to the selected female flowers. Fruit setting and fruits characters will be recorded and analyzed. Better ones will be used to develop F_1 progeny and planted at BSRI date palm garden for further evaluation.

TREATMENT:

a) Improved date palm
b) Local date palm

DESIGN : RCBD

DATA TO BE RECORDED:

1. Flowering time
2. No. of pollinated inflorescence
3. No. of fruit set/ inflorescence
4. Fruit size and shape
5. Thickness of pulp layer
6. Collection of juice/plant (if any)
7. Brix% in juice
8. Fruit yield

10.4 WORK ELEMENTS:

1. Parent selection
2. Flowering record
3. Pollen collection
4. Determination of pollen fertility (%)
5. Artificial pollination
6. Bagging of inflorescence
7. Recording fruit weight
8. Juice collection
9. True to type seedling production

10.5 TIME SCHEDULE:

Sl. No.	2025	2026											
	D	J	F	M	A	M	J	J	A	S	O	N	D
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3	→	→	→	→									
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9	→	→	→	→	→	→	→	→	→	→	→	→	

10.6 ECONOMIC IMPACT:

Improve genotypes will help to produce juice and quality fruit from same plant which will meet up the demand of the farmers as well as of the country.

10.7 EFFECT ON ENVIRONMENT: Friendly to environment.

10.8 UTILIZATION OF RESEARCH RESULTS:

The research result (variety) will be used for higher production of juice and quality fruit through commercial cultivation.

11.0 TITLE : CHARACTERIZATION AND DOCUMENTATION OF LOCAL AND EXOTIC DATE PALM
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : M M Alam, S N Asha, L Rahman, M R Alam and M A Rahman
NATURE OF STUDY : On-going (Modified)
DURATION : 2022-2027
ESTIMATED COST(Tk): 10,000/-

11.1 DEFINITION OF THE PROBLEM:

Different date palm germplasm generally resemble each other in their appearance but they are morphologically different. Characterization of germplasm means the description of the materials for determining the magnitude of genetic diversity, variety identification, studying the relationship of species and in the establishment of core collection. It also provides an indication of the value of each germplasm accession and an important basis for gene bank management. It is prerequisite for crossing programme. Without characterization successful breeding programme is not possible. If characterization is done properly, breeders can proceed in right direction, it helps the breeders to take correct decision in cross making. As there is no previous record of date palm characterization in Bangladesh, therefore characterization and documentation of date palm (*Phoenix sylvestris & Phoenix dactylifera*) has been under taken to execute successful breeding programme.

11.2 OBJECTIVES:

1. Assessing the genetic diversity;
2. Registering the accession and avoiding duplication;
3. Establishing the relationship between the species and
4. Establishing the core collection.

11.3 METHODOLOGY:

Under this programme, local and exotic germplasm of date palm garden will be considered for characterization. Morphological characterization will be based on the physical attributes of a plant. The germplasm will be characterized at different time at different growth stage. Healthy date palm plant will be selected for recording data. In case of leaf data, well developed 5 mature leaf data will be collected. From each plant first 5 early blooming flower will be considered for data collection. After the flower gets matured data of 5 early emerging fruits will be collected and in case of seed, 10 mature healthy ripening fruits will be considered for data collection.

TREATMENT:

Local and exotic date palm collection of BSRI.

DATA TO BE RECORDED:

a) Data to be recorded (Morphological data):

1. Leaf length (cm)
2. Petiole length (cm)
3. Leaf blade length (cm)
4. Spine length (cm)
5. Spine area length (cm)
6. No. of spine per leaf
7. Spine rachis angle(º)
8. collection of juice per plant(litre)
9. Brix (%) of juice

b) Data to be recorded (flower and fruit data):

1. Flowering time
2. No. of inflorescence per plant
3. No. of fruit set
4. Spathe length(cm)
5. Peduncle length(cm)
6. Peduncle thickness(cm)
7. Days to fruit maturity
8. Days to fruit ripening
9. Fruit per plant
10. Fruit colour of the maturity
11. Fruit length (cm)
12. Fruit width (cm)
13. Fruit weight (gm)
14 volume
15. Fruit shape
16. Fruit apex
17. Flavour
18. Flesh thickness
19. Flesh colour
20. Fruit density(w/v)

c) Data to be recorded (seed data):

1. Seed length (cm)
2. Seed width (cm)
3. Seed weight (gm)
4. Seed volume (cm3)
5. Seed colour
6. Seed surface
7. Seed weight percentage of fruit weight
8. Seed volume percentage of fruit volume

11.4 WORK ELEMENTS:

1. Collection of Morphological data (e.g. Leaf length, Petiole length, Spine length, No. of spine per leaf etc.)
2. Collection of flowering data
3. Collection of fruit and seed data
4. Data processing and analysis

11.5 TIME SCHEDULE:

Sl.	2025				2026											
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	→															→
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3							→				→					
4					→											→

11.6 ECONOMIC IMPACT:

An indication of the potential value or utility of each germplasm accession will be an important basis for gene bank management and subsequent use.

11.7 EFFECT OF ENVIRONMENT: Friendly to environment.

11.8 UTILIZATION OF RESEARCH RESULTS:

Characterization of germplasm will act as useful guide to overcome many confusion associated with identification of date palm varieties which look very alike in the field. Therefore, the knowledge and the ability of extension workers and plant breeders to recognize varieties will help for successful planning and hybridization programme, respectively.

12.0 TITLE : **SELECTION OF PALMYRA PLAM GERMPLASM BASED ON JUICE YIELD AND QUALITY**
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : H M Tarique, M M Alam, S N Asha, K M R Karim, M R Alam, M S Arefin and M A Rahman
NATURE OF STUDY : On-going
DURATION : 2023-
ESTIMATED COST(Tk): 77,500.00

12.1 DEFINITION OF THE PROBLEM:

Palmyra plam plants belongs to Palmae family which spontaneously grows throughout Bangladesh. This plant is used for different purposes, but popular for their sweet juice and *gur*. This plant plays a significant role in improving the environment, because it can be cultivated along the sides of roads, railway lines, embankments, farmland ails and it can aid the meat sugar and gur requirement of the country.

Bangladesh is suffering from the shortage of sugar and *gur* production. In both cases sugarcane is only the main source of raw material. A secure supply of raw material of sweetener plants is the prerequisite for achieving self-sufficiency and sustainability in this sector. *Gur* production from Palmyra plam may be alternative source to minimize sugar and gur deficiencies of country. Therefore, characterization of germplasm of Palmyra plam in case of juice yield and quality is very essential for future research programme for development of improved variety.

12.2 OBJECTIVES:

1. Identifying palmyra palm genotypes based on juice yield and quality and
2. Selecting parents for hybridization program.

12.3 METHODOLOGY:

Sap or juice is the most important product of palmyra palm. Palm sap or juice will be collected from Palmyra palm Germplasm Center of Bangladesh Sugarcrop Research Institute, Ishwardi, Pabna. The tapping technique of palm juice involves the messaging of the interior of the developing inflorescences by means of a hand and wooden mallet or tong, thereby stimulating sap flow. Sap is collected by cutting the outer end at the head of the inflorescences. Sap is collected three times a day from each inflorescence, normally in morning, noon and evening. Three to five inflorescences are tied together and inserted into a suitable container for juice collection, usually using an earthen pitcher. The inflorescence generally emerged in the last week of March. After emergence of palm inflorescence, it will be processed in the month of mid April.

TREATMENT: Not applicable

DATA TO BE RECORDED:

i) Juice secretion/day/plant/season.
ii) Chemical analysis of juice (Brix %, Pol %, Purity %, Reducing Sugar %)

12.4 WORK ELEMENTS:

1. Preparation for juice collection
2. Juice collection (tapping)
3. Characterization for juice yield and quality parameter of selected genotypes
4. Data processing and documentation

12.5 TIME SCHEDULE:

Sl.	2025				2026											
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1							→	→	→							
2								→	→	→						
3								→	→	→						
4								→	→	→	→	→				

12.6 ECONOMIC IMPACT:

A potential variety will improve the economic condition of the farmers as well as of the country.

12.7 EFFECT OF ENVIRONMENT: Friendly to environment.

12.8 UTILIZATION OF RESEARCH RESULTS:

The promising germplasm will be released as variety, after a series of evaluation, for commercial cultivation.

13.0 TITLE : EVALUATION OF SUGARCANE CLONE MODHUMALA AS LOCATION SPECIFIC *GUR* VARIETIY

LOCATION : BSRI, Ishwardi, Chapainawabganj, Chunarughat, Shubornochor, Gazipur, Kurigram and Barishal

INVESTIGATORS : M R Alam, K M R Karim, M M Rahman, R K Ganopoti and M A Rahman

NATURE OF STUDY : On-going

DURATION : 2016-

ESTIMATED COST(Tk): 1,50,000/-

13.1 DEFINITION OF THE PROBLEM:

Sugarcane is one of the economically important foods cum cash crop in Bangladesh. There is a good demand of juice as well as *gur* variety in the country. However, there is no location specific *gur* variety for the *gur* producing zones. At present, there are few local varieties cultivating in the *gur* zones. Thus, it is important to recommend the variety suitable for *gur* producing in that particular area.

13.2 OBJECTIVES:

1. To evaluate Modhumala clone for releasing as a variety with high recovery and quality *gur* characters

13.3 METHODOLOGY:

Three sugarcane varieties/clone will be used as experimental materials. The experiment will be conducted at BSRI, Ishwardi, Chapainawabganj, Chunarughat, Shubornochor, Gazipur, Kurigram and Barishal. The trial will be set in each location separately following RCB design with 3 replications. The clone Modhumala will be planted in 6m X 8m plot using BSRI Akh 41 & BSRI Akh 46 as check. The clone will be evaluated on the basis of *gur* recovery/juice qualities. Management practices will be followed as and when necessary. If the clone Modhumala showed suitable will be released for commercial cultivation.

TREATMENTS:

1. Modhumala
2. BSRI Akh 41
3. BSRI Akh 46

DATA TO BE RECORDED:

1. Morphological character (colour, growth, erectness, etc.)
2. Cane qualities (softness, *gur* quality, *gur* recovery etc.)
3. Number of millable cane (MC)
4. Brix %
5. Sweetness (sugar %)
6. Yield (TCH)

13.4 WORK ELEMENTS:

1. Setting trials with selected materials
1. Detrashing of old leaves
2. Evaluation of the clones in different stages in respect of disease, pests and yield traits.

13.5 TIME SCHEDULE:

Sl. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→	→												
2									→	→	→	→				
3											→	→	→	→	→	

13.6 ECONOMIC IMPACT:

Sugarcane cultivation with high quality *gur* variety will bring economic benefit to the farmers through income generation.

13.7 EFFECT OF ENVIRONMENT:

The investigation is friendly to environment and as such has no adverse impact on environment.

13.8 UTILIZATION OF RESEARCH RESULTS:

The improved *gur* variety of sugarcane will be used for commercial cultivation at different locations of Bangladesh as per suitability of environment.

14.0 TITLE : MORPHOLOGICAL CHARACTERIZATION AND FLORAL BEHAVIOR OF GRAPEVINE (*Vitis vinifera* L.) GERMPLASM
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : M A Rahman, M R Alam, S N Asha and N A Munna
NATURE OF STUDY : New
DURATION : 2025-
ESTIMATED COST(Tk): 1,50,000.00

14.1 DEFINITION OF THE PROBLEM:

In recent years, there has been a noticeable rise in farmers' interest in grape cultivation in Bangladesh due to its high market value, nutritional benefits, and potential for economic return. As the demand for fresh grapes and processed products such as juice and raisins continues to grow, farmers are increasingly looking for alternative high-value crops like grapevine (*Vitis vinifera* L.) to diversify their income sources. Currently, most farmers rely on a few introduced or locally multiplied varieties such as Black magic, Bikunur, Akelo etc. without scientific validation of their performance. As a result, yield and fruit quality are inconsistent, and crop failure risks remain high. However, successful cultivation is hindered by the lack of well-adapted varieties and insufficient knowledge of the crop's morphological and floral traits under local conditions. Key floral behaviors such as bud burst, anthesis, and stigma receptivity, which directly influence fruit set and breeding potential, remain undocumented in the Bangladesh context. Thus, to develop suitable variety the baseline data of the new crop is crucial. Therefore, systematic observation of morphological and floral characteristics is essential to support both farmers and breeding programs for sustainable grape production in Bangladesh.

14.2 OBJECTIVES:

1. Characterization of morphological traits of the same germplasm using standard descriptors;
2. Documentation of the floral phenology and reproductive behavior of twenty grapevine germplasm and
3. Identification of promising genotypes combining stable flowering behavior, high fruit set, and desirable morphological traits.

14.3 METHODOLOGY:

Twenty healthy and uniform rooted cutting grapevine germplasm will be collected and planted in the experimental field. All vines will be uniformly maintained with recommended pruning, irrigation, fertilization and pest/disease control. Morphological and pomological characterization will be performed. Data will be collected from five representative shoots per vine, and both qualitative and quantitative traits will be recorded using standardized scoring scales and measurement tools. Floral behavior will be monitored by recording key parameters such as date of bud burst, inflorescence emergence, anthesis period and pollen viability (assessed

with 2% acetocarmine staining). Fruit set percentage will be calculated from five tagged inflorescences per vine. Statistical analysis will include descriptive statistics, analysis of variance (ANOVA), principal component analysis (PCA), and cluster analysis conducted using R or SPSS to determine variability among genotypes and identify those best suited to local growing conditions.

TREATMENT:

Green grapes genotypes-10
Coloured grapes genotypes-10

DESIGN: Augmented

DATA TO BE RECORDED:

Morphological and Pomological Traits

1. Shoot: Shoot tip color, growth habit
2. Leaf: Shape, sinus shape, lobe number, serration
3. Inflorescence: Cluster length, compactness
4. Berry: Size, shape, color, skin thickness, seed number
5. Yield Traits: No. of bunches/vine, bunch weight, yield/vine

Floral Behavior (Reproductive Phenology)

1. Bud burst date
2. Inflorescence emergence
3. Anthesis duration (days)
4. Pollen viability (2% acetocarmine staining)
5. Bunch density
6. Fruit set percentage

14.4 WORK ELEMENTS:

1. Field planting
2. Trellis setup
3. Vine training (Y- shape, H-shape)
4. Fruit cutting(for green grapes 8 leaf cut up to 2.5m, for colored grapes 4 leaf cut up to 2.5m)
5. Morphological data collection
6. Floral behavior observation
7. Fruit bagging
8. Data analysis and report preparation

14.5 TIME SCHEDULE:

Sl.	2025				2026											
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	→															
2		→	→													
3				→	→	→										
4					→	→								→	→	
5						→	→	→	→							
6										→	→	→				
7											→	→				
8														→	→	→

14.6 ECONOMIC IMPACT:

Diverse parent materials will help for improving variety which in turn will improve the economic condition of the farmers as well as of the country.

14.7 EFFECT OF ENVIRONMENT: Friendly to environment.

14.8 UTILIZATION OF RESEARCH RESULTS:

Genotypes with good adaptation, high fruit set, and desirable bunch traits will be identified. Collected germplasm will be preserved in the germplasm bank of BSRI will be used for hybridization programme. The promising germplasm will be released as variety for commercial cultivation.

15.0 TITLE : PERFORMANCE EVALUATION OF THE VARIETY BSRI Akh 41 BASED ON CANE & SUGAR YIELD AND MATURITY BEHAVIOR IN SUGAR MILL AREAS
LOCATION : NBSM, TSM and BSRI HQ farm's
INVESTIGATORS : M A Rahman, M R Alam, M S Arefin, M N Alam, M A Rahman, M K Begum and M S Hossain
NATURE OF STUDY : New
DURATION : 2025-2026
ESTIMATED COST(Tk): 90,000/-

15.1 DEFINITION OF THE PROBLEM:

Sugarcane is cultivated both in mill and non-mill zones for sugar, *gur* production and chewing purpose. Bangladesh Sugarcrop Research Institute (BSRI) has been developed forty-eight (48) cane varieties that covered about 95% and 78% of sugarcane production areas in mills and non-mill zones, respectively. The existing cultivated varieties showing huge yield gap between mill zone and research field. The BSRI Akh 41 has released as a chewing variety having higher yield potentiality. Its yield potentiality is higher than any sugar producing variety developed by BSRI. Besides good chewing quality, this variety became popular to the farmers of non mill areas for vigor growths, huge tiller, higher yield and quality *gur* production characteristics and so on. High quality *gur* producing capability of the variety indicates it's suitability to use in sugar production but it was never tested. Hence, a study has been planned to evaluate the performance of BSRI Akh 41 at mill areas to use as sugar producing variety.

15.2 OBJECTIVES:

i. Observing the suitability of BSRI Akh 41 in sugar mill areas;
ii. Finding out the pol% of cane at the crushing period of sugar mills and
iii. Determining the maturity behavior and maturity period.

15.3 METHODOLOGY:

Treatment : BSRI Akh 41
Plot Size : 33 decimal
Replication : 3
Design : RCB
Planting Method : Conventional (Two bud setts)/STP

DATA TO BE RECORDED:

i. Tiller count at 150 and 180 days after planting
ii. Disease and pest incidence at growth period
iii. Millable cane count
iv. Pol% Cane at maturity
v. Cane yield at harvest

15.4 WORK ELEMENTS:

1. Field preparation
2. Basal fertilizer application
3. Intercultural operation
4. Irrigation
5. Tiller count at 150 and 180 DAP
6. Fertilizer application (top dressing)
7. Insect and pest control
8. Millable cane count
9. Harvesting of cane
10. Cane height, girth, yield data

15.5 TIME OF SCHEDULE:

Ac No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→	→	→												
2			→	→	→											
3				→	→	→	→	→	→	→						
4					→	→	→	→	→	→						
5								→	→	→						
6						→	→	→	→	→						
7						→	→	→	→	→	→	→	→			
8														→	→	
9																→
10																→

15.6 ECONOMIC IMPACT:

It is expected that the variety will play an important role in farmers as well as the national economy through higher cane and sugar production.

15.7 EFFECTS ON ENVIRONMENT:

This variety is environment to friendly and there will not be any adverse effect on the surrounding environment for implementation of this trial.

15.8 UTILIZATION OF RESEARCH RESULTS:

The result of this study will be used to increase the production of cane and sugar in mill zones.

16.0 TITLE : EVALUATION OF YIELD, SUGAR CONTENT AND MATURITY BEHAVIOR OF BSRI RELEASED POTENTIAL SUGARCANE VARIETIES CULTIVATED IN SUGAR MILLS AREAS

LOCATION : Carew & Co., TSM and NBSM

INVESTIGATORS : M A Rahman, H M Tarique, M S Arefin, M A Rahman, M N Alam, M S Hossain, M K Begum and M R Alam

NATURE OF STUDY : New

DURATION : 2025-2026

ESTIMATED COST(Tk): 3,00,000.00

16.1 DEFINITION OF THE PROBLEM:

Bangladesh Sugarcrop Research Institute (BSRI) has been developed 48 sugarcane varieties. Out of the released varieties 45 are found suitable for sugar production. Presently 21 varieties are under cultivation in mill zones and covered about 95% cane cultivation areas. All the varieties do not perform equal. The yield of a particular variety depends upon the heredity of genotypes and the environment where its exposed during the course of life cycle and proper cultural practices. Some varieties show its maturity early and some late. In *gur* making areas (non-mill zones) BSRI released varieties performing better and producing quality *gur*. On the other hand, using BSRI varieties in sugar mills, the recovery scenario is not up to the mark which demands for conducting research on the varietal performance. Besides, due to crop competition with short duration crops, sugarcane is replacing to the marginal land, on the other hand farmers are interested to plant sugarcane after harvesting of Aman paddy and winter vegetables Which lead to the late plantation of sugarcane. So, it is urgent to test the varietal performance of BSRI released sugarcane varieties at the existing environments of the mill areas. Therefore, the present study has been designed to evaluate some potential sugarcane varieties at mill zones including late planting practices.

16.2 OBJECTIVES:

i. Determining the yield performance and maturity behavior of the tested sugarcane varieties and
ii. Analyzing the pol% of cane of the varieties.

16.3 METHODOLOGY:

Treatments

T_1 = Isd 33
T_2 = BSRI Akh 45
T_3 = BSRI Akh 48

Design : RCBD
Replication : 3
Plot size : 33 decimals for each variety
Method of planting : Conventional (2 budded setts)
Planting time : 1. Optimum Plantation (November-December)
2. Late Plantation (February – March)

Data to be collected:

1. Germination percent at 90 days
2. Tiller population at 150 days
3. Millable cane count
4. Cane yield at harvest
5. Analysis of pol% cane

16.4 WORK ELEMENTS:

1. Land preparation
2. Plantation
3. Germination count at 90 days
4. Intercultural operation
5. Irrigation
6. Tiller counting at 150 days
7. Fertilizer application (top dressing)
8. Insect and pest control
9. Millable cane count
10. Harvesting of cane
11. Pol% cane analysis

16.5 TIME SCHEDULE :

AC	Year	2025			2026											
No.	Month	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1.																
2.																
3.																
4.																
5.																
6.																
7.																
8.																
9.																
10.																
11.																

16.6 ECONOMIC IMPACT: Positive economic impact is expected.

16.7 IMPACT ON ENVIRONMENT:

This is environment friendly and there will not be any adverse effect on the surrounding environment for implementation.

16.8 UTILIZATION OF RESEARCH RESULTS:

The result of the study will help to reveal the varietal status at existing environment of mill zones. Both the researchers, extension personnel's and farmers will be benefited to select their suitable varieties for their localization using the research results.

Rahmatpur Sub-station, Barishal:

17.0 TITLE : COLLECTION, CHARACTERIZATION AND MANAGEMENT OF NIPA PALM GERMPLASM
LOCATION : Nobipur, Kalapara, Patuakhali
INVESTIGATORS : R K Ganapati, M N Morshed and M A Rahman
NATURE OF STUDY : New
DURATION : 3 years
ESTIMATED COST(Tk): 50,000/-

17.1 DEFINITION OF THE PROBLEM:

Genetic variability is very important in breeding as well as adaptation to a changing environment by environmental stressors like rising salinity, climate change, and coastal erosion which also a big challenge for coastal ecosystem. Nipa palm as a mangrove flora inhabitant to Sundarban from ancient time and dispersed across the coast of Bengal delta. On time being and varying salinity and environmental interreference variability developed and adapted to particular environments. And utilizing this variability in breeding is crucial. Therefore, collecting genotypes from different region of the country and conserve them is prerequisite to develop new varieties through breeding.

Depending upon the garden phenotype and geographic distribution the genotypes of Nipa palm will be collected and planted in tidal flash able river side near coast to establish garden in future use as genetic resources.

17.2 OBJECTIVES:

1. Evaluating and utilizing the germplasm as parent materials in future breeding programs and
2. To establish Nipa palm garden by the genotypes/biotype collected from different territories.

17.3 METHODOLOGY:

Treatments

NP_1 = Genotype collected from Satkhira(Shyamnagar) district
NP_2 = Genotype collected from Khulna district
NP_3 = Genotype collected from Bagerhat district
NP_4 = Genotype collected from Barguna district
NP_5 = Genotype collected from Patuakhali district
NP_6 = Genotype collected from Bhola district
NP_7 = Genotype collected from Hatiya district
NP_8 = Genotype collected from Cox-bazar district

Locations: Dhulasher, Kalapara, Patuakhali

Plot Size: 10m x 10m, **Replication:** 3

17.4 WORK ELEMENTS:

i. Establish seedlings will be count 120, 150 and 180 days of planting.
ii. Expanded leaves will be recorded at 90,120,150 and180 DAP
iii. Seedling vigor will be assessed at 90, 120, 150 and180 DAP

17.5 TIME SCHEDULE:

AC No.	2026												
	1	2	3	4	5	6	7	8	9	10	11	12	1
1		→	→	→									
2					→	→	→	→	→	→	→	→	→
3						→	→	→	→	→	→	→	→

17.6 ECONOMIC IMPACT:

Nipa palm is a environmentally friendly plant protect land from river erosion, use as wind break in cyclone, réclame saline affected soil and support in rural livelihood in coastal area.

17.7 EFFECTS ON ENVIRONMENT: No adverse effect on environment.

17.8 UTILIZATION OF RESEARCH RESULTS: Collected germplasm will be used in future for breeding.

Bandarban sub-station:

18.0 TITLE : STUDY OF THE FLORAL BEHAVIOR OF SUGARCANE AT BANDARBAN
LOCATION : BSRI sub-station, Bandarban
INVESTIGATORS : A Chakraborty, N A Munna and M A Rahman
NATURE OF STUDY : New
DURATION : 2025-26
ESTIMATED COST(Tk): 75,000/-

18.1 DEFINITION OF THE PROBLEM:

Sugarcane is a major cash crop contributing to the sugar industry. However, genetic improvement of sugarcane is often constrained by limited flowering, poor synchronization of flowering, and the strong influence of environmental factors. Many of the collected germplasm did not flower in the Ishwardi region. Therefore, non-flowering germplasm have been taken to Bandarban, where their floral behavior will be studied. Exploring the floral behavior of germplasm is essential for targeted hybridization, especially for the development of superior clones. The objective of this research is to study the floral behavior of these germplasms under different Hilly regions. Understanding and documenting their flowering responses is crucial for facilitating targeted hybridization and accelerating the development of superior sugarcane clones. Therefore, this study aims to overcome the existing barriers to flowering in sugarcane to accelerate varietal development.

18.2 OBJECTIVES:

1. To evaluate the breeding potential of sugarcane clones that do not flower at Ishwardi region and
2. To identify suitable parental combinations for hybridization.

18.3 METHODOLOGY:

This study will be conducted at Bandarban to identify the breeding potential and floral behavior of 100 parental clones that do not flower in the Ishwardi region. Flowering data will be collected through key developmental stages. The Elongation Stage will be measured by counting the days from mid-October to the start of flag leaf formation. The Flag Leaf Stage will be measured by counting the days from the beginning of flag leaf formation to full flag leaf emergence. The Full Emergence Stage will be tracked by counting the days from tip emergence to the full extension of the inflorescence. Finally, the Percentage of Flowering will be determined by dividing the number of flowering stalks by the total number of plants and multiplying by 100.
Weather data, flowering propensity, and pollen viability are key components of this study. Temperature, day length, and relative humidity, which critically influence sugarcane flowering time and pollen viability, will be monitored by recording daily averages of minimum and maximum temperatures, day length, and relative humidity throughout the flowering development stages. Flowering propensity of each clone will be assessed by recording the number of flowering canes relative to the total canes and scored on a standardized scale from 1 to 5: very low (≤10%), low (11–30%), medium (31–60%), high (61–80%), and very high (>80%) flowering. Pollen viability will be evaluated by crushing anthers from mature, unopened spikelets in a 10% iodine solution and examining the slides under a light microscope to determine the percentage of viable pollen grains. Clones with less than 10% viable pollen will be classified as female parents, while those with more than 10% viable pollen will be considered male parents.

TREATMENT: Not applicable

DATA TO BE RECORDED:

1. Days to Elongation stage
2. Days to Inflorescence tip emergence
3. Days to Inflorescence full emergence
4. Date of flowering initiation
5. Date of flowering
6. % Pollen viability
7. Flowering Propensity

8. Record temperature, rainfall, and photoperiod at flowering time
9. Flowering time
10. Length of the flowering period
11. Assess the type and structure of flowers produced (e.g. spikelets, panicles).

18.4 WORK ELEMENTS:

1. Documentation of breeding germplasm
2. Flowering record
3. Record temperature, Relative humidity, and photoperiod at flowering time
4. Laboratory determination for pollen viability %
5. Assessment of the type of flower produced
6. Cross setting
7. Fuzz collection
8. Assess the seed set for each cross

18.5 TIME SCHEDULE:

Sl.	2025				2026												
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J
1		→															
2		→	→	→	→												
3		→	→	→													
4												→	→	→			
5														→	→	→	
6																	
7														→	→	→	
8																→	→

18.6 ECONOMIC IMPACT:

Improved understanding of sugarcane flowering can significantly boosts breeding efficiency and crop yields. By enhancing hybridization programs and developing climate-adapted varieties, this research can lead to higher sugar content varieties and increase productivity.

18.7 EFFECTS OF ENVIRONMENT: Friendly to the environment.

18.8 UTILIZATION OF RESEARCH RESULTS:

Flowering varieties are valuable for hybridization programs, especially in variable climates where unpredictable flowering and pollination impact breeding success. Insights into reproductive traits will help preserve genetic diversity and enhance breeding for higher sugar content, increased yield, and development of climate-adapted varieties.

BIOTECHNOLOGY DIVISION

Rationale

Biotechnology is the integration of natural sciences and organisms, cells, parts thereof, and molecular analogues for products and services. Biotechnological techniques such as tissue culture, genetic transformation and molecular marker studies could be used as important tools for sugar crops; sugarcane, sugar beet, stevia, date palm, and palmyra palm improvement. Sugarcane is often cited as the model crop in which cultivar improvement has been obtained through tissue culture. It has some important advantages as a target for genetic transformation such as excellent regeneration system, and routinely multiplied and maintained by vegetative propagation. Marker studies could be useful for variety identification and development of MAS (Marker Assisted Selection) method for accurate, rapid and early selection of sugar crops variety independent of environmental factors.

Development of superior sugarcane cultivar through conventional breeding takes about 10-12 years in Bangladesh. An elite variety might completely be abandoned because of a single deficiency often being vulnerable to biotic or abiotic stress under climatic change. Traditional breeding approaches to rectify such a deficiency in an existing cultivar are difficult because of its genetic complexity. Consequently, date palm, palmyra palm, sugar beet and stevia as alternate sweeteners are receiving research importance as alternate source of sugar. Therefore, biotechnological research may offer viable options for sugarcane improvement as well as alternate sweeteners.

Keep in mind of climatic change and need based demand “Research Program of 2025-2026” has been undertaken with major emphasis on:

- Characterization and documentation of sugar crops using molecular markers.
- Genetic enhancement of sugarcane containing desirable characters through tissue culture techniques.
- Genetic transformation of desirable genes in sugarcane.
- Micropropagation for multiplication of sugar crops.
- Development of somaclones of stevia through tissue culture techniques and subsequent molecular diversity analysis.
- CRISPR/Cas9 based genome editing for the improvement of stevia.
- Adaptive trial of stevia in saline prone areas of Bangladesh.

LIST OF EXPERIMENTS

1.0 Title : Characterization and documentation of sugar crops using molecular markers
2.0 Title : Genetic enhancement of sugarcane containing desirable characters through tissue culture techniques
3.0 Title : Genetic transformation of desirable genes in sugarcane
4.0 Title : Micropropagation for multiplication of sugar crops
5.0 Title : Development of somaclones of stevia through tissue culture techniques and subsequent molecular diversity analysis
6.0 Title : CRISPR/Cas9 based genome editing for the improvement of stevia
7.0 Title : Adaptive trial of stevia in saline prone areas of Bangladesh

PROGRAMME IN DETAILS

PROGRAMME AREA : BIOTECHNOLOGY AND FRONTIER RESEARCH
1.0 TITLE : CHARACTERIZATION AND DOCUMENTATION OF SUGAR CROPS USING MOLECULAR MARKERS
LOCATION : BSRI Lab
INVESTIGATORS : N Islam, M A Azim, M R R Rajib and A K Ghose
NATURE OF STUDY : On-Going
DURATION : Continuous
ESTIMATED COST(Tk): 12,50,200.00

1.1 DEFINITION OF THE PROBLEM:

Molecular characterization of sugar crop varieties and germplasm is a very important component in any crop improvement programme. The traditional method of characterization and identification of sugar crops varieties or germplasm is based on agronomic and morphological traits. However, such traits are highly affected by the environment. Interest in molecular characterization and identification of crop varieties and collected germplasm is increasing because molecular markers are accurate, abundant and less affected by the environment. Identification of varieties using molecular markers through DNA fingerprinting is indispensable for variety protection. Characterization of varieties and existing germplasms using molecular markers would be directed for hybridization and selection of varieties to achieve target breeding.

Commercial sugar crop varieties are characterized by a narrow genetic base and breeding programme throughout the world has limited genetic diversity. Potential for maximum gain in the breeding programme is only realized when a broad genetic base is present. To determine the extent of diversity present in the sugar crop germplasm pool, proper evaluation and accurate characterization of the materials would be done using molecular markers.

1.2 OBJECTIVES:

1. Identification of sugar crop varieties, active germplasm and developed somaclones through DNA fingerprinting;
2. Determination of genetic diversities among the sugar crop varieties, active germplasm, and somaclones;
3. Tagging of marker against identified character;
4. Developing Marker Assisted Selection (MAS) method for different sugar crops and
5. Documentation and database development.

1.3 METHODOLOGY:

1. The BSRI-bred sugar crop varieties, collected germplasm, developed somaclones would be used as experimental materials.
2. DNA extraction and purification will be followed by the modified mini prep CTAB method. Three individual DNA samples from a cultivar or germplasm in equal volume and concentration will be pooled to form the bulked sample.
3. SSRs and ESTs primers will be used in PCR amplification.
4. Amplified DNA will be run in agarose gel by electrophoresis to separate allele specific bands.
5. Electrophoresesed gel will be documented for DNA fingerprinting using gel documentation system.
6. Documented electrophoreses gel will be scored on the basis of presence or absence of allele specific bands. Data will be analyzed to determine the relationships among all varieties, germplasm collection, and developed somaclones and cluster analysis will be carried out using computer software.

It may be mentioned that, the method might need to be modified depending on responses and observations of the experiments.

1.4 WORK ELEMENTS:

1. Samples collection
2. DNA extraction, quality determination and quantification
3. PCR amplification
4. Gel electrophoresis
5. Documentation/Imaging
6. Data collection and analysis

1.5 TIME SCHEDULE:

Sl No	2026												2027	
	J	F	M	A	M	J	J	A	S	O	N	D	J	F
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1.6 ECONOMIC IMPACT:

Breeding program would be formulated based on molecular characterization. Time and cost for variety selection will be reduced.

1.7 EFFECT ON ENVIRONMENT:

This experiment is environment friendly and there would have no adverse impact on environment.

1.8 UTILIZATION OF RESEARCH RESULTS:

Results of this investigation will be utilized for variety identification, documentation and protection. Breeding programme would be formulated based on molecular characterization of active germplasm collection. Marker Assisted Selection (MAS) method for different sugar crops would be developed.

PROGRAM AREA : BIOTECHNOLOGY AND FRONTIER RESEARCH
2.0 TITLE : GENETIC ENHANCEMENT OF SUGARCANE CONTAINING DESIRABLE CHARACTERS THROUGH TISSUE CULTURE TECHNIQUES
LOCATION : BSRI Lab
INVESTIGATORS : A K Ghose, M A Azim, M R R Rajib and N Islam
NATURE OF STUDY : On-Going
DURATION : Continuous
ESTIMATED COST(Tk): 2,09,989.00

2.1 DEFINITION OF THE PROBLEM:

Genetic enhancement of sugarcane for sustainable productivity with desirable characters under changing climate is demanding due research attention as existing gene pool became exhaustive use of conventional breeding system. Tissue culture might be an option for the same. It has been proposed that the primary application of tissue culture in crop improvement is to take an acceptable commercial cultivar that is deficient in one or a few characters, produce somaclones of that cultivar through tissue culture, and select variants with the desired change. Sugarcane is often cited as the model crop in which cultivar improvement has been obtained through tissue culture. The role of tissue culture in commercial cultivar development is an important consideration that remains to be resolved at the present time.

Desirable characters for sugarcane include high sucrose content, disease resistance, tolerance to biotic and abiotic stresses, profuse tillering, and ratooning potentiality, which are all crucial for maximizing yield and improving sugarcane production. Since traditional plant breeding methods have been slow to yield substantial improvements in desirable characters, the alternative approach of utilizing plant tissue culture techniques has received increased attention. An added advantage in generation of plants through tissue culture is the regenerated plants are clones of commercial varieties those have deficit in one or a few

characters, thereby simplify subsequent testing. The induction of genetic variability for desirable characters in sugarcane would further facilitate its cultivation under unfavorable condition. Sodium chloride (NaCl), hydroxy proline (HYP), polyethylene glycol (PEG), and mutagenic agents would be used to select sugarcane with desirable characters.

2.2 OBJECTIVES:

1. Development of sugarcane somaclones under selection pressure using NaCl, hydroxy proline, polyethylene glycol, and mutagenic agents;
2. Evaluation and selection of sugarcane somaclones with desirable traits and
3. Identification of the genetic variability among tissue culture derived plants using molecular markers RAPD, ISSR or SSR etc.

2.3 METHODOLOGY:

1. BSRI released sugarcane varieties and Modhumala will be used as experimental materials.
2. Somaclones from different varieties will be produced through callus culture.
3. For callus initiation explants will be inoculated on MS + 2, 4-D (at different concentrations) + 10% coconut water.
4. Callus will be sub-cultured on the medium containing NaCl (50, 100, 150, 200 and 250 mM), HYP (0.5, 1.0, 1.5, 2.0 and 2.5 mM), EMS (0.01M, 0.02M, 0.03M) and PEG (5.0, 7.5, 10.0, 12.5 and 15.0%). On every concentration the callus will be maintained for 2-3 weeks.
5. The tolerant callus will be tested for retention of tolerance by sub-culture first on media without selecting agents, followed by selecting agents containing media.
6. Shoot will be regenerated on shooting media (MS+ different concentrations of BAP + different concentrations of Kn) with and without selecting agents.
7. For root initiation regenerated shoots will be sub-cultured on the medium MS + NAA (different concentrations of) with and without selecting agents.
8. After hardening, plants will be tested under induced salinity and drought under pot as well as natural drought conditions in the field.

It may be mentioned that the method might need to be modified depending on responses and observations of the experiments.

2.4 WORK ELEMENTS:

1. Explants collection and sterilization
2. Media preparation
3. Inoculation and incubation of explants
4. Sub-culture
5. Observation and data collection in *in vitro* conditions
6. Observation and data collection in *ex vitro* conditions

2.5 TIME SCHEDULE:

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2.6 ECONOMIC IMPACT:

It is expected to develop sugarcane varieties with desirable characters.

2.7 EFFECT ON ENVIRONMENT:

This experiment is environment friendly and there would have no adverse impact on environment.

2.8 UTILIZATION OF RESEARCH RESULTS:

Results of this experiment will be used to develop sugarcane varieties with desirable characters within a shorter period of time.

PROGRAM AREA : BIOTECHNOLOGY AND FRONTIER RESEARCH
3.0 TITLE : GENETIC TRANSFORMATION OF DESIRABLE GENES IN SUGARCANE
LOCATION : BSRI Lab
INVESTIGATORS : M A Azim, A K Ghose, M R R Rajib and N Islam
NATURE OF STUDY : On-Going
DURATION : Continuous
ESTIMATED COST(Tk): 2,55,200.00

3.1 DEFINITION OF THE PROBLEM:

Plant genetic transformation mediated by *Agrobacterium tumefaciens*, a soil born phytopathogenic bacterium, has become the most useful method for the induction of foreign genes into plant cells and the subsequent regeneration of transgenic plants. *A. tumefaciens* has the exceptional ability to transfer a particular DNA segment of the plasmid into the nucleus of the infected cells where it is then stably integrated into the host genome and transcribed expressing the desirable trait. *Agrobacterium*-mediated transformation is advantageous in comparison with other methods of genetic transformation in plants. Efficient method for *Agrobacterium*-mediated transformation and recovery of transgenic plants has been reported in sugarcane (Arencibia *et al.*, 1998). In BSRI, hybridization is the only method being practiced for varietal development, which has proved to be much less effective now a days since similar or same parentage is being used in crossing programme. As such no break-through could be expected in varietal development in future. *Agrobacterium*-mediated transformation method might be a prospective method to develop sugarcane varieties having built-in potential with desired characters. Therefore, the present programme on *Agrobacterium*-mediated transformation has been undertaken to transfer desirable genes and their expression for development of transgenic sugarcane in Bangladesh.

3.2 OBJECTIVES:

1. Collection and maintenance of *Agrobacterium* strains with desirable gene (s);
2. Transformation of desired gene (s) in sugarcane;
3. Confirmation of the presence and expression of transgene in the transgenic sugarcane; and
4. Transgenic sugarcane development.

3.3 METHODOLOGY:

1. Luria-Bertani (LB) broth medium contained 1% Bacto peptone, 0.5% Bacto-yeast extracts and 1% NaCl will be used for routine *Agrobacterium* culture.
2. Sugarcane varieties such as Isd 16, Isd 38, Isd 39, Isd 40, BSRI Akh 44, BSRI Akh 45 and BSRI Akh 46 will be used as experimental materials. Excised basal innermost area of spindle leaf as explant will be cultured on MS-M1 medium (MS medium containing 100 mg/l myo-inositol, 500 mg/l casein hydrolysate, 2 mg/l 2,4-D, 3% sucrose and 0.6% agar) and MS-M2 (MS medium containing 7.5 mg/l NAA, 3% sucrose and 0.6% agar) for callus initiation and shoot development respectively.
3. For transformation, *Agrobacterium* strains ($P^{CAMBIA1301}$ containing plasmid with OsPDH45+ OsGlyI+OsGlyII genes for salt and drought tolerance) will be cultured in LB medium supplemented with 50 mg/l hygromycin, at 100 rpm under 37 ºC for 24-48 hours. Then the bacterial cells will be suspended in MS-M1 liquid medium and will be used for infection of callus produced on MS-M1 medium and leaf segments.

4. Callus (21-28 days after initiation on MS-M1 medium in the dark at 25ºC) will be sub-cultured on fresh MS-M1 medium for 7-14 days. Then the callus (3-5 mm in diameter) and separated leaf segments will be immersed in the *Agrobacterium* suspension for 60, 90 and 120 minutes for infection. Infected callus will be cultured on solid MS-M1 medium and leaf segments on MS-M2 for co-cultivation. Co-cultivation will be made in the dark at 28-30 ºC for 3-14 days.
5. All the media for co-cultivation and *Agrobacterium* suspension culture will be supplemented with 30 mg/l acetosyringone.
6. The co-cultivated materials will be washed two times with liquid MS-M1 and MS-M2 media supplemented with 500 mg/l cefotaxime according to *Agrobacterium* strains. Then washed materials will be transferred to MS-M1 and MS-M2 solid media containing 50 hygromycin according to bacterial strains and maintained 14-21 days for selection. After selection, the cultures will be sub-cultured regularly on regeneration media (MS-M2 + hygromycin 50 mg/l for leaf segments and MS-M3 containing MS + BAP 2mg/l + Kn 1mg/l + hygromycin 50 mg/l for callus) at an interval of 2-3 weeks.
7. Optimum inhibitory concentration of kanamycin will be determined using 50, 75, 100 mg/l concentrations of kanamycin in routine media.
8. After co-cultivation and selection, the expression of GUS will be analyzed histochemically in callus tissues and leaf segments as well as shoots from resistant callus and leaf segments.
9. On the other hand shoots from resistant callus and leaf segments will be cultured on the regeneration medium under fluorescent light with 16 h photo period.
10. Regenerated shoots will be cultured on rooting medium MS-M4 (MS basal medium supplemented with 5.0 mg/l NAA or IBA) containing 50 mg/l hygromycin.
11. To identify and confirm the stable incorporation of introduced genes and its expression in the transformed plants two different assays viz. GUS assay (to identify putative transformed shoots) and genetic analysis using PCR will be carried out.
12. After PCR confirmation transferred plants will be tested against salt and drought stresses using *in vitro* methods and will be maintained under *in vitro* contained conditions.

It may be mentioned that the methods and media might need to be changed depending on plasmid construct, responses and observations.

3.4 WORK ELEMENTS:

1. Collection of *Agrobacterium* strains
2. Culture and maintenance of *Agrobacterium* strains
3. Sugarcane explants collection and preparation
4. Media preparation and sterilization
5. Infection of sugarcane explants with *Agrobacterium*
6. Co-cultivation of *Agrobacterium* and sugarcane explants
7. Sub-culture in regeneration media
8. Detection of transformation and expression

3.5 TIME SCHEDULE:

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3.6 ECONOMIC IMPACT:

It is expected to produce high yielding salinity and drought tolerant sugarcane varieties. In future receiving higher yield through cultivation of resistant variety, growers would be economically benefited.

3.7 EFFECT ON ENVIRONMENT:

This investigation will be conducted under contained condition therefore, would have no adverse impact on environment.

3.8 UTILIZATION OF RESEACH RESULTS:

Method of genetic transformation of sugarcane will be optimized. Findings of this investigation will be used for genetic transformation of sugarcane with desired gene (s) as well as the developed method will be used in conducting CRISPR/Cas9 based genome editing for improvement of different sugar crops.

PROGRAM AREA : BIOTECHNOLOGY AND FRONTIER RESEARCH
4.0 TITLE : MICROPROPAGATION FOR MULTIPLICATION OF SUGAR CROPS
LOCATION : BSRI Lab. Pot and Field
INVESTIGATORS : M A Azim, A K Ghose, M R R Rajib and N Islam
NATURE OF STUDY : On-Going
DURATION : Continuous
ESTIMATED COST(Tk): 1,50,000.00

4.1 DEFINITION OF THE PROBLEM:

In Bangladesh, the demand of sugar is increasing day by day but the area under production of sugar crops is decreasing. BSRI released high yielding, disease free sugarcane varieties may cultivate in the limited area and tissue culture derived sugarcane plantlets with superior characters will be the best solution. Among the considerations, the main candidature is long duration of this crop to cultivate by the farmers. Sugar beet (*Beta vulgaris*) have been introduced in Bangladesh which is the source of almost 40% of the world sucrose and it is a temperate crop, but can be cultivated successfully in tropical and sub-tropical regions. It is a cross-pollinating, highly heterogeneous crop and has a self-incompatibility system thus, micropropagation, *i.e.* vegetative multiplication under *in vitro* conditions can be widely used for sugar beet propagation. It is possible to multiply sugar beet from all its vegetative and generative organs such as hypocotyls, cotyledons, epicotyls, leaf, leaf stalk and dormant shoots (Annonymous, 2006) which can be utilized to eliminate the problem of the true seed production in our country and help to enhance the cultivation of sugar beet in Bangladesh.

Date palm and palmyra palm is economically important plants and produce juice and *gur*; an alternate source of sugar which can meet up the substantial demand of high shortage sugar in the country. Arabian date palm and palmyra palm fruits are sweet and used as food. True to type propagating materials are need for cultivation of Arabian date palm and palmyra palm. Propagation of these plants through seeds is not a viable proposition because of very low percentage of germination and heterozygous nature of seed grown plants.

Therefore, the present investigation has been undertaken to produce vegetative seed production of sugar beet and the propagation of date palm and palmyra palm through tissue culture technique.

4.2 OBJECTIVES:

1. Identifying the suitable sources of explants for micropropagation of sugarcane, sugar beet, Arabian date palm and palmyra palm;
2. Finding out the suitable media for micropropagation;
3. Developing tissue culture protocols; and
4. Hardening plantlets for transplantation.

4.3 METHODOLOGY:

1. Hypocotyls, cotyledons, epicotyls, leaf, leaf stalk, dormant shoots, and offshoots will be used as explants for micropropagation of sugarcane, sugar beet, Arabian date palm and palmyra palm and cultured on MS medium supplemented with different concentrations and combinations of auxins and cytokinins.

2. The explants will be cut into small pieces (about 1cm long) and then will be treated with 1% savlon for 5-6 minutes with constant shaking and washed thoroughly with distilled water.
3. Then the explants will be taken under laminar airflow cabinet. Surface sterilization will be done with a 0.1% mercuric chloride solution containing two-three drops of tween-80 for five minutes under aseptic condition. Surface sterilized explants will be washed four times with sterilized distilled water.
4. Then explants will be inoculated aseptically for shooting on MS medium with different concentrations and combinations of growth regulators. Shoots will be cultured on rooting media for root production.
5. Rooted plantlets will be hardened and transplanted in the soil.

4.4 WORK ELEMENTS:

1. Explants collection and sterilization of sugarcane, sugar beet, Arabian date palm and palmyra palm
2. Media preparation
3. Inoculation and incubation of explants
4. Sub-culture
5. Observation and data collection under *in vitro* conditions
6. Hardening of plantlets
7. Transplantation of plantlets in the field
8. Observation and data collection in *ex vitro* and field conditions

4.5 TIME SCHEDULE:

Sl No	2026												2027	
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4.6 ECONOMIC IMPACT:

Sugarcane, sugar beet, Arabian date palm and palmyra palm plantlets will be produced through micropropagation which will save the seed cost and provide disease free quality seed. Farmers would get higher economic benefit out of the results of this experiment.

4.7 EFFECT ON ENVIRONMENT:

This experiment is environment friendly and there would have no adverse impact on environment.

4.8 UTILIZATION OF RESEARCH RESULTS:

Results of this investigation will be utilized as alternate source for sugarcane, sugar beet, Arabian date palm and palmyra palm plantlets production. In Bangladesh, tissue culture techniques being developed and integrated with conventional breeding programmes are playing a significant role in the agricultural improvement, and adaptation of sugarcane, sugar beet, Arabian date palm and palmyra palm. Farmers will be economically benefited from the results of this experiment.

PROGRAM AREA : BIOTECHNOLOGY AND FRONTIER RESEARCH
5.0 TITLE : DEVELOPMENT OF SOMACLONES OF STEVIA THROUGH TISSUE CULTURE TECHNIQUES AND SUBSEQUENT MOLECULAR DIVERSITY ANALYSIS
LOCATION : BSRI Lab. Pot and Field
INVESTIGATORS : N Islam, M A Azim, M R R Rajib and A K Ghose
NATURE OF STUDY : On-Going
DURATION : Continuous
ESTIMATED COST(Tk): 7,50,000.00

5.1 DEFINITION OF THE PROBLEM:

Stevia is economically important medicinal plant that contains stevioside in the leaves. Stevia leaves are alternate source of sugar which can meet up the substantial demand of high shortage sugar in the country. Stevia used as medicinal purpose in case of diabetic patient. Micropropagation is a method of plant propagation which starts from very small parts of plant (shoot tip, meristem) in germ free environment. Micropropagation technology could be used as an effective tool for a rapid and cheaper means of propagation of stevia due the limited source of planting materials such as newly released high yielding varieties. Micropropagation might be used for rapid multiplication and high quality plantlets production in stevia. Besides, it is needed to develop non flowering stevia plant or changes flowering behavior as well as stevioside content per plant in Bangladesh.

Therefore, to increase the yield of stevia utilizing micropropagated high quality plantlets and to determine the extent of diversity present in the stevia germplasm pool and accurate characterization of the materials done by using molecular markers the experiment has been undertaken.

5.2 OBJECTIVES:

1. Identification of suitable sources of explants;
2. Finding out the suitable media;
3. Generate somaclones through repeated sub-culturing
4. Developing desirable non-flowering stevia plantlets and molecular diversity analysis; and
5. Biochemical profiling of stevioside and other important secondary metabolites.

5.3 METHODOLOGY:

1. Shoot tip and meristematic buds of stevia will be cultured on MS medium supplemented with different concentrations and combinations of cytokinins and auxins for shoot and root production.
2. The explants will be cut into small pieces (about 1cm long) and then will be treated with 1% savlon for 5-6 minutes with constant shaking and washed thoroughly with distilled water.
3. Then the explants will be taken under laminar airflow cabinet. Surface sterilization will be done with a 0.1% mercuric chloride solution containing two-three drops of tween-80 for five minutes under aseptic condition. Surface sterilized explants will be washed four times with sterilized distilled water.
4. Then explants will be inoculated aseptically for shooting on MS medium with different concentrations and combinations of growth regulators. Shoots will be cultured on rooting media for root production.
5. Rooted plantlets will be hardened and transplanted in the soil.
6. DNA extraction and purification will be followed by the modified mini prep CTAB method. Three individual DNA samples from a somaclone in equal volume and concentration will be pooled to form the bulked sample.
7. SSRs and ESTs primers will be used in PCR amplification.
8. Amplified DNA will be run in agarose gel by electrophoresis to separate allele specific bands.
9. Electrophoresesed gel will be documented for DNA fingerprinting using gel documentation system.
10. Documented electrophoreses gel will be scored on the basis of presence or absence of allele specific bands. Data will be analyzed to determine the relationships among all varieties, germplasm collection, and developed somaclones and cluster analysis will be carried out using

computer software.

It may be mentioned that the method might need to be modified depending on responses and observations of the experiments.

5.4 WORK ELEMENTS:

1. Explants collection and sterilization of stevia
2. Media preparation
3. Inoculation and incubation of explants
4. Sub-culture
5. Observation and data collection from *in vitro* conditions
6. Hardening of plantlets
7. Transplantation of plantlets in the field
8. Observation and data collection from *ex vitro* and field conditions
9. Samples collection
10. DNA extraction, quality determination, and quantification
11. PCR amplification
12. Gel electrophoresis
13. Documentation/Imaging
14. Data collection and analysis

5.5 TIME SCHEDULE:

Sl No	2026												2027	
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5.6 ECONOMIC IMPACT:

Stevia cultivation in Bangladesh has the potentiality to boost up the economy by providing farmer's with a high value crop suited for meeting up the partial demand of sugar production.

5.7 EFFECT ON ENVIRONMENT:

This experiment would have no adverse impact on environment.

5.8 UTILIZATION OF RESEARCH RESULTS:

Results of this experiment will be used to develop stevia varieties having desirable characters within a shorter period of time. Farmers will be economically benefited by increasing the cultivation of superior stevia varieties.

PROGRAM AREA : BIOTECHNOLOGY AND FRONTIER RESEARCH
6.0 TITLE : CRISPR/Cas9 BASED GENOME EDITING FOR THE IMPROVEMENT OF STEVIA
LOCATION : BSRI Lab. Pot and Field.
INVESTIGATORS : A K Ghose, M A Azim, M R R Rajib and N Islam
NATURE OF STUDY : On-Going
DURATION : Continuous
ESTIMATED COST(Tk): 15,50,000.00

6.1 DEFINITION OF THE PROBLEM:

In BSRI, hybridization is the only method being practiced for varietal improvement of different sugar crops, especially stevia which has proved to be much less effective now a day since similar or same parentage is being used in crossing programme. As such no break-through could be expected in varietal development in future. The "Clustered Regularly Interspaced Short Palindromic Repeats" (CRISPR)/Cas9 based genome editing might be a prospective method to develop sugar crop varieties having superior quality and built-in potential against biotic and abiotic stresses.

The "Clustered Regularly Interspaced Short Palindromic Repeats" (CRISPR)/Cas9 system with Cas9 endonuclease offers a powerful targeted genetic modification apparatus for gene functional studies and ultimately heritable trait improvement. CRISPR/Cas9 system has been recently proven to be a versatile tool for genome editing and also can recruit various modifying enzymes and transcriptional activators to the targeted genomic site through fusion with Cas9. Artificial transcriptional activators provide a useful means for gene activation by administering a transcription activation domain (TAD) to a particular gene promoter at the native genomic locus via a programmable DNA-binding module. Recruitment of these regulators to promoters adjacent to transcription start site (TSS) through the CRISPR/Cas9 system can modify the level of expression of the targeted genes. Although the modifications caused by the CRISPR/Cas9 systems are similar to naturally occurring mutations, the employment of transgenic systems during the creation of specific varieties needs to follow GMO laws in nations that rely on process-based regulations.

Therefore, the present programme on the genome editing of stevia through CRISPR/Cas9 technique has been undertaken to develop high quality stevia varieties in Bangladesh.

6.2 OBJECTIVES:

1. Identification and characterization of target gene (s) responsible for increased stevioside content in stevia through bioinformatic analysis;
2. Designing of specific and efficient single guide RNAs (sgRNAs) targeting desired gene (s);
3. Transformation, expression, isolation, and purification of Cas9 protein;
4. Establishing the protoplast isolation protocol;
5. Optimization of PEG mediated transfection of protoplast with ribonucleoprotein (RNP); and
6. Evaluation of the expression of desired edited gene (s).

6.3 METHODOLOGY:

1. Literature survey and selection of candidate gene (s) responsible for increased stevioside content in stevia using different bioinformatic tools.
2. The BSRI-bred variety of stevia would be used as experimental materials.
3. DNA extraction and purification will be followed by the modified mini prep CTAB method.
4. PCR amplification of the target gene (s) by gene specific primers, sequencing of the gene and annotation with the databases.
5. Specific and efficient single guide RNAs (sgRNAs) will be designed by different online tools.
6. PCR assembly and in vitro transcription of sgRNAs.
7. Designing and synthesis of Cas9 protein
8. Transformation, expression, isolation, purification, and visualization of Cas9 protein by SDS-PAGE gel electrophoresis.
9. Protoplast isolation from leaves by different combinations and concentrations of enzymes.

10. Transfection of isolated protoplast with different ribonucleoproteins (RNPs) through PEG method.
11. Total RNA isolation from transfected protoplasts and evaluation of the expression level of targeted gene (s) responsible for the desired character (s).

It may be mentioned that the method might need to be modified depending on responses and observations of the experiments.

6.4 WORK ELEMENTS:

1. Plant samples collection
2. DNA extraction, PCR amplification, and sequencing of the targeted gene (s)
3. Single guide RNAs (sgRNAs) designing, synthesis and *in vitro* transcription
4. Designing, synthesis, transformation, expression, isolation, purification, and visualization of Cas9 protein
5. Protoplast isolation
6. Evaluation of the efficacy of different enzyme solutions in protoplast isolation
7. Transfection of protoplasts with Different ribonucleoproteins (RNPs)
8. Evaluation of the expression level of targeted gene (s) responsible for the desired character (s).
9. Transfected protoplast culture
10. Data collection and analysis

6.5 TIME SCHEDULE:

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6.6 ECONOMIC IMPACT:

Improved stevia varieties would be developed within shorter period of time. Cost and time required for variety development will be reduced.

6.7 EFFECT ON ENVIRONMENT:

This experiment is environment friendly and there would have no adverse impact on environment.

6.8 UTILIZATION OF RESEARCH RESULTS:

Results of this investigation will be utilized for varietal development of stevia. Based on the results of this experiment, further research program can be developed for specific trait of any sugar crops.

PROGRAM AREA : BIOTECHNOLOGY AND FRONTIER RESEARCH
7.0 TITLE : ADAPTIVE TRIAL OF STEVIA IN SALINE PRONE AREAS OF BANGLADESH
LOCATION : Bhola, Khulna and Satkhira
INVESTIGATORS : M R R Rajib, A K Ghose, M A Azim and N Islam
NATURE OF STUDY : New
DURATION : 2026-2028
ESTIMATED COST(Tk): 3,50,000.00

7.1 DEFINITION OF THE PROBLEM:

Stevia is economically important medicinal plant that contains stevioside in the leaves. Stevia leaves are alternate source of sugar which can meet up the substantial demand of high shortage sugar in the country. The leaves of stevia is 30-40 times sweeter than sugar and it's stevioside is 250-300 times sweeter than sugar. Stevia also used as medicinal purpose in case of diabetic patient. This is a new plant for the people of Bangladesh. The introduction of this plant has not yet reached the people in that way. Moreover, its cultivation method has not been monitored in the entire area of Bangladesh. Saline area is one of them. Salinity is one of the prime factors for deterioration of the agricultural crop production. soil salinity has adverse effects on plant germination, strength and yield. Bangladesh has about 14.3 million hectares agricultural land of which about 59.8% is available for cultivation and more than 30% of the cultivable land in Bangladesh is in the coastal. Out of 2.86 million hectares of coastal and off-shore lands, about 1.056 million hectares of arable lands are affected by varying degrees of salinity.If we can adapt this plant to saline areas, then new horizons for stevia cultivation will open up in that area.

7.2 OBJECTIVES:

1. Adaption of stevia plant in coastal areas;
2. Screening out the suitable planting materials for stevia cultivation and
3. Popularizing stevia cultivation among the people of coastal areas.

7.3 METHODOLOGY:

Planting materials	: BSRI Stevia 1
Treatments	: T_1= Micropropagated plantlets
	T_2= Stem cuttings
	T_3= Seedlings
Design	: RCB
Replication	: 3 (Three)
Plot size	: 300 m^2
Plant to Plant Distance	: 50 cm
Line to Line Distance	: 50 cm
Planting Time	: January to March/ 2026

Data to be recorded:

1. Salinity level (ds/m) of soil
2. Survivability (%)
3. Number of branch per plant
4. Number of leaves per plant
5. Fresh leaves weight per plant
6. Dry leaves weight per plant
7. Yield ($kgha^{-1}$)

7.4 WORK ELEMENTS:

1. Land selection and preparation
2. Seed collection and planting material preparation
3. Basal fertilizer application and plantation
4. Irrigation
5. Weeding and mulching
6. Harvesting and data collection

7.5 TIME SCHEDULE:

Sl No	2026												2027	
	J	F	M	A	M	J	J	A	S	O	N	D	J	F
1	→													
2	→	→	→											
3		→	→	→										
4		→	→	→										
5			→	→	→									
6				→	→	→								

7.6 ECONOMIC IMPACT:

Stevia cultivation in Bangladesh has the potentiality to boost up the economy by providing farmer's with a high value crop suited for meeting up the partial demand of sugar production.

7.7 EFFECT ON ENVIRONMENT:

This experiment would have no adverse impact on environment.

7.8 UTILIZATION OF RESEARCH RESULTS:

Results of this experiment will be used to adapt suitable planting material of stevia. Farmers will be economically benefited by increasing the cultivation of stevia in coastal areas.

PHYSIOLOGY & SUGAR CHEMISTRY DIVISION

Rationale

In Bangladesh, Sugarcane cultivation is being gradually pushed to low-lying Char and marginal lands prone to water-logging, flood, drought and salinity stresses due to increasing demand of cereals and vegetables for the fast growing population. Of the total sugarcane production in the country only 23-27% cane is utilized for sugar production and about 53-57% usually utilized for *gur* manufacturing. Besides, Date palm and Palmyra palm are potential plants for *gur*/syrup production in the country to reduce gap between demands of sugar/*gur* and production. Therefore, screening experiments against water-logging, flood, drought and salinity stresses as well as *gur* manufacturing have been proposed. For maximizing sugarcane yield, proposed research programme has been undertaken through physiological management. Programme of cane and juice quality due to water-logging and flood have been undertaken. Trials on preservation techniques of sugarcane juice and juice collection and date palm syrup production and preservation have been proposed to explore the maximum economic return from Date palm and Palmyra palm as an alternate crop for quality *gur*/syrup production. Studies on sugarcane germination under low temperature has been proposed since majority plantation is done during November to following January in north and south west parts of Bangladesh when ambient temperature remains below 20ºC which affects germination.

The another alternate sweetening agent stevia plant cultivation has been included in the current programme for the extraction of stevioside in different growth stage. For the observation of maturity behavior and *gur* quality of different clones under ZYT I II and III test stages, a study has been undertaken. The maturity status and *gur* quality with chemical analysis will be determined through this study. In the manufacturing of *gur*, various chemicals hazardous to human health are used by commercial gur makers. In order to recommend a safe and environment friendly products for *gur* clarificants, experimentation with plants extracts clarificants like Wild Okra has been used. Research has also been undertaken to find out effectiveness of various packing devices for semi solid/solid/granular *gur* and Date palm syrup preservation and suitability for super market.

LIST OF EXPERIMENTS

PHYSIOLOGY SECTION

PROGRAMME AREA : VARIETAL IMPROVEMENT

1.0 Title : Screening of Sugarcane Genotypes under ZYT- I, II & III against Stress Condition (a. Water-logging, b. Flood, c. Drought and d. Salinity)

PROGRAMME AREA : CROPS AND SOIL MANAGEMENT

2.0 Title : Germination Potentiality of Advanced Sugarcane Clones under Low Temperature Stress Condition

3.0 Title : Determination of Stevioside at Different Growth Stage of Stevia

SUGAR CHEMISTRY SECTION

PROGRAMME AREA : VARIETAL IMPROVEMENT

4.0 Title : Screening Sugarcane Clones Based on Maturity Behavior and *Gur* Quality

PROGRAMME AREA : SUGAR AND GUR PROCESSING

5.0 Title : Studies on Preservation Techniques of Sugarcane Juice

6.0 Title : Optimization Study of Storage Time on Liquid Palmyra Palm *Gur* to Develop *Tal Misri*

PROGRAMME AREA : VALUE ADDITION OF *GUR*

7.0 Title : Formulation of *Gur* based Chocolate and Optimization of its Physicochemical and Sensory Attributes

PROGRAMME AREA : VALUE ADDITION OF SUGAR CROP PRODUCTS

8.0 Title : Optimization of preservation techniques of taler shas (tender kernel of palmyra palm)

PROGRAMME AREA: SUGARCANE VARIETAL IMPROVEMENT

9.0 Title : Effect of flowering on juice and *gur* quality of sugarcane

PROGRAMME IN DETAILS

PHYSIOLOGY SECTION

PROGRAMME AREA : SUGARCANE VARIETAL IMPROVEMENT

1.0 TITLE : SCREENING OF SUGARCANE GENOTYPES UNDER ZYT-I, II & III AGAINST STRESS CONDITION
(A. WATER LOGGING, B. FLOOD, C. DROUGHT AND D. SALINITY)

A. FOR WATER LOGGING STRESS

LOCATION : BSRI (Concrete tank & Field), Pabna (Ishwardi), and Jamalpur (Melandah)
INVESTIGATORS : M S Islam, S Arefin, F H Shanta and M A Habib
NATURE OF STUDY : On going- modified
DURATION : Continuous
ESTIMATED COST(Tk): 1,50,000.00

1.1.1 DEFINITION OF THE PROBLEM:

In Bangladesh, one of the important reasons of low yield of sugarcane is water-logging problem. Due to higher demand of vegetables and cereal crops, sugarcane is gradually pushed into marginal and low lying areas and sugarcane varieties being cultivated do not have proven capabilities to grow under water-logging stress condition. As a result higher yield cannot be achieved. In this trial, sugarcane clones will be screened out having proven capabilities to grow under water-logging stress condition.

1.1.2 OBJECTIVES:

i) Selecting sugarcane clones with superior tolerance to water-logging;
ii) Finding out morphological and physiological basis for water-logging tolerance to sugarcane and
iii) Identifying parents to use in further crossing programme to develop water-logging tolerant varieties.

1.1.3 METHODOLOGY:

The BSRI bred clones as well as those collected from selected areas of Bangladesh will be included in the study to be accomplished in the following phases:

I. Testing under artificial/induced water-logging.
II. Field-testing.

I. ARTIFICIAL WATER-LOGGING TESTING IN THE YARD: In this case, the test clones/varieties will be grown in pots, and subjecting them to standing water in a concrete water tank. Sugarcane clones of ZYT I, II, III and other selected clones will be compared with water-logging stress tolerant commercial varieties. Another set of pots will be maintained as control.

II. FIELD TESTING: Sugarcane clones of ZYT I, II, III and other selected clones will be tested under field condition at BSRI farm as well as farmer's field at BSRI (Pot & Field), Ishwardi (Pabna), and Gaibandha. Screening of clones/varieties will be done through field testing in water-logging prone areas in order to obtain more information on their yielding potential under field water-logging stress condition at BSRI farm as well as at farmer's field under farmer's management level.

PROCEDURE: A randomized complete block design with at least three replications will be followed for the field experiment. Normal cultural practices for sugarcane cultivation including land preparation, planting, fertilizer application, and weed control etc will be maintained. The experimental plants will be kept under 30-90 cm deep standing water at least 60-90 days continuously.

1.1.4 WORK ELEMENTS:

I. Artificial water-logging testing trial:

i) Planting of single-budded setts to plastic pots.
ii) Placement of pots to water tank & water-logging stress treatment starts.
iii) Primordial water roots (PWR) recording at an interval of 15 days.

iv) Analysis of root characters.
v) Dissolve oxygen determination.
vi) Chlorophyll level determination.
vii) Measurement of stem elongation rate at an interval of 15 days.
viii) Grading of clones under stress condition.
ix) Green and dry leaves count at an interval of 15 days during stress period
x) Determination of fibre per cent cane.
xi) Determination of Brix per cent cane.
xii) Final data collection at harvest (volume, fresh and dry weight of water roots).

II. Field testing trial (BSRI farm):

i) Land preparation.
ii) Planting of 2-budded setts to main field.
iii) Irrigation.
iv) Weeding/Mulching.
v) 1st top dressing of urea and MP fertilizer.
vi) 2nd top dressing of urea, MP fertilizer/ Furadan application.
vii) Tiller count (March, April, May, June).
viii) Earthing up.
ix) Tying of cane.
x) Imposition of water-logging stress.
xi) Grading of stressed sugarcane clones at an interval of 15 days.
xii) Green and dry leaves count at an interval of 15 days during stress period.
xiii) Millable cane count.
xiv) Chlorophyll level determination.
xv) Determination of Brix per cent cane.
xvi) Yield data collection at harvest.

III. Farmer's field testing trials [Pabna, and Natore].

i) Land selection.
ii) Land preparation.
iii) Planting date fixation.
iv) Planting of 2-budded setts to main field.
v) Field visit for irrigation supervision/ advice.
vi) Field visit for weeding supervision/ advice.
vii) 1st top dressing supervision.
viii) 2nd top dressing of fertilizer/ Furadan application supervision.
ix) Tiller recording (March, April, May and June).
x) Earthing up supervision.
xi) Grading of selected sugarcane clones at an interval of 15 days starting
xii) from 1st August until last November.
xiii) Green and dry leaves count at an interval of 15 days during water-logging stress period.
xiv) Final yield/ millable canes records.

1.1.5 TIME SCHEDULE:

Sl. No.	2025			2026												2027
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
I. Artificial water-logging trial:																
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II. Field testing trial (BSRI Farm):																
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15															→	→
III. Farmer's field testing trials:																
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12											→	→	→	→		
13																→

1.1.6 DATA TO BE COLLECTED:

i) Volume of primordial water roots.
ii) Fresh weight of primordial water roots.
iii) Dry weight of primordial water roots.
iv) No. of green leaves per plant at an interval of 15 d.
v) No. of dry leaves per plant at an interval of 15 d.

vi) Stem elongation rate.
vii) Chlorophyll level.
viii) Grading of cane at an interval of 15d.
ix) Millable cane and Cane yield at harvest.
x) Juice quality at harvest.

1.1.7 ECONOMIC IMPACT:

It is expected to get water-logging tolerant variety which would expand the scope of sugarcane cultivation to low-lying water-logging prone marginal land and sugarcane growers would get higher economic benefit out of results of this experiment.

1.1.8 EFFECT ON ENVIRONMENT:

It is environment friendly and there would not be any adverse effects on environment due to implementation of this experiment.

1.1.9 UTILIZATION OF RESEARCH RESULTS:

The expected results (tolerant variety) of water-logging stress experiment will be disseminated to potential user i.e. farmers through demonstration and training of extension personnel and farmers of water-logging stress prone areas.

B. FOR FLOOD STRESS

LOCATION : BSRI (concrete tank), Sirajganj and Natore (Lalpur)
INVESTIGATORS : M S Islam, M S Arefin, F H Shanta and M A Habib
NATURE OF STUDY : On going- modified
DURATION : Continuous
ESTIMATED COST(Tk): 1,00,000.00

1.2.1 DEFINITION OF THE PROBLEM:

It is assumed that there is about 0.2 million hectare of Charland suitable for sugarcane cultivation and sugarcane is gradually pushed into flood prone Charland due to higher demand of cereals and vegetables. Sugarcane developed for high and medium high land do not grow well in these Charlands. Therefore, this experiment is undertaken to develop flood tolerant varieties.

1.2.2 OBJECTIVES:

i) Selecting clones with superior tolerance to flood stress;
ii) Finding out morphological and physiological basis for flood tolerance to sugarcane and
iii) Identifying parents to use in further crossing programme to develop flood tolerant varieties.

1.2.3 METHODOLOGY:

The BSRI bred clones as well as those collected from selected areas of Bangladesh will be included in the study to be conducted in the following phases:

I. Testing under induced flood stress condition.
II. Field-testing.

I. TESTING UNDER INDUCED FLOOD STRESS CONDITION: In this case, the test clones/varieties will be grown in Plastic pots and subjecting them to artificially made running water in a concrete water tank. Sugarcane clones of ZYT-I, II, III and other selected clones will be compared with known flood stress tolerant commercial varieties. A separate set of those clones will be maintained as check.

II. FIELD TESTING: Sugarcane clones of ZYT-I, II, III and other selected clones/varieties will be tested under farmers field condition at Ishurdi (Pabna) and Lalpur (Natore).Screening of clones/varieties will be done through field testing in flood prone areas in order to obtain more information on their yielding potential under field flood stress condition.

PROCEDURE: A randomized complete block design with at least three replications will be followed for the field experiment. Normal cultural practices for sugarcane including land preparation, planting, fertilizer application, weed control etc will be maintained. The experimental plants will be kept under standing water at least 60-90 days continuously.

1.2.4 WORK ELEMENTS:

I. Artificial Flood Stress testing trial:

i) Planting of single budded setts to plastic pots.
ii) Placement of pots to water tank & flood stress treatment starts.
iii) Primordial water roots (PWR) recording at an interval of 7 days.
iv) Analysis of root characters.
v) Dissolve oxygen determination
vi) Green and dry leaves count at an interval of 15 days.
vii) Grading of clones under stress condition.
viii) Determination of fibre per cent.
ix) Chlorophyll level determination
x) Final data collection at harvest.

II. Field testing trial (Farmer's field): Sirajganj and Natore

i) Land preparation.
ii) Planting of 3-budded setts to main field.
iii) Irrigation supervision.
iv) Weeding/ Mulching suppression.
v) 1st top dressing of urea and MP fertilizer application supervision.
vi) 2nd top dressing of urea and MP application supervision.
vii) Tiller count.
viii) Earthing up.
ix) Tying of cane.
x) Green and dry leaves count at an interval of 15 days.
xi) Grading of stressed sugarcane clones at an interval of 15 days.
xii) Millable cane count.
xiii) Final data collection at harvest.

1.2.5 TIME SCHEDULE :

Sl No.	2025					2026											
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
I. Artificial flood trial:																	
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3													→				
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7														→			
8															→		
9														→			
10																→	
II. Farmer's field testing trial																	
1			→	→													
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3				→			→										
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1.2.6 DATA TO BE COLLECTED:

i) Record of primordial water roots (PWR) initiation at an interval of 7 d.
ii) Fresh weight of PWR.
iii) Volume of PWR.
iv) Dry weight of PWR.
v) No. of green leaves per plant at an interval of 15 d.
vi) No. of dry leaves per plant at an interval of 15 d.
vii) Stem elongation rate.
viii) Chlorophyll level.
ix) Grading of cane at an interval of 15 d.
x) Millable canes and Cane yield at harvest.
xi) Juice quality at harvest.

1.2.7 ECONOMIC IMPACT:

It is expected to get flood tolerant variety which would expand the scope of cultivation of sugarcane to flood prone areas, and sugarcane growers of these areas would get higher economic benefit out of this experiment.

1.2.8 EFFECT ON ENVIRONMENT:

This experiment is environment friendly and there would not be any adverse effects on environment due to implementation of this experiment.

1.2.9 UTILIZATION OF RESEARCH RESULTS:

The expected outcome (flood tolerant variety) of flood stress experiment will be disseminated to potential users through demonstration and training of extension personnel, and farmers of flood stress prone areas.

C. FOR DROUGHT STRESS

LOCATION : BSRI (PVC pipe), RSRS (Thakurgaon) and Rajshahi (Godagari).
INVESTIGATORS : M S Islam, M S Arefin, F H Shanta and M A Habib
NATURE OF STUDY : On going- modified
DURATION : Continuous
ESTIMATED COST(Tk): 1,50,000.00

1.3.1 DEFINITION OF THE PROBLEM:

In drought prone areas of Bangladesh, yield of sugarcane is low due to lack of drought tolerant varieties. To extend sugarcane cultivation in marginal land and drought prone areas development/screening of drought tolerant varieties are important. Therefore, in this trial sugarcane clones will be screened out having capabilities to grow under drought stress condition.

1.3.2 OBJECTIVES:

i) Selecting sugarcane clones with superior tolerance to drought stress;
ii) Finding out morphological and physiological basis for drought tolerance to sugarcane and
iii) Identifying parents to use in further crossing programme to develop drought tolerant varieties.

1.3.3 METHODOLOGY:

The BSRI bred clones as well as locally collected clones will be included in the study to be carried out in the following phase:

I. Testing under induced drought stress condition.
II. Field-testing.

I. TESTING UNDER INDUCED DROUGHT STRESS CONDITION: In this case, the test clones/varieties will be grown in PVC pipe and subjecting them to artificially made drought stress by using PEG (Polyethylene Glycol 6000). Sugarcane clones of ZYT-I, II, III and other selected clones will be compared with known drought stress tolerant commercial varieties. A separate set of those clones will be maintained as check.

II. FIELD TESTING: BSRI bred sugarcane clones of ZYT-I, II, III and other selected clones/varieties will be tested under field condition. Screening of clones/varieties will be done subjecting them to field testing in drought prone areas (Barind tract, Rajshahi and RSRS, Thakurgaon) in order to obtain more information on their yielding potential under field drought stress condition.

PROCEDURE: Single-budded setts of different test clones will be planted into 60x10cm PVC pipes each containing 6 Kg soil. Normal intercultural operations including watering, fertilization, weeding etc will be done. Four months after planting PEG or Manitolosmotica will be applied to 50% PVC pipes containing plants. The remaining 50% plant will serve as control. In case of field testing two budded setts will be planted to normal drought prone areas such as Godagari (Rajshahi) and RSRS (Thakurgaon) in the month of late October.

1.3.4 WORK ELEMENTS:

I. Induced drought testing trial:

i) Planting of single-budded setts to PVC pipe.
ii) Application of water to PVC pipe as and when required
iii) Application of PEG/Manitol to PVC pipes to create drought stress.
iv) Grading/tolerance rating at an interval of 15 days.
v) Green and dry leaves count.
vi) Leaf area index determination in June and September
vii) Determination of Chlorophyll ‘a’ and Chlorophyll ‘b’.
viii) Determination of Proline content in stress period.
ix) Determination of Stomatal conductance in drought period
x) Determination of Sucrose percent of juice in September.
xi) Data collection at harvest (Weight of root, root volume, fresh and dry weight of roots).

II. Field testing trial (RSRS Thakurgaon):

i) Planting of 2-budded setts to main field.
ii) Irrigation.
iii) Weeding/ Mulching.
iv) 1st top dressing of urea and MP fertilizer.
v) 2nd top dressing of urea.
vi) Grading of sugarcane at an interval of 15 days.
vii) Green and dry leaves count.
viii) Tiller count.
ix) Earthing up and tying of canes.
x) Yield data collection at harvest.

III. Farmer's field testing trial (Godagari, Rajshahi):

i) Selection of farmers/ land for setting up proposed trial.
ii) Monitoring of land preparation and fixation of planting date.
iii) Planting of 2-budded setts to main field.
iv) Field visit for irrigation, weeding & mulching.
v) 1st top dressing supervision.
vi) 2nd top dressing supervision.
vii) Tiller recording (March, April, May) and earthing up.
viii) Green and dry leaves count.
ix) Grading of selected sugarcane clones during drought stress period.
x) Millable cane count in the month of October and November.
xi) Final yield records at harvest.

1.3.5 TIME SCHEDULE:

Sl No.	2025					2026											
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
I. Artificial drought trial (BSRI yard):																	
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II. Field testing trial (RSRS, Thakurgaon)																	
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III. Farmer's field testing trial (Rajshahi)																	
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1.3.6 DATA TO BE COLLECTED:

i) Tiller count in the month of March, April, May & June.
ii) No. of green leaves record at an interval of 30 d.
iii) No. of dry leaves record at an interval of 30 d.
iv) Grading of cane in the month of February and March.
v) Roots production.
vi) Chlorophyll 'a' and chlorophyll 'b'.
vii) Proline content.
viii) Leaf area index.
ix) Millable canes and Cane yield at harvest.
x) Cane quality at harvest.

1.3.7 ECONOMIC IMPACT:

It is expected to get drought tolerant variety which would expand the scope of cultivation of sugarcane to drought prone areas, and sugarcane growers would get higher economic benefit out of results of this experiment.

1.3.8 EFFECT ON ENVIRONMENT:

It is environment friendly and there would not be any adverse effects on environment due to implementation of this experiment.

1.3.9 UTILIZATION OF RESEARCH RESULTS:

It is expected to obtain drought tolerant sugarcane varieties from this trial. The drought tolerant varieties will be disseminated to potential users of this technology in sugar mills and non-mill zones through demonstration and training of extension personnel and farmers of drought stress prone areas.

D. FOR SALINITY STRESS

LOCATION : BSRI (Concrete tank) and Shatkhira (Ashasuni).
INVESTIGATORS : M S Islam, S Arefin, F H Shanta and M A Habib
NATURE OF STUDY : On going- modified
DURATION : Continuous
ESTIMATED COST(Tk): 1,60,000.00

1.4.1 DEFINITION OF THE PROBLEM:

Southern part of Bangladesh is salinity stress prone and cultivation of sugarcane crop is hazardous. To increase productivity of crop plants in saline area is an important task for the scientists. Selection of crop variety tolerant to salinity will help to increase productivity as a whole in saline area. Considering the future productivity potential of saline areas, it will be important to conduct experiments to select BSRI bred sugarcane varieties/clones tolerant to salinity stress.

1.4.2 OBJECTIVES:

i) Selecting sugarcane clones with superior tolerance to salinity;
ii) Identifying morphological and physiological characters of salinity tolerance and
iii) Identifying parents to use in further crossing programme to develop salinity tolerant varieties.

1.4.3 METHODOLOGY:

The BSRI bred clones as well as locally collected clones will be included in the study to be carried out in the following phases:

I. Testing under induced salinity stress condition.
II. Field-testing.

I. TESTING UNDER INDUCED SALINITY STRESS CONDITION: In this case, the test clones /varieties will be grown in plastic pot and subjecting them to artificially made salinity stress .Sugarcane clones of ZYT I, II, III and other selected clones will be compared with known salinity stress tolerant commercial varieties. A separate set of those clones will be maintained as check.

II. FIELD TESTING: A field experiment will be set up at Shatkhira known saline areas with BSRI bred advanced clones of ZYT I, II and III. Two budded sugarcane setts will be planted in furrow. The experiment will be laid out in RCB with at least three replications. Size of unit plot will be 10 m x 5 m with one meter row spacing. Normal intercultural practices including land preparation, planting, fertilizer & furadan application, weed control etc will be done as and where required.

PROCEDURE: Soils of plastic pots will be treated with different levels of salt concentration (8 dSm^{-1}, 10 dSm^{-1}). Single-budded setts of different test clones will be planted into plastic pots. Normal intercultural operations including watering, fertilization, weeding etc will be done. Salt will be applied to 50% pots containing plants. The remaining 50% plant will serve as control. In case of field testing two budded setts will be planted to normal salinity prone areas such as Shatkhira in the month of late October.

1.4.4 WORK ELEMENTS:

I. Induced salinity testing trial:

i) Application of salt to pot to create salinity stress.
ii) Planting of single-budded setts to pot.
iii) Application of water to pot as and when required
iv) Grading/tolerance rating at an interval of 15 days.
v) Green and dry leaves count.
vi) Observation of anatomical changes.
vii) Leaf area index determination in June and September
viii) Determination of Chlorophyll 'a' and Chlorophyll 'b'.
ix) Determination of Proline content in growth period.
x) Determination of Sucrose percent of juice in September.

II. Field testing trial (Shatkhira):

i) Land selection.
ii) Monitoring of land preparation & planting date fixation.
iii) Planting.
iv) Supervision of irrigation, mulching, weeding and insect control.
v) First top dressing of urea and MP.
vi) Second top dressing of urea and MP.
vii) Leaf and soil sample collection.
viii) Evaluate growth performance during grand growth period (grading of sugarcane).
ix) Tiller count (March, April, May and June).
x) Yield of cane, millable cane and cane quality at harvest.

1.4.5 TIME SCHEDULE:

Sl.	2025							2026						
No.	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	→													
2				→	→									
3					→									
4				→	→									
5					→	→								
6						→								
7						→	→	→						
8						→	→	→						
9								→	→	→				
10						→	→	→						
11						→	→	→						
12						→	→	→						
13												→	→	→
14														→

1.4.6 DATA TO BE COLLECTED:

i) Observation of anatomical changes of sugarcane root under different salinity levels.
ii) Proline and CSI determination under different salinity levels.
iii) Pre planting soil sample collection and analysis.
iv) Tiller count in the months of March, April, May and June.
v) Grading during salinity stress period.
vi) Soil sample collection at maximum soil salinity period.
vii) Brix reading in the months of September, October, November and December.
viii) Millable canes and Cane yield at harvest.

1.4.7 ECONOMIC IMPACT:

It is expected to get salinity tolerant variety which would expand the scope of cultivation of sugarcane to salinity prone marginal land, and sugarcane growers would get higher economic benefit out of results of this experiment.

1.4.8 EFFECT ON ENVIRONMENT:

It is environment friendly and there would not be any adverse effects on environment due to implementation of this experiment.

1.4.9 UTILIZATION OF RESEARCH RESULTS:

Present study will help to get the response of BSRI bred advanced clones under saline condition. Replacement of presently cultivated local variety by BSRI bred salt tolerant high yielding varieties will hopefully increase sugarcane production in salinity affected marginal lands and will bring economic benefits to farmers.

PROGRAMME AREA : CROPS AND SOIL MANAGEMENT
2.0 TITLE : GERMINATION POTENTIALITY OF ADVANCED SUGARCANE CLONES UNDER LOW TEMPERATURE STRESS CONDITION
LOCATION : BSRI yard and RSRS (Thakurgaon)
INVESTIGATORS : M A Habib, M S Islam, S Arefin, and F H Shanta
NATURE OF STUDY : On-going- modified
DURATION : Continuous
ESTIMATED COST(Tk): 30,000.00

2.1 DEFINATION OF THE PROBLEM:

Sugarcane plantation time is generally September-November, when ambient temperature remains above 20ºC. But, sometimes, sugarcane is planted in December and January when the ambient temperature prevails below 20ºC. It is reported that sugarcane field remains vacant due to poor and uneven germination when it is planted in December-January. This poor germination is obtained due to lower ambient temperature and moisture stress during this dry season. Thus, this study has been undertaken to evaluate germination behaviour of BSRI bred advanced clones under lower ambient temperature.

2.2 OBJECTIVES:

Evaluating BSRI bred advanced sugarcane clones having inbuilt potential to germinate under lower ambient temperature.

2.3 METHODOLOGY:

A set of 3- budded 50 setts of each BSRI bred sugarcane clone under ZYT-III will be planted in the soil bed at an interval of 15 days starting from 1st November and continued up to end of February. Water will be applied regularly to keep field condition. Emergence of shoots will be recorded at an interval of 3 days.

2.4 WORK ELEMENTS:

i) Land preparation to set up proposed trial (Soil bed).
ii) Preparation of 3-budded setts and planting.
iii) Irrigation and weeding as and when required.
iv) Germination record at an interval of 3 days after emergence of 1st shoot.
v) Temperature record.

2.5 TIME SCHEDULE:

Sl. No.	2025				2026			
	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb
1	→				→			→
2	→				→			→
3	→				→			→
4	→				→			→
5	→				→			→

2.6 DATA TO BE COLLECTED:

i) Germination record at an interval of 3 d.
ii) The highest germination record.
iii) No of days required to achieve the highest germination per cent.
iv) Temperature record.

2.7 ECONOMIC IMPACT:

It is expected to get cold tolerant variety that would help growers to do planting even during low temperature without gappy germination resulting higher yield of sugarcane.

2.8 EFFECT ON ENVIRONMENT:

This trial is environment friendly and there would have no adverse impact on environment.

2.9 UTILIZATION OF RESEARCH RESULTS:

This study will bring direct benefit to the sugarcane growers. They would be able re-schedule their planting time to avoid gappy and uneven germination in the field.

3.0 TITLE : DETERMINATION OF STEVIOSIDE AT DIFFERENT GROWTH STAGE OF STEVIA
LOCATION : BSRI Farm and Physiology and Sugar Chemistry Lab
INVESTIGATORS : M S Islam, M S Arefin, F H shanta and M A Habib
NATURE OF STUDY : NEW
DURATION : 2025-2028
ESTIMATED COST(Tk): 2,00,000/-

3.1 DEFINITION OF THE PROBLEM:

Stevia (*Stevia rebaudiana Bert.*) belongs to the family of compositae. The dry leaves of this plant are 30 times sweeter than sugar, with zero calories whereas pure extract stevioside (diterpene glycosides) in non caloric and 300 times sweeter than sugar. The stevia dried leaves powder is used in the tea cup well as other food as calorie-free sweetener. It is completely natural, safe for human health and beneficial to diabetic patients. International demands are only for high quality stevia leaves having at least 9% stevioside content. There is no buyer for stevia leaves having less then 8% stevioside. Stevioside, a compound extracted from stevia leaves, is a sweetener that stands out among the natural sweeteners. This extract is a white powder composed of stevioside and its anomers, the rebaudiosides, which are responsible for the sweetness of the compound (Higginbotham, 1983; Parpinello *et al.*, 2001). The leaves of stevia are the source of sweet glycosides. It is mainly used as a sweetener and flavor enhancer in the food and beverage industry. The chemical compound obtained from stevia is considered to be the best alternative source of sugar especially for diabetes patients. Climatic factors and agronomical practices affect the quality and quantity of yield. The concentration of stevioside in the leaves is higher when the stevia plants are grown under long days and when these plants are harvested just prior to flowering. Time of harvesting depends on land type, type of stevia and growing season.

3.2 OBJECTIVES:

i. To extract the stevioside in different time of growth stage of stevia;
ii. To analyze the quality as well as the amount of stevioside in different growth stage of stevia and
iii. To determine the amount of fresh and dry leaf.

3.3 METHODOLOGY:

The field study will be conducted at BSRI farm and in the laboratory of physiology and sugar chemistry division.

Plot Size : 2m × 2m
Replications : 03
Design : RCB
Stevia variety : BSRI Stevia 1
Date of planting : March, 2025
Gross area : 0.05 ha

3.4 DATA TO BE COLLECTED:

i) Plant height (cm)
ii) Number of leaves plant^{-1}
iii) Leaf area plant^{-1} (cm)
iv) Fresh leaf yield plant^{-1} (g)
v) Dry leaf yield plant^{-1} (g)
vii) Nutritional value of stevioside

3.5 WORK ELEMENTS:

i) Land preparation.
ii) Plantation of seed.
iii) Irrigation.
iv) Weeding/ Mulching.
v) Sample collection
vi) Leaf yield (Kg ha^{-1}).
viii) Fresh leaf yield plant^{-1} (g)
ix) Dry leaf yield plant^{-1} (g)
x) Extraction of stevioside

3.6 TIME SCHEDULE:

Sl.No	2026									
	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov
i.	---									
ii.		---								
iii.		---	---	---						
iv.			---	---						
v.			---	---	---	---	---	---	---	
vi.			---	---	---	---	---	---	---	
vii.								---	---	---
viii							----	-		
ix							----	-		
x				-----	------	------	-----	------	-------	

3.7 ECONOMIC IMPACT:

It is expected that stevia growers would get higher economic benefit out of the results of this experiment.

3.8 EFFECT ON ENVIRONMENT:

This experiment is environment friendly and there would have no adverse effects on environment.

3.9 UTILIZATION OF RESEARCH RESULTS:

It is expected that the research results will be helpful for stevia growers. This will be an alternative natural sweetener for people specially for diabetic patients. The results will also be helpful for getting higher economic benefit to the growers.

PROGRAMME AREA : SUGARCANE VARIETAL IMPROVEMENT
4.0 TITLE : SCREENING SUGARCANE CLONES BASED ON MATURITY BEHAVIOUR AND *GUR* QUALITY
LOCATION : BSRI Farm & laboratory of Physiology & Sugar Chemistry Division
INVESTIGATORS : M S Arefin, M S Islam, F H Shanta and M A Habib
NATURE OF STUDY : On-going- modified
DURATION : Continuous
ESTIMATED COST(Tk): 1,20,000.00

4.1 DEFINITION OF THE PROBLEM:

The maturity of sugarcane is essentially a varietal character though maturity is largely regulated by environmental factors and management practice. The early maturing potential sugarcane varieties have direct impact for higher sugar and *gur* recovery at early stage of crushing. A variety suitable for sugar production may not be equally suitable for *gur* production. Selection of sugarcane clones suitable for good quality *gur* production on the basis of high sugar and low reducing sugars content, medium stalk diameter, low fibre content are important. In some areas of Bangladesh early *gur* making starts from August. Due to lack of suitable *gur* making early maturing variety, *gur* makers are manufacturing *gur* from old indigenous degenerated varieties. As a result, *gur* production is low and quality of *gur* is poor. The *gur* makers use chemical clarificants to improve the colour of *gur*. Chemical clarificants are hazardous for human health. Therefore, it is important to identify early maturing sugarcane varieties/clones for production of sugar and good quality *gur*.

4.2 OBJECTIVES:

i) Determining maturity behaviour of sugarcane varieties/clones and find out peak maturity period;
ii) Screening sugarcane clones suitable for *gur* production and
iii) Determining the quality of *gur* after preparation.

4.3 METHODOLOGY:

Selected sugarcane clones under ZYT-I, II & III test stages will be planted at BSRI farm in the month of October/November 2023. Similar intercultural operations and management practices will be followed for all the clones. Chemical analysis for brix (%), pol % juice, purity%, reducing sugars per cent and pol % cane will be determined starting from mid September 2026 and to be continued up to March 2027. The chemical analyses of all the clones will be done once in a month with three replications. On basis of chemical analyses, the clones will be grouped as early, medium and late maturing potential. The clones showing pol % cane 10.5% and above in mid October with 0.5% reducing sugars content will be grouped as early maturity potential and the same value obtained in November and December will be grouped as mid and late maturing potential clones. *Gur* will be prepared from the same clones in the month of October, December and February by open pan boiling method without adding chemical clarificants. The physical and chemical properties of prepared *gur* will be determined within 7(seven) days of its preparation to screen suitable clones for superior quality *gur* production.

4.4 WORK ELEMENTS:

i) Land preparation.
ii) Plantation.
iii) Irrigation.
iv) Intercultural operations.
v) Top dressing of fertilizers and insecticide (Urea, MoP and Furadan).

vi) Brix survey.
vii) Chemical analysis of sugarcane.
viii) *Gur* preparation.
ix) Determination of physico-chemical properties of *gur*.

4.5 TIME SCHEDULE:

Sl. No.	2025			2026												2027		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
i	---																	
ii	---	---																
iii		---	---	---	---	---												
iv			---	---	---	---	---											
v						---		---										
vi											---	---						
vii												---	---	---	---	---	---	---
viii													---		---		---	
ix													---		---		---	

4.6 DATA TO BE COLLECTED:

i) Brix (%), pol in juice, pol in cane, Purity (%), Reducing Sugars (%), Fibre (%) of juice.
ii) *Gur* recovery
iii) Physico-chemical properties of *gur*.

4.7 ECONOMIC IMPACT:

It is expected to identify the clones having different maturity behaviour to widen the scope of crushing period. If early, mid and late maturing clones could be identified, sugar mills and *gur* makers will be benefited through introduction of maturity based crushing schedule. The millers and *gur* makers will get higher economic benefit.

4.8 EFFECT ON ENVIRONMENT:

This investigation is environment friendly and there would have no adverse impact on environment.

4.9 UTILIZATION OF RESEARCH RESULTS:

i) Sugar mills/*gur* makers will be benefited for introducing maturity based crushing programme for higher sugar and *gur* recovery.
ii) Research results will fulfill a part of NSB requirement for releasing sugarcane variety.
iii) Sugarcane varieties/clones grouped as early, medium and late maturing potential will be helpful for cane breeders in crossing and hybridization programme.
iv) *Gur* manufacturers will be benefited through utilization of expected research results. *Gur* makers will be able to manufacture superior quality of *gur* avoiding hazardous chemicals for human health.
iv) It is expected that the results will be helpful for future crossing and hybridization programme in sugarcane variety development.

PROGRAMME AREA : SUGAR AND *GUR* PROCESSING
5.0 TITLE : STUDIES ON PRESERVATION TECHNIQUE OF SUGARCANE JUICE
LOCATION : Physiology and Sugar Chemistry Laboratory
INVESTIGATORS : M S Arefin, M S Islam, F H Shanta and M A Habib
NATURE OF STUDY : On-going- modified
DURATION : 2025-2028
ESTIMATED COST(Tk): 1,50,000.00

5.1 DEFINITION OF THE PROBLEM:

Sugarcane is a long duration crop of high and medium high land. On an average, sugarcane is grown in 0.18 million hectares of which 50% is located in the sugar mills zones, where sugarcane is mostly used for

sugar production and remaining 50% that of non-mill zone is mostly utilized for '*gur*' production. At present total annual production of sugarcane in Bangladesh is around 7.0-7.5 million tons, 23-27% of which utilize for sugar production; 53-57% use for '*gur*' production and remaining 14-24% for seed, chewing and drinking juice purpose. Sugarcane juice is available almost all over the country. But the juice extracted from the canes turns dark brown and marked sedimentation appears during storage. Conventional heat processing imparts the taste of '*gur*' and the delicate flavour of juice is adversely affected. Sugarcane variety and cultivation practices also affect the juice characteristics. Bucheli and Robinson (1994) reported that the polyphenol oxidase is the major enzyme involved in the discolouration of sugarcane juice which can be improved by heat inactivation of enzyme. Addition of citric acid or ascorbic acid to juice also gave good pleasant dull orange colour to juice. Addition of lemon and ginger followed by pasteurization and preservation with sulphurdioxide also reduced physico-chemical changes during storage of ready-to-serve bottled sugarcane juice. In view of above information, the present investigation was envisaged to optimise the process of manufacture and preservation for ready-to-serve bottled sugarcane juice up to consumer acceptability. This technique may be a barrier to prevent deterioration of sugarcane juice during preservation period. So, this study is undertaken to find out suitable sugarcane juice preservation technique for consumption, preservation and marketing throughout the year.

5.2 OBJECTIVES:

i) Optimizing the techniques for preservation of ready-to-serve bottled sugarcane juice of consumer acceptability and
ii) Observing shelf life of preserved sugarcane juice.

5.3 METHODOLOGY:

Treatments:

T_1 = Pasteurization at 70ºC for 20 min (Control)
T_2 = Juice heated at 50ºC + Black Pepper @ 1 g/L + Ginger Juice @ 4.0 ml/L + Citric Acid @ 0.05%+ KMS @ 300 ppm + Pasteurization at 70ºC for 20 min
T_3 = Juice heated at 50ºC + Black Pepper @ 2 g/L + Ginger Juice @ 5 ml/L + Citric Acid @ 0.05%+ KMS @ 300 ppm + Pasteurization at 70ºC for 20 min
T_4 = Juice heated at 50ºC + Clove @ 1 g/L + Ginger Juice @ 4 ml/L + Citric Acid @ 0.05%+ KMS @ 300 ppm + Pasteurization at 70ºC for 20 min
T_5 = Juice heated at 50ºC + Clove @ 2 g/L + Ginger Juice @ 5 ml/L + Citric Acid @ 0.05%+ KMS @ 300 ppm + Pasteurization at 70ºC for 20 min

For juice collection, mature sugarcanes will be collected from BSRI farm and carrying in *gur* house of Physiology and Sugar Chemistry Division. Canes were cleaned, washed and crushed by hand driven brash crusher to obtain maximum possible juice. Juice was filtered through a four layered markin cloth. Juice yields were recorded and juice were subjected to physico-chemical and sensory evaluation

5.4 DATA TO BE COLLECTED:

The following data will be taken from sugarcane juice after preservation at 7 days interval:

i) Brix (%)
ii) Pol % juice
iii) Pol % cane
iv) Purity%
v) RS%
vi) Microbial load before and after preservation of sugarcane juice

5.5 WORK ELEMENTS:

i) Collection of bottles
ii) Cane collection and crushing
iii) Bottling.
iv) Chemical analyses of juice at the time of preservation
iv) Chemical analyses of juice and microbial load after preservation

5.6 TIME SCHEDULE:

Sl. No.	2025			2026									
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
i	---	---											
ii		---									---		
iii		---	---	---							---		
iv		---	---	---							---		
v		---	---	---	---	---	---				---	---	---

5.7 UTILIZATION OF RESEARCH RESULTS:

Sugarcane juice will be available to the consumers throughout the year and traders will be benefited for higher market price.

5.8 EFFECT ON ENVIRONMENT:

This experiment is environment friendly and there would have no adverse effect on environment.

5.9 UTILIZATION OF RESEARCH RESULTS:

The research findings will be helpful to preserve sugarcane juice and marketed throughout the year and will be attractive to the consumers. This will be popular to the elite people of the city.

PROGRAMME AREA : SUGAR AND *GUR* PROCESSING

6.0 TITLE : OPTIMIZATION STUDY OF STORAGE TIME ON LIQUID PALMYRA PALM *GUR* TO DEVELOP *TAL MISRI*

LOCATION : BSRI Farm and Physiology and Sugar Chemistry Lab

INVESTIGATORS : M S Arefin, F H shanta, M S Islam and M A Habib

NATURE OF STUDY : On-going- modified

DURATION : 2026-2028

ESTIMATED COST(Tk): 1,00,000/-

6.1 DEFINITION OF THE PROBLEM:

The Palmyrah is a tropical palm tree that grows indigenously in Bangladesh, India, Sri Lanka, Malaysia, Indonesia and many parts of East Africa. Cultivation requires little labour in planning the nuts and protecting them from cattle till they grow above reach. The growth of tree is very slow and it takes from 15 to 30 years to bear. The palmyra palm is a large tree growing up to 30m high and the trunk may have a circumference of over 1.5 meters at the base. The trunk is black in colour and looks like cylinders. It is also corrugated by the semicircular scars of fallen leaves. The tree can be easily recognized by its gigantic fan shaped leaves. There may be 25-40 fresh leaves and they are leathery, gray green, fan-shaped, 1-3 meters wide and folded along the midrib and they spring at the top in a clump. They are usually very tough and have thick stalks. There are two kinds of the palmyra – the male and the female. The male and female flowers are held by two different trees, never in one. Both male and female trees produce spikes of flowers but only the female plant bears fruits. However both trees are used for tap toddy. The flowers are small and appear in densely clustered spikes, developing into large, brown, roundish fruits. The male flowers are smaller than the female flowers. Though growing of this important palm has an immense potential, no determined effort has been made to bring the palm under cultivation. Palmyra referred as tree of life with nearly 800 uses including food, beverage, fiber, fodder, medicinal and timber. Among the various edible uses of the palm, the sweet sap tapped from the inflorescence for making palm sugar is of prime importance. The endosperm of the young fruit, like tender coconut, is a delicacy in summer. The petiole fiber and leaf blade are used to make products such as brushes and handicrafts. The tree serves as a source of raw material for several cottage industries. (Vengaiah PC *et al*, 2017). There are many health benefits of palm jaggery. It improves digestion, boosts the production of digestive enzymes, and facilitates bowel movement. It also boosts immunity and is rich in zinc and potassium, which help the body fight against several diseases. It also helps prevent anemia. Palm jaggery is a good source of iron that allows the body to maintain hemoglobin levels. * Corresponding author. E-mail address: sac007s@gmail.com (S.K. Sonawane). On the other hand, Palm candy or “Tal mischief” is a commonly prepared confectionary product made from a combination of palm jaggery, water, and various other forms of sugars, cane sugar being

the most widely used one (Borse *et al.*, 2007; Lasekan & Abbas, 2010). It is a crystalline translucent sweet candy. As a product, it has significant economic importance and is consumed extensively in many states of India. Like palm jaggery, palm candies are a good source of ascorbic acid, nicotinic acid, riboflavin, and several minerals. It also has a reasonably high percentage of carbohydrates and protein. Palm candy is produced by boiling a mixture of store-bought neera in a galvanized iron pan until it reaches its striking point. It is crystalline, sweet, and translucent. Palm candy confers several health benefits upon its regular consumption. It is said to aid in treating chickenpox, digestive problems, coughs, and colds. Palm candy is also thought to be advantageous throughout pregnancy (Lata & Kamala, 1966; Devdas *et al.*, 1969; Uzochukwu *et al.*, 1997).

6.2 OBJECTIVES:

1. To determine the perfect time to form *tal misri* from semi liquid palmyra palm *gur*;
2. To optimize the total protocol of making *tal misri* and
3. To identify the physicochemical properties of *tal misri*

6.3 METHODOLOGY:

Liquid *gur* will be prepared from the freshly collected palmyra palm juice by tapping into the inflorescence of the palm tree using lime-added collection pots by open pan boiling method without adding chemical clarificants. After attaining a certain brix content (Final brix must be within 80 to 82 %) the semi liquid *gur* will be transferred into a earthen pot. After cooling, this earthen pot is placed into a cool place (in cold storage) for a certain period of time. It will take 03 to 07 months to form *tal misri*.

Treatments:

T_1 = Stored for 3 months
T_2 = Stored for 4months
T_3 = Stored for 5 months
T_4 = Stored for 6 months
T_5 = Stored for 7 months

6.4 WORK ELEMENTS:

i) Removing the dry leaves of palmyra palm tree .
ii) Messaging the inflorescence part continuously for 07 days within 15 days of initiation of inflorescences.
iii) Cutting the end part of inflorescences for 0.2 to 0.3 mm in every morning and afternoon.
iv) Then tapping into some inflorescences of palmyra palm tree using lime-added collection pots.
v) Repeatation of above mentioned process for collecting juice..
vi) Liquid *gur* will be prepared by open pan boiling method and double filtration without adding chemical clarificants
vii) Storage of freshly prepared liquid *gur* in a dry and cool place.
viii) Formation of *tal misri*.
ix) Determination of physico-chemical properties of *tal misri*

6.5 TIME SCHEDULE:

Sl. No.	2025												2026		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
i			----												
ii			----												
iii				----	-----	----									
iv				----	-----	----									
v				----	-----	----									
vi				----	-----	----									
vii				----	-----	----	----	----	----	----	----	----			
viii				----	-----	----	----	----	----	----	----	----			
ix													-----		

6.6 DATA TO BE COLLECTED:

i) Brix (%), pol (%) in juice, Reducing Sugars (%),.
ii) Optimum time formation of *tal misri*.
iii) Amount of prepared tal misri in every treatment
iv) Determination of physico-chemical properties nutritional value of *tal misri*

6.7 ECONOMIC IMPACT:

It is expected that people will get pure *tal misri*. It has multilateral health benefits. Sometimes infants and babies are fed *tal misri*. The producers will get higher economic benefit.

6.8 EFFECT ON ENVIRONMENT:

This investigation is environment friendly and there would have no adverse impact on environment.

6.9 UTILIZATION OF RESEARCH RESULTS:

i) The producers will be benefited for introducing pure *tal misri*.
ii) Research results will fulfill a research part of sugarcrop mandate part.
iii) *Tal misri* can supersede with white sugar and it is useful to health.
iv) *Tal misri* manufacturers will be benefited through utilization of expected research results. *Tal misri* makers will be able to manufacture superior quality of *tal misri* avoiding hazardous chemicals for human health.

PROGRAMME AREA : VALUE ADDDITION OF *GUR*
7.0 TITLE : FORMULATION OF *GUR* BASED CHOCOLATE AND OPTIMIZATION OF ITS PHYSICOCHEMICAL AND SENSORY ATTRIBUTES
LOCATION : BSRI farm & Dept. of Food Technology and Rural Industries, BAU, Mymensingh
INVESTIGATORS : F H Shanta, M S Arefin , M S Islam and M A Habib
NATURE OF STUDY : NEW
DURATION : 2025-2028
ESTIMATED COST(Tk): 1,50,000/-

7.1 DEFINITION OF THE PROBLEM:

Chocolate is enjoyed worldwide due to its flavourful components, and health benefits as it contains high levels of polyphenols (Tan *et al.*, 2021). The global chocolate market size was estimated at USD 113.16 billion in 2021, and it is anticipated that it will grow at a compound annual growth rate (CAGR) of 3.7% from 2022 to 2030 (Market Analysis Report, 2023). Chocolate is the generic name for a homogenous mixture of products that contain no less than 35% cocoa solids on a dry matter basis, of which no less than 18% is cocoa butter and no less than 14% is fat-free cocoa solids (Codex Alimentarius, 2016). Primary chocolate products are categorised as dark, milk and white and differ in their content of cocoa solids, milk fats and cocoa butter (Afoakwa *et al.*, 2007). Goor is a concentrated product of date palm juice, cane juice, or palm juice ,sugar beet juice without separation of the molasses and crystals. *Gur* contains 60-85% sucrose, 5-15% glucose and fructose and about 20% moisture, with the remainder made up of other insoluble matter, such as wood ash, proteins, and bagasse fibers. It provides 383 calories energy per 100 grams. 1 tsp (4 grams) of *gur* contains about 4-5 mg calcium. 8 mg magnesium, 48 mg potassium, 2-3 mg phosphorus and 0.5 mg iron along with traces of copper, zinc, vitamins B1, B2, and niacin. On the other hand Sugar has almost nonexistent levels of these contents except 400 calories in 100 grams. Chocolate is a sweet food product. Chocolate, also called sweets, is a confection that features sugar as a principal ingredient. Physically, chocolate is characterized by the use of a significant amount of sugar, or, in the case of sugar-free chocolate, by the presence of sugar substitutes . Due to high nutrients retention in *gur*, it is good to intake *gur* products instead of sugar one especially for kids. *Gur* is mixed with other ingredients, such as peanuts, condensed milk, coconut, and white sugar, to produce several locally marketed and consumed delicacies. In our country, chocolate is very popular to kids. Hence sugar is the principal ingredients of chocolate, kids may not get any nutrient except calorie. Also due to higher intake of sugary products tooth decay can occur. In this case chocolate made with *gur* can be a good one because *gur* is rich with minerals and vitamins and contains sugar elements glucose and sucrose that would help cure indigestion, stomach upset and constipation. *Gur* is a store of iron that it helps in the growth

of children. *Gur* is a wonderful source of calcium, phosphorous and zinc. Treats anemia, purifies blood, prevents and cures pimples & acne, makes skin and hair healthy. So chocolate made with condensed milk, butter, nuts and *gur* will not only healthy for the kids but also be popular with them. So this study is undertaken to prepare value added chocolate with three different types of *gur* without any preservatives and find out the nutritional value.

7.2 OBJECTIVES:

i) Preparation of chocolate with date palm, palmyra palm and sugarcane gur in different proportion;
ii) Determination of the nutritional value of prepared chocolate and
iii) Observation of shelf life and conduction overall acceptability of prepared chocolate.

7.3 METHODOLOGY:

Treatments:

T_1 = Palmyra palm *gur* + Butter + skimmed milk+ Corn syrup+ Nuts+ coco powder
T_2 = Date palm *gur* + Butter + skimmed milk+ Corn syrup+ Nuts+ coco powder
T_3 = Sugarcane *gur* + Butter + skimmed milk+ Corn syrup+ Nuts+ coco powder
T_4 = Nipa palm *gur* + Butter + skimmed milk+ Corn syrup+ Nuts+ coco powder
T_5 = Sugar + Butter + skimmed milk + Corn syrup+ Nuts+ coco powder

Gur, corn syrup, skimmed milk, coco powder and butter are combined in pan. Slowly bringing to a boil. It is required to stir until boils. (When sugar boils, stirring must be stopped) . If any *gur* starts to crystallize on the side of the pot, a pastry brush dipped in water should be used to brush the sides. The boiling *gur* mixture is swirled gently throughout the boiling process. Then it is poured immediately into buttered dish. When cooled, cut into squares with oiled pizza cutter and wrapped them in wax paper. Finally it will be stored at room temperature. Then chocolate is subjected to nutritive value and sensory evaluation.

7.4 DATA TO BE COLLECTED:

The following data will be collected from prepared candy:

i) Moisture
ii) Protein
iii) Fat
iv) Carbohydrate
v) Mineral and
vi) Microbial load of preserved candy

7.5 WORK ELEMENTS:

i) Collection of all ingredients that will be required preparing chocolate
ii) Chocolate. preparation with different concentration of *gur*
iii) Preservation of chocolate
iv) Determination of nutritive value of prepared chocolate
v) Conducting Panel test for overall acceptability

7.6 TIME SCHEDULE:

Sl. No.	2025			2026						
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
i	→	→	→							
ii	→	→	→							
iii			→	→	→	→				
iv				→	→	→				
v					→	→	→			

7.7 ECONOMIC IMPACT:

Chocolate. made with *gur* is beneficial to health as well as tooth. Thus traders will get new product for marketing throught the year.

7.8 EFFECT ON ENVIRONMENT:

This experiment is environment friendly and there would have no adverse impact on environment.

7.9 UTILISION OF RESEARCH RESULTS:

The research findings will be helpful to increase the demand of different types of *gur* and can be attractive to the consumers. This may be popular to the elite people of the city.

PROGRAMME AREA : VALUE ADDITION OF SUGAR CROP PRODUCTS

8.0 TITLE : OPTIMIZATION OF PRESERVATION TECHNIQUES OF *TALER SHAS* (TENDER KERNEL OF PALMYRA PALM)

LOCATION : Physiology and Sugar Chemistry Laboratory

INVESTIGATORS : F H Shanta, M S Arefin, M S Islam and M A Habib

NATURE OF STUDY : New

DURATION : 2025-2028

ESTIMATED COST(Tk): 1,50,000.00

8.1 DEFINITION OF THE PROBLEM:

Palmyrah (*Borassus flabellifer*) is an ancient palm belonging to the family Palmae and sub family Boracidae. It possesses a great capacity to yield several products of economic importance and hence it is called "Wishing tree" which means a palm that yields anything and everything. Almost every part of the palm is utilized (Murthy *et al.*, 2015. 5(5): p. 1.). Palmyrah fruit has a great demand in the world due to its medicinal and nutritive values. Around 1500 tons of fruits are annually available in Sri Lanka during its seasons when inflorescences of the female palm become mature, they start to bear fruits. A palm may give 200-300 fruits for a season. The fruiting season is between September and October (Theivendrarajah *et al.*, 2008.). The fruit is large, fibrous and usually contain three nuts like portion with a seed enclosed in each of them. The palmyrah young fruit kernel contains a lining of gelatinous endosperm or kernel with some sweet tasting water inside a hard shell. The endosperm is known as "*Taler Shas*", the Bengali word for palmyrah young fruit kernel. Immature fruits the endosperm becomes harder under favourable conditions. Palmyrah fruits mature during the month of August and the ripened fruits fall from the tree during September and October. After utilization of palmyrah fruit pulp the seeds along with the remaining fruits are collected then beds are made with 3 or 4 tiers of seeds and their moisture level is maintained adequately (Murthy *et al.*, 2015. 5(5): p. 1.). During germination shoot-root axis of the seed goes to the ground and the distal portion which remains within the seed develops into the haustorium during and following germination. Palmyrah haustorium which is a delicious white, spongy edible part and the seed produces a shoot which gives rise to the product palmyrah tuber. This shoot grows to 20-30 cm in height before it is harvested. As a general practice, palmyrah tubers are harvested at their full maturity stage (Arunachalam K *et al.*, 2011. 20(1): p. 143-149.). Palmyrah young fruit kernel, haustorium and fresh boiled tuber are full of nutrition (Theivendrarajah, K. *et al.*, 2008.). In addition to nutritional importance, they are also being recognized as having total phenolic content and vitamin C which show anti-oxidant properties (Jeyaratnam, M. 1986. p. 1-200.). Therefore increasing consumption of these palmyrah products will help the people to maintain their dietary requirements and prevent the chronic diseases such as cancer, cardiovascular diseases, age-related pathologies and promote overall health (Arunachalam K., *et al.*, 2011. 20(1): p. 143-149.). Palmyrah young fruit kernel, haustorium and fresh boiled tuber are full of nutrition (Theivendrarajah, K. *et al.*, 2008.). However, palmyrah young fruit kernel are available for particular season. These seasonable palmyrah products are consumed in raw and fresh form and the consumers who enjoy those products are expecting throughout the year. Therefore preservation method was adopted to lengthen the shelf life of these seasonable product (palmyrah young fruit kernel). Consumers increasingly require food products that preserve their nutritional value, retain a natural and fresh colour, taste, flavour and texture and contain fewer additives such as preservatives. Canning may be considered as one of the preservation tools to preserve the nutritional and sensory qualities demanded by consumers. So an experiment is undertaken to optimize the preservation technique of young fruit kernel of palmyrah palm (*Taler Shas*) and lengthening its shelf life under the Physiology & Sugar Chemistry division, BSRI.

8.2 OBJECTIVES:

i) Optimizing the techniques for preservation of young fruit kernel of palmyrah palm (*Taler Shas*);
ii) Observing shelf life of preserved sugarcane juice;
iii) Developing the total protocol for preservation of young fruit kernel of palmyrah palm (*Taler Shas*) and
iv) Facilitating the availability of that specific food year-round.

8.3 METHODOLOGY:

Materials : Sodium metabisulphite-Food grade (E223), Sodium benzoate-Food grade (E211) and Citric acid-Food grade(commonly available in local market) and glass bottles.

Preparation of the medium for preservation : Sugar solutions at two different concentrations were prepared for comparison of the effect on preservation. Sucrose was dissolved in distilled water to make the medium for preservation with desired °Brix values and then the pH was adjusted to 3.8 by using citric acid.

Effect of different pasteurization temperature in the preservation : Fresh young fruit kernel (140 g) was transferred into the sugar solution (300 ml) containing fixed concentration of selected preservative to cover them fully and pasteurized at different temperatures (70°C, 80°C and 90°C) separately for 30 min, sealed with parafilm and stored at room temperature. Control sample was not undergone pasteurization treatment..

Preparation of the medium for preservation : Sugar solutions of 20 °Brix and 30 °Brix were prepared for the medium for preservation. The reason behind this is to select 15 °Brix is to avoid either hypertonic or hypotonic effect in the young fruit kernel where size and shape of young fruit kernel might have been changed due to osmosis. But for comparison low brix medium was used. If there was any advantage in using low brix, which make the process is feasible in large scale and also suitable for people suffering from diabetes. But isotonic medium (30 °Brix) showed better effect for preservation rather than the other.

Total soluble solid of the fresh young fruit kernel (°Brix) : By gentle pressing the fruit kernel, fluid was taken and the °Brix value was determined directly by using Refractometer.

Treatments:

(Sugar solutions of 20 °Brix)
T_1 = Pasteurization at 70° C
T_2 = Pasteurization at 80° C
T_3 = Pasteurization at 90° C

(Sugar solutions of 30 °Brix)
T_4 = Pasteurization at 70° C
T_5 = Pasteurization at 80° C
T_6 = Pasteurization at 90° C

(With distilled water 0 °Brix)
T_0 = Control (without Pasteurization)

8.4 WORK ELEMENTS:

Collecting of young fruit kernel of palmyrah palm (*Taler Shas*) from local market Removing the peels, washing and grading

i. Preparing the solution with distilled water, Sodium metabisulphite-Food grade (E223), Sodium benzoate-Food grade (E211) and Citric acid-Food grade(commonly available in local market) and sugar to make it of 20 °Brix .
ii. Then fresh young fruit kernel (140 g) will be transferred into the sugar solution (300 ml) containing 20 °Brix to cover them fully and pasteurized at different temperatures (70°C, 80°C and 90°C) separately for 30 min and sealed, cooled followed by stored at room temperature.
iii. Again Preparing the solution with distilled water, Sodium metabisulphite-Food grade (E223), Sodium benzoate-Food grade (E211) and Citric acid-Food grade(commonly available in local market) and sugar to make it of 30 °Brix

iv. Then fresh young fruit kernel (140 g) will be transferred into the sugar solution (300 ml) containing 30 °Brix to cover them fully and pasteurized at different temperatures (70°C, 80°C and 90°C) separately for 30 min and sealed, cooled followed by stored at room temperature.
v. The treatment. pH of the media, microbiological observation, physicochemical characteristics analysis and organoleptic evaluation were made on sample in 30 days interval.

8.5 TIME SCHEDULE:

Sl. No.	2026											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
i			----	----	-----	----						
ii			----	----	-----	-----						
iii			----	----	-----	----						
iv			----	----	-----	----						
v			----	----	-----	----						
vi			----	----	-----	----						
vi					----	----	----	----	----	----	----	

8.6 DATA TO BE COLLECTED:

i) Brix (%), pH content
ii) Preservation period
iii) Total microbial count
iv) Organoleptic taste and color

8.7 ECONOMIC IMPACT:

It is expected that people will get pure of young fruit kernel of palmyrah palm (*Taler Shas*). It will facilitate the availability of that specific food year-round. It has multilateral health benefits. Can be sold in super shop. The producers will get higher economic benefit.

8.8 EFFECT ON ENVIRONMENT:

This investigation is environment friendly and there would have no adverse impact on environment.

8.9 UTILIZATION OF RESEARCH RESULTS:

i) The producers will be benefited for introducing pure young fruit kernel of palmyrah palm (*Taler Shas*.
ii) Research results will fulfill a research part of sugarcrop mandate part.
iii) Young fruit kernel of palmyrah palm (*Taler Shas*) can supersede with suggary food products and it is useful to health.
iv) young fruit kernel of palmyrah palm (*Taler Shas*) manufacturers will be benefited through utilization of expected research results.

PROGRAMME AREA : SUGARCANE VARIETAL IMPROVEMENT
9.0 TITLE : EFFECT OF FLOWERING ON JUICE AND *GUR* QUALITY OF SUGARCANE
LOCATION : BSRI Farm & laboratory of physiology & sugar chemistry division
INVESTIGATORS : M S Arefin, M S Islam, F H Shanta and M A Habib
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk): 1,20,000.00

9.1 DEFINITION OF THE PROBLEM:

Flowering in sugarcane is influenced by a number of plant and environmental factors like photoperiod, temperature, moisture and nutrition (Moore and Nuss 1987). In sub-tropical cane growing belt, flower initiation is usually observed in the second week of September, whereas in tropical belt, it commences in second week of August. Flowering is known to affect the productivity of cane and sugar. Although flowering in sugarcane is essential for breeding, uncontrolled flowering in commercial fields poses a serious problem for sugarcane

farmers and millers with a considerable loss of cane and sugar yield (Rao and Kumar 2003). The reduction in cane tonnage due to flowering varies with the percentage of flowering and the age of the crop at flowering. Miah and Sarkar (1981) reported that the fresh weight of non flowered stalks was superior over the flowered ones, while Singh (1980) reported that the weight of flowered canes after 35 to 45 days of inflorescence emergence was superior to the non-flowered canes in the varieties 'Co 1158' and 'Co 740'. Flowering reduced the sucrose content in cane especially when there is a high percentage of flowering. He is (1951) reported that flowering reduced the purity of the juice, if the crop was harvested after four or more months. In sub-tropical cane growing belt, growth of cane practically ceases with the fall in mean maximum and minimum temperature between 25ºC and 10ºC, respectively, whether they have flowered or are still in vegetative phase. Therefore, under such conditions, difference in cane yield as a result of flower inhibition is usually not observed. Contrary Therefore, it is important to identify early maturing sugarcane varieties/clones for production of sugar and good quality *gur*.

9.2 OBJECTIVES:

i) Determining the effect of flowering on juice and *gur* quality in different months and
ii) Determining the quality of *gur* after preparation.

9.3 METHODOLOGY:

Selected six flowering sugarcane varieties (eg. Isd 16, Isd 33, Isd 39, BSRI Akh 43, BSRI Akh 45 & BSRI Akh 46) and six non-flowering sugarcane varieties (eg. Isd 34, Isd 36, Isd 37, Isd 38, Isd 2/54 & BSRI Akh 41) will be planted at BSRI farm in the month of October/November 2025. Similar intercultural operations and management practices will be followed for all the clones. Chemical analysis for brix (%), pol % juice, purity%, reducing sugars per cent and pol % cane will be determined starting from mid September 2026 and to be continued up to March 2027. The chemical analyses of all the varieties will be conducted once in a month with three replications. *Gur* will be prepared from the same clones in the month of October, December and February by open pan boiling method without adding chemical clarificants. The physical and chemical properties of prepared *gur* will be determined within 7(seven) days of its preparation to screen suitable clones for superior quality *gur* production.

9.4 WORK ELEMENTS:

i. Land preparation.
ii. Plantation.
iii. Irrigation.
iv. Intercultural operations.
v. Top dressing of fertilizers and insecticide (Urea, MoP and Furadan).
vi. Brix survey.
vii. Chemical analysis of sugarcane.
viii. *Gur* preparation.
ix. Determination of physico-chemical properties of *gur*.

9.5 TIME SCHEDULE:

Sl. No.	2025			2026												2027		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
i	---																	
ii	---	---																
iii		---	---	---	---	---												
iv			---	---	---	---	---											
v						---		---										
vi											---	---						
vii												---	---	---	---	---	---	---
viii													---		---		---	
ix													---		---		---	

9.6 DATA TO BE COLLECTED:

i. Brix (%), pol in juice, pol in cane, Purity (%), Reducing Sugars (%), Fibre (%) of juice.
ii. *Gur* recovery
iii. Physico-chemical properties of *gur*.

9.7 ECONOMIC IMPACT:

It is expected to identify the varieties having flowering and non flowering behavior to widen the scope of crushing period. If the peak period could be identified, sugar mills and *gur* makers will be benefited through introduction of maturity based crushing schedule. The millers and *gur* makers will get higher economic benefit.

9.8 EFFECT ON ENVIRONMENT:

This investigation is environment friendly and there would have no adverse impact on environment.

9.9 UTILIZATION OF RESEARCH RESULTS:

i) Sugar mills/*gur* makers will be benefited for introducing flowering and non flowering behavior for higher sugar and *gur* recovery.
ii) Research results will fulfill a part of NSB requirement for releasing sugarcane variety.
iii) Flowering and non flowering sugarcane varieties grouped for higher recovery in in mill zone and non mill zone that will be helpful for cane breeders in crossing and hybridization programme.
iv) *Gur* manufacturers will be benefited through utilization of expected research results. *Gur* makers will be able to manufacture superior quality of *gur* in peak period for flowering and non flowering varieties.
v) It is expected that the results will be helpful for future crossing and hybridization programme in sugarcane variety development.

AGRONOMY & FARMING SYSTEMS DIVISION

Rationale

Agronomy & Farming Systems Division undertakes research works to develop technologies related to improved agronomic practices of different sugarcrops. Another objective of the division is to develop sugarcane based sustainable cropping systems through inclusion of a number of crops grown as intercrops in sequence to get higher economic benefit from sugarcane field, thus enriching BSRI technology bank. Apropos to previous year's activities, research program for 2025-2026 is undertaken. The proposed research programs have been designed to address different agronomic problems in sugarcane cultivation, intercropping high value crops with chewing cane, optimizing pit diameter and number of setts, weed management practices in sugarcane, agronomic management strategies of stevia, effect of gibberellic acid and irrigation on sugarbeet yield and quality. It also includes new experiments regarding ratooning potentiality of sugarcane with different intercrop, effect of lentil intercropping on yield, and productivity of sugarcane and effect of onion planting materials on productivity of sugarcane-onion intercropping system. A total eight (08) experiments are designed to set-up during 2025-2026 cropping year which will be conducted at BSRI Farm and some other locations of Bangladesh.

LIST OF EXPERIMENTS

PROGRAMME AREA: CROP AND SOIL MANAGEMENT

1.0 Title : Productivity of chewing cane with different high value intercrops
2.0 Title : Effect of lentil intercropping with sugarcane on yield and productivity
3.0 Title : Effect of onion planting materials on productivity of sugarcane-onion intercropping system
4.0 Title : Ratooning potentiality of sugarcane with different intercrop
5.0 Title : Effects of gibberellic acid and irrigation interval on growth and quality of sugarbeet
6.0 Title : Effect of spacing and fertilizer levels on growth and yield of stevia
7.0 Title : Optimizing pit diameter and number of setts per pit for profitable sugarcane production
8.0 Title : Evaluation of new herbicides for weed management in sugarcane

PROGRAMME IN DETAILS

PROGRAMME AREA : CROP AND SOIL MANAGEMENT
1.0 TITLE : PRODUCTIVITY OF CHEWING CANE WITH DIFFERENT HIGH VALUE INTERCROPS
LOCATION : BSRI Farm, RSRS Gazipur, Fulbaria (Mymensingh) and Sirajganj
INVESTIGATORS : T A Apon, M A Alam, M A E Hossain, H P Roy, N Islam, M A R Doel and A K M R Islam
NATURE OF STUDY : On-going (Modified)
DURATION : 2023-2026
ESTIMATED COST(Tk): 1,60,000.00

1.1 DEFINITION OF THE PROBLEM:

Sugarcane (*Saccharum officinarum*) is a key industrial crop grown globally for sugar and biofuel production. Its wide row spacing (80–150 cm) and slow early growth phase (100–110 days) make it suitable for intercropping, allowing efficient use of space, nutrients, moisture, and light. Intercropping with short-duration crops like vegetables, legumes, or oilseeds can boost productivity and income, especially where land expansion is limited. In Bangladesh, many small farmers cannot sustain the long 10–14 months cane cycle, leading to reduced cane cultivation. Intercropping offers a practical solution to enhance production and income. This study explores the effects of intercropping high-value crops with chewing cane on growth, yield, and profitability.

1.2 OBJECTIVES:

i. To assess the impacts of different intercropping combinations on cane yield;
ii. To identify the most profitable high value intercrop combination with sugarcane and
iii. To increase crop production and economic benefit with sugarcane intercropping.

1.3 METHODOLOGY:

Treatments:

T_1 : Sole Chewing cane
T_2 : Chewing cane + Chia
T_3 : Sole Chia
T_4 : Chewing cane + Cabbage
T_5 : Sole Cabbage
T_6 : Chewing cane + Cauliflower
T_7 : Sole Cauliflower
T_8 : Chewing cane + Potato
T_9 : Sole Potato
T_{10} : Chewing cane + Beet Root
T_{11} : Sole Beet Root

Planting material : Polybag settlings
Plot size : 6 m × 6 m
Replications : 3
Design : RCBD
Cane Variety : BSRI Akh 42
Time of planting : December, 2025
Data to be collected
For chewing cane

1. Establishment (%)
2. Tiller population ($\times 10^3$ ha^{-1}) at 120 and 150 DAP
3. Chewable cane ($\times 10^3$ ha^{-1})

4. Unit stalk weight (kg), stalk height (m), stalk girth (cm), internodes/cane (no.), internode distance at harvest
5. Cane yield (tha^{-1})
6. Juice purity
7. Brix (%) cane
8. Total antioxidant activity ($\mu molg^{-1}$ fresh biomass)
9. Total phenolic compounds
10. Different economic indices (LER, GMV, BCR etc.)

For intercrops

i. Plant height (m)
ii. Plant population ($\times 10^3$ ha^{-1})
iii. Intercrop Green Biomass (tha^{-1}) at harvest
iv. Intercrop yield (tha^{-1}) at harvest

1.4 WORK ELEMENTS:

1. Seed collections
2. Land preparation
3. Basal fertilization
4. Chewing cane plantation
5. Irrigation
6. Weeding and mulching
7. Fertilizer top dressing
8. Insect and pest control
9. Harvesting of intercrops
10. Harvesting of cane
11. Data collection
12. Data tabulation, analysis and reporting

1.5 TIME SCHEDULE:

Activity No.	MONTHS																		
	2025					2026												2027	
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
1			→																
2				→															
3				→															
4				→															
5						→			→										
6						→				→									
7							→			→									
8							→							→					
9								→		→									
10															→				
11							→								→				
12																	→	→	

1.6 ECONOMIC IMPACT: Positive economic impact is expected.

1.7 EFFECTS ON ENVIRONMENT: Friendly to soil and environment.

1.8 UTILIZATION OF RESEARCH RESULTS:

It will help to increase crop production and economic benefit per unit area of land.

PROGRAMME AREA : CROP AND SOIL MANAGEMENT
2.0 TITLE : EFFECT OF LENTIL INTERCROPPING WITH SUGARCANE ON YIELD AND PRODUCTIVITY
LOCATION : BSRI Farm
INVESTIGATORS : M A Alam, T A Apon, M A E Hossain, H P Roy and A K M R Islam
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk): 80,000.00

2.1 DEFINITION OF THE PROBLEM:

Sugarcane is a widely cultivated long-duration crop with significant inter-row space that remains underutilized in the initial growth stages. Lentil, being a short-duration and low-input legume crop, can effectively utilize this space and enrich soil fertility through biological nitrogen fixation (Ali *et al.*, 2012). However, traditional farmers' intercropping practices are often unscientific, leading to poor yield and resource competition. Scientific planting patterns such as single line, double line, or mixed cropping of lentil can enhance productivity, land-use efficiency, and farm income when properly evaluated (Singh *et al.*, 2015; Rahman *et al.*, 2019).

2.2 OBJECTIVE(S):

i. To evaluate the effect of different lentil intercropping patterns on growth and yield of sugarcane;
ii. To assess the performance and yield of lentil under different intercropping arrangement and
iii. To determine land use efficiency and profitability of the sugarcane-lentil intercropping system.

2.3 METHODOLOGY:

Treatments

T_1 : Sole Sugarcane
T_2 : Sugarcane + Lentil (Farmer's practice)
T_3 : Sugarcane + Lentil (1 Line)
T_4 : Sugarcane + Lentil (2 Line)
T_5 : Sugarcane + Lentil (Systematic)
T_6 : Sole Lentil

Planting material : Two budded sett
Plot size : 6 m × 6 m
Replications : 3
Design : RCBD
Cane Variety : BSRI Akh 46
Time of planting : December, 2025
Data to be collected
For sugarcane

- Germination (%)
- Tiller population ($\times 10^3$ ha^{-1}) at 90,120 and 150 DAT
- Millable cane ($\times 10^3$ ha^{-1}) at harvest
- Unit stalk weight (kg), height (m), girth (cm), internode (no.)
- Cane yield (tha^{-1}) at harvest
- Pol (%) cane at harvest

For Lentil

- number of pods per plant
- grain yield (kg/ha)
- 1000-seed weight

System Productivity Metrics

- Land Equivalent Ratio (LER)
- Sugarcane Equivalent Yield (SEY)
- Gross and Net Return

2.4 WORK ELEMENTS:

1. Land preparation.
2. Intercrop sowing/planting
3. Basal fertilization
4. Irrigation
5. Weeding and mulching
6. Fertilizer top dressing
7. Insect and pest control
8. Earthing-up & tying
9. Lentil Harvesting
10. Cane harvesting
11. Data collection

2.5 TIME SCHEDULE:

Activity No.	MONTHS																	
	2025					2026												2027
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1				→														
2				→														
3				→														
4					→					→								
5							→		→									
6						→					→							
7									→		→	→						
8								→			→							
9							→		→									
10																→		
11					→												→	

2.6 ECONOMIC IMPACT: Positive economic impact is expected.

2.7 EFFECTS ON ENVIRONMENT: Friendly to soil and environment.

2.8 UTILIZATION OF RESEARCH RESULTS:

This experiment will help to identify the systematic lentil intercropping with sugarcane, which will give more yield and economic return

PROGRAMME AREA : CROP AND SOIL MANAGEMENT
3.0 TITLE : EFFECT OF ONION PLANTING MATERIALS ON PRODUCTIVITY OF SUGARCANE-ONION INTERCROPPING SYSTEM
LOCATION : BSRI Farm
INVESTIGATORS : M A Alam, T A Apon, M A E Hossain, H P Roy and A K M R Islam
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk): 1,00,000.00

3.1 DEFINITION OF THE PROBLEM:

Sugarcane, a long-duration and widely spaced crop, allows scope for intercropping short-duration, high-value crops in the early stages to maximize land use efficiency. Garlic, potato, and onion are high-return horticultural crops that can be profitably intercropped with sugarcane (Singh *et al.*, 2015). Onion, in particular, can be established using multiple methods viz. direct seed sowing, seedling transplanting, bulb planting for green onion (bulb to bulb), or bulb to seed for seed production (Kumar *et al.*, 2019; Islam *et al.*, 2022). However, the compatibility and economic return of these approaches under sugarcane intercropping remain poorly documented. Scientific evaluation is necessary to identify the most productive and profitable intercropping method, especially for onion under sugarcane canopy.

3.2 OBJECTIVE(S):

i. To evaluate the effect of various onion establishment methods on the growth and yield of sugarcane;
ii. To compare the productivity and profitability of different planting systems with sugarcane and
iii. To assess land-use efficiency in sugarcane-based intercropping systems.

3.3 METHODOLOGY:

Treatments

T_1 : Sole Sugarcane
T_2 : Sugarcane + Onion (Direct Seed Sowing)
T_3 : Sole Onion (Direct Seed Sowing)
T_4 : Sugarcane + Onion (Seedling Transplanting)
T_5 : Sole Onion (Seedling Transplanting)
T_6 : Sugarcane + Onion (Direct Bulb Planting)
T_7 : Sole Onion (Direct Bulb Planting)

Planting Material	: Two budded sett
Plot size	: 6 m × 6 m
Replications	: 3
Design	: RCB
Date of sugarcane planting	: November, 2025
Cane Variety	: BSRI Akh 46
Date of intercrop sowing/ planting	: November, 2025

Data to be collected

For sugarcane

- Germination (%)
- Tiller population ($\times 10^3$ ha^{-1}) at 90, 120 and 150 DAT
- Millable cane ($\times 10^3$ ha^{-1}) at harvest
- Unit stalk weight (kg), height (m), girth (cm), internode (no.)
- Cane yield (tha^{-1}) at harvest
- Pol (%) cane at harvest

For Intercrops

- Yield of bulb /seed
- Crop duration and harvest index
- Quality indicators (size, seed viability, etc.)

System Productivity Metrics

- Land Equivalent Ratio (LER)
- Sugarcane Equivalent Yield (SEY)
- Gross and Net Return, Benefit-Cost Ratio (B:C Ratio)

3.4 WORK ELEMENTS:

1. Land preparation.
2. Intercrop sowing/planting
3. Sugarcane planting

4. Basal fertilization
5. Irrigation
6. Weeding and mulching
7. Fertilizer top dressing
8. Insect and pest control
9. Earthing-up & tying
10. Intercrop harvesting
11. Cane harvesting
12. Data collection

3.5 TIMESCHEDULE:

Activity No.	MONTHS																	
	2025					2026												2027
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1				→														
2				→														
3				→														
4				→														
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11																→		
12					→												→	

3.6 ECONOMIC IMPACT: Positive economic impact is expected.

3.7 EFFECTS ON ENVIRONMENT: Friendly to soil and environment.

3.8 UTILIZATION OF RESEARCH RESULTS:

This experiment will help to identify the best onion establishment method while intercropping with sugarcane, which will give more yield and economic return.

PROGRAMME AREA : CROP AND SOIL MANAGEMENT
4.0 TITLE : RATOONING POTENTIALITY OF SUGARCANE WITH DIFFERENT INTERCROP
LOCATION : BSRI Farm
INVESTIGATORS : T A Apon, M A Alam, M A E Hossain, H P Roy and A K M R Islam
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk): 40,000.00

4.1 DEFINITION OF THE PROBLEM:

Ratoon cane cultivation contributes significantly to sugarcane production due to reduced cost of cultivation and early maturity. However, productivity of ratoon crops often declines due to poor crop management, reduced soil fertility, and competition from weeds (Sundara, 2000; Yadav *et al.*, 2017). Introducing short-duration, high-value intercrops like potato, garlic, onion, and linseed may improve resource use efficiency, enhance soil health, and provide additional income to farmers (Kumar *et al.*, 2015). Intercropping has the potential to suppress weeds, improve land equivalent ratio (LER), and maintain or even improve ratoon yield when managed properly.

4.2 OBJECTIVE(S):

i. To evaluate the impact of different intercrops on the productivity and profitability of ratoon sugarcane;

ii. To assess the land use efficiency under ratoon cane intercropped with different crops and
iii. To recommend suitable intercropping pattern for sustainable ratoon cane production.

4.3 METHODOLOGY:

Treatments

T_1 : Sole ratoon sugarcane (Control)
T_2 : Ratoon sugarcane + Potato
T_3 : Sole Potato
T_4 : Ratoon sugarcane + Garlic
T_5 : Sole Garlic
T_6 : Ratoon sugarcane + Onion
T_7 : Sole Onion
T_8 : Ratoon sugarcane + Linseed
T_9 : Sole Linseed

Plot size	: 6 m × 6 m
Replications	: 3
Design	: RCB
Cane Variety	: BSRI Akh 46
Date of planting	: November, 2025
Date of shaving	: November, 2026

Data to be collected

For sugarcane

- Establishment (%)
- Tiller population ($\times 10^3$ ha^{-1}) at 90,120 and 150 DAT
- Millable cane ($\times 10^3$ ha^{-1}) at harvest
- Unit stalk weight (kg), height (m), girth (cm), internode (no.)
- Cane yield (tha^{-1}) at harvest
- Pol (%) cane at harvest

For Intercrops

- Yield per plot (t/ha or kg/ha)

System Productivity Metrics

- Land Equivalent Ratio (LER)
- Sugarcane Equivalent Yield (SEY)
- Gross and Net Return, Benefit-Cost Ratio (B:C Ratio)

4.4 WORK ELEMENTS:

1. Stubble Shaving
2. Land preparation.
3. Intercrop sowing/planting
4. Basal fertilization
5. Irrigation
6. Weeding and mulching
7. Fertilizer top dressing
8. Insect and pest control
9. Earthing-up & tying
10. Cane harvesting
11. Data collection

4.5 TIME SCHEDULE:

Activity No.	MONTHS																	
	2025					2026												2027
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1				→														
2				→														
3				→														
4				→														
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6							→		→									
7						→												
8									→		→	→						
9								→										
10																→		
11					→													

4.6 ECONOMIC IMPACT: Positive economic impact is expected.

4.7 EFFECTS ON ENVIRONMENT: Friendly to soil and environment.

4.8 UTILIZATION OF RESEARCH RESULTS:

This experiment will help to identify the suitable intercrop combinations with ratoon cane, which will give more yield and economic return.

PROGRAMME AREA : CROP AND SOIL MANAGEMENT
5.0 TITLE : EFFECTS OF GIBBERELLIC ACID AND IRRIGATION INTERVAL ON GROWTH AND QUALITY OF SUGARBEET
LOCATION : BSRI Farm
INVESTIGATORS : T A Apon, M A Alam, M A E Hossain, H P Roy and A K M R Islam
NATURE OF STUDY : On-going (Modified)
DURATION : 2024-2027
ESTIMATED COST(Tk): 40,000.00

5.1 DEFINITION OF THE PROBLEM

Gibberellic acid (GA_3) is a plant hormone known to influence growth, development and flowering. It has been widely used in agriculture to enhance crop yield and quality. Sugarbeet, an important crop for sugar production, is sensitive to hormonal treatments as well as irrigation frequency. By considering the above-mentioned facts this research aims to fulfill the following objectives:

5.2 OBJECTIVES

i. To investigate the interaction effect of GA_3 and irrigation interval on growth and quality of sugarbeet and
ii. To optimize GA_3 application dose and irrigation interval to maximize sugarbeet yield and sugar content.

5.3 METHODOLOGY

Treatments:

Foliar spraying of GA_3
S_0: 0 mgL^{-1}
S_1: 75 mgL^{-1}
S_2: 150 mgL^{-1}
S_3: 225 mgL^{-1}

Irrigation Interval
I_1: 10 days
I_2: 20 days
I_3: 30 days

Plot size	: 2 m × 2 m
Design	: RCBD
Replication	: 3
Sowing date	: 15 December, 2025
Sugarbeet variety	: KWS Allanya
Frequency of GA_3 spraying	: 30, 60 and 90 DAS
Irrigation	: As per treatment
Cultural practices	: As and when required

Data to be collected

1. Germination (%)
2. SPAD value
3. Plant height (cm)
4. Beet length (cm)
5. Beet diameter (cm)
6. Shoot fresh weight ($gplant^{-1}$)
7. Beet fresh weight ($gplant^{-1}$)
8. Shoot dry weight ($gplant^{-1}$)
9. Beet dry weight ($gplant^{-1}$)
10. Unit beet weight (g)
11. Yield of sugarbeet (tha^{-1})
12. Pol (%) in beet at harvest
13. Root elongation rate as compared to control

5.4 WORK ELEMENTS:

1. Land preparation
2. Basal fertilization
3. Seed sowing
4. Irrigation
5. Weeding and mulching
6. Fertilizer top dressing
7. Foliar spraying of GA_3
8. Insect and pest management
9. Harvesting of sugarbeet
10. Data collection, tabulation and analysis

5.5 TIME SHEDULE:

Activity No.	Months																	
	2025					2026												
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
1.				→														
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6.					→	→	→											
7.							→	→	→	→	→							
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9.											→	→						
10.					→	→	→	→	→	→	→	→						

5.6 ECONOMIC IMPACT: Positive economic impact is expected

5.7 EFFECTS ON ENVIRONMENT: No adverse effect on environment.

5.8 UTILIZATION OF RESEARCH RESULTS:

The results of this study will provide necessary data about optimized GA_3 application strategies along with optimum irrigation interval for specific sugarbeet varieties to maximize yield and sugar content.

PROGRAMME AREA : CROP AND SOIL MANAGEMENT
6.0 TITLE : EFFECT OF SPACING AND FERTILIZER LEVELS ON GROWTH AND YIELD OF STEVIA
LOCATION : BSRI farm
INVESTIGATORS : A K M R Islam, T A Apon, M A E Hossain, H P Roy and M A Alam
NATURE OF STUDY : On-going
DURATION : 2024-2027
ESTIMATED COST(Tk): 80,000.00

6.1 DEFINITION OF THE PROBLEM:

Stevia (*Stevia rebaudiana*) is being domesticated and cultivated in many countries like Japan, China, Taiwan, Korea, Mexico, USA, Thailand, Malaysia, Indonesia, Australia, Tanzania, Canada, Abkhazia, and Russia because of the sweetness of the leaf extract, having sweetener power 300 times greater than cane sugar. Industrial crops should not be grown as pure crops as food crops requirement is also increasing. Considering the need for higher food production, stevia needs to be introduced as a sugar crop. Industrial monocultures may pose potential hazards of continuous cropping including suppression of soil fertility, productivity and sparing food crops as well as market glut. By considering the above-mentioned facts, the current study is undertaken with the following objectives.

6.2 OBJECTIVES:

i. To find out the effect of spacing and fertilizer on leaf yield of stevia and
ii. To determine the optimum spacing and fertilizer dose of stevia.

6.3 METHODOLOGY:

Treatments:

Spacing
S_1 : 50×50 cm
S_2 : 50×40 cm
S_3 : 40×40 cm
S_4 : 40×35 cm

Fertilizer Dose per Hectare
F_1 : 100:30:40 Kg NPK
F_2 : 110:40:50 Kg NPK
F_3 : 120:50:60 Kg NPK

Replications : 3
Design : RCB
Plot size : 1 m x 1 m
Planting material : Stevia seedlings
Date of planting : November, 2025
Data to be collected

1. Establishment % of seedling
2. Plant population (m^{-2})
3. Leaf yield (kg ha^{-1})
4. Unit leaf weight (g), plant height (cm), individual plant weight (g), individual plant leaf weight (g)
5. Fresh biomass
6. Total antioxidant activity (µmolg^{-1} fresh leaf)
7. Total phenolic compound

6.4 WORK ELEMENTS:

1. Seed collections
2. Land preparation
3. Basal fertilization
4. Stevia plantation

5. Irrigation
6. Weeding and mulching
7. Fertilizer top dressing
8. Insect and pest control
9. Harvesting of cane
10. Data collection
11. Data tabulation, analysis and reporting

6.5 TIME SCHEDULE:

Activity No.	MONTHS																		
	2025					2026												2027	
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
1			→																
2			→																
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9															→	→			
10					→	→	→	→	→	→	→	→	→	→	→	→	→		
11																		→	→

6.6 ECONOMIC IMPACT: Positive economic impact is expected.

6.7 EFFECTS ON ENVIRONMENT: Friendly to soil and environment.

6.8 UTILIZATION OF RESEARCH RESULTS:

The experiment will determine the optimal spacing and fertilizer levels for maximizing stevia leaf yield while assessing their effects on plant growth, productivity, and soil health. It will provide insights into the most efficient agronomic practices for sustainable stevia cultivation.

PROGRAMME AREA : CROP AND SOIL MANAGEMENT
7.0 TITLE : OPTIMIZING PIT DIAMETER AND NUMBER OF SETTS PER PIT FOR PROFITABLE SUGARCANE PRODUCTION
LOCATION : BSRI Farm
INVESTIGATORS : T A Apon, M A E Hossain, H P Roy, M A Alam and A K M R Islam
NATURE OF STUDY : On-going
DURATION : -
ESTIMATED COST(Tk): 40,000.00 (TK.)

7.1 DEFINITION OF THE PROBLEM:

Sugarcane is one of the most productive plant species known in terms of dry matter production as it potentially produces from 41 to 65 t of dry matter ha^{-1} $year^{-1}$. Limited horizontal expansion of sugarcane area due to industrialization of cultivable lands, the vertical growth by adopting effective crop management techniques is the option left. Among many reasons for low cane yield at farmer's field, use of conventional methods of planting associated with low plant population is considered to be of primary importance. The superior performance of the crop depends upon establishment methods as it is directly influenced by amount of harvestable solar radiation and crop stand. Recently a new technology of planting sugarcane in ditches and pits of variable size has been developed, which has not only explored the possibility of increasing plant population per unit area, but also making efficient utilization of water and applied nutrients which produces higher proportion of thick and heavy primary shoot, contributing more to final population and the yield. By considering the above-mentioned facts the experiment has been undertaken to optimize the size of the pit and number setts per pit to obtain maximum yield per unit land.

7.2 OBJECTIVE(S):

i. To identify the optimum pit diameter along with number of setts per pit and
ii. To maximize the cane yield per unit of land.

7.3 METHODOLOGY:

Treatments:

Pit Diameter	**Number of Two-budded Setts Per Pit**
P_1 : 60 cm	S_1 : 5
P_2 : 90 cm	S_2 : 10
P_3 : 120 cm	S_3 : 15
P_4 : 150 cm	

Design : RCB
Replication : 3
Cane Variety : BSRI Akh 46
Date of planting : December, 2025

Data to be collected

1. Germination (%)
2. Tiller population ($\times 10^3$ ha^{-1}) at 120, 150 and 180 DAP
3. Millable cane ($\times 10^3$ ha^{-1}) stalks at harvest
4. Unit stalk weight (kg), height (m), girth (cm), internode (no.)
5. Cane yield (tha^{-1}) at harvest
6. Pol (%) cane at harvest
7. Different economic indices (GMV, MAI etc.)

7.4 WORK ELEMENTS:

1. Sett collection
2. Land selection and preparation
3. Basal fertilization and planting
4. Weeding and mulching
5. Irrigation
6. Fertilizer top dressing
7. Insect and pest management
8. Earthing-up & tying
9. Harvesting of cane
10. Data tabulation, analysis and reporting

7.5 TIME SHEDULE:

Activity No.	Months																	
	2025					2026												
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
1		→	→	→														
2			→	→														
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4			→	→	→	→	→											
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6							→	→	→	→								
7				→	→	→	→	→	→	→	→	→	→	→				
8									→	→								
9															→	→	→	
10					→	→	→	→	→	→	→	→	→	→	→	→	→	→

7.6 ECONOMIC IMPACT: Positive economic impact is expected.

7.7 EFFECTS ON ENVIRONMENT: Friendly to soil and environment.

7.8 UTILIZATION OF RESEARCH RESULTS:

It will help to minimize the cost of production and increase the yield of cane per unit area of land.

PROGRAMME AREA : CROP AND SOIL MANAGEMENT

8.0 TITLE : EVALUATION OF NEW HERBICIDES FOR WEED MANAGEMENT IN SUGARCANE

LOCATION : BSRI Farm and RSRS Thakurgaon

INVESTIGATORS : H P Roy, T A Apon, M A E Hossain, M A Alam, M S Hossain and A K M R Islam

NATURE OF STUDY : On-going with new herbicides

DURATION : 2024-2026

ESTIMATED COST(Tk): 30,000.00

8.1 DEFINITION OF THE PROBLEM:

Weeds are unwanted plant populations which interfere with the utilization of land and water resources. Of the total annual loss of agricultural produce from various pests, weeds account for 45%, insects 30%, diseases 20%, and other pests 5%. Weed is one of the most important single factors for sugarcane production, upto 14.1 to 71.7% yield reduction in sugarcane occur due to weed infestation (Mani *et al.*, 1968). Hand weeding (manually) is the most common weed control practice but expensive and laborious in many cases. Therefore, the only manual weed control now is considered not to be effective for weed control in cane field. In the developed countries, herbicide is successfully used for efficient weed control. But herbicides are not widely used in Bangladesh. A very few works have been done on the use of herbicides in cane field in Bangladesh, even no effective herbicides are recommended for cane field yet. Therefore, in the present study, an attempt has been initiated to find out efficacy of different herbicides for controlling various weeds of sugarcane field for higher yield and economic benefit.

8.2 OBJECTIVES:

i. To study the performance of herbicides for controlling weeds of sugarcane and
ii. To find out the weed control efficiency of herbicides as compared to control.

8.3 METHODOLOGY:

Treatments:

T_1 : Control (no weeding)
T_2 : Hand weeding
T_3 : AKARI 55 SC (Atrazine 50% + Mesotrione 5%)@ 2 Lha^{-1}
T_4 : Athena 55 SC (Atrazine 50% + Mesotrione 5%) @ 2 Lha^{-1}
T_5 : Glusinat 20 SL (Glufosinate Ammonium 20%) @ 3.0 Lha^{-1}
T_6 : Cinder 30 SL (Glufosinate Ammonium 30%) @ 2.5 Lha^{-1}
T_7 : Penachlor 40 SE (Pretilachlor 38.5% + Penoxsulam 1.5%) @ 2.5 L ha^{-1}
T_8 : Rolar 75 WDG (Halosulfuron-methyl 75% W/W) @45-75 g ha^{-1}
T_9 : Rajclean 10 WP (Pyrazosulfuron-ethyl 10%) @ 150 g ha^{-1}
T_{10} : D-SET 30 SL (Glufosinate Ammonium 30%)@ 3 L ha^{-1}
T_{11} : TARON 55 SC (Atrazine 50% + Mesotrione 5%) @ 2.5 L ha^{-1}
T_{12} : PCI-Quat 20 SL (Diquat Dibromide)@ 2 kg ha^{-1}
T_{13} : Total mine 72 SL (2,4-D Amine salt 72%) 500 L ha^{-1}
T_{14} : R-Quat-Methyl 20SL (Diquat Dibromide) @2 L ha^{-1}
T_{15} : Easiquat 20 SL (Diquat Dibromide 20%) @2 L ha^{-1}
T_{16} : Nibuchlor 40 SC (Pretilachlor 38% + Penoxsulam 1.5%) @ 1.3 L ha^{-1}

Planting material : Two budded setts
Plot size : 6 m × 6 m
Replications : 3
Design : RCBD
Cane Variety : BSRI Akh 43
Time of planting : December, 2025
Fertilizer dose : As per BSRI recommendation
Herbicides application : As per treatments

Data to be collected

For sugarcane

1. Germination (%)
2. Tiller population (10^3 ha^{-1}) at 90, 120 and 150 DAT
3. Millable cane (10^3 ha^{-1})
4. Unit stalk weight (kg), stalk height (m), stalk girth (cm), internodes/cane (no.) at harvest
5. Cane yield (tha^{-1})
6. Pol (%) cane
7. Economic analysis

For weeds

1. Weed species found on experimental plots
2. Mean weed intensity (m^{-2}) at 30, 60, 90 and 120 DAT
3. Dry weight of weeds (gm^{-2}) at 30, 60, 90 and 120 DAT
4. Weed control efficiency (%)

8.4 WORK ELEMENTS:

1. Land preparation
2. Pre emergence herbicides application
3. Basal fertilization, planting of cane and irrigation
4. Post emergence herbicides application
5. Irrigation
6. Fertilizer top dressing
7. Insect and pest management
8. Harvesting of cane
9. Biometry of harvested cane
10. Data collection, tabulation, analysis and reporting

8.5 TIME SCHEDULE:

Activity No.	Months																
	2025					2026											
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→															
2			→														
3				→													
4						→											
5				→						→							
6								→		→							
7							→						→				
8																→	→
9																	→
10				→												→	→

8.6 ECONOMIC IMPACT: Positive economic impact is expected.

8.7 EFFECTS ON ENVIRONMENT: No much adverse effect on environment.

8.8 UTILIZATION OF RESEARCH RESULTS:

Expected results of the experiment will encourage farmers to apply herbicides in sugarcane field for controlling the weeds economically.

SOILS AND NUTRITION DIVISION

Rationale

The goal of sustainable crop production and Nutritional security can be achieved through a constant monitoring and correcting the existing and emerging nutrient deficiencies. Climate change and land degradation is a crucial and important issue to our country as well as to the global perspective. To face that challenges Soils and Nutrition Division has been conducting researches with major emphasis on organic and inorganic fertilizer management packages, to maintain soil health and soil microbiological activities for sustainable sugar crops production and prevent environmental pollution. For the cropping year 2025-2026, 8 (eight) research programs have been proposed. The proposed programs will address the existing problems aimed at desirable solutions to provide appropriate nutrient packages for sustainable sugar crops production, which are technically sound, economically attractive and environmentally safe.

LIST OF EXPERIMENTS

Soil Fertility

1.0 Title : Nutrient requirement for sustainable sugar crops production under different AEZs
- 1.1 Nutrient requirement for sustainable sugarcane production under AEZ 4 and 28
- 1.2 Nutrient requirement for sustainable chewing cane production under AEZ 3, 18, 28 and 29
- 1.3 Effect of integrated nutrient management on growth, biomass yield, quality and nutrient content of stevia (*stevia rebaudiana* Ber.)
- 1.4 Determination of fertilizer rate for local and improved date palm

2.0 Title : Effect of pressmud on the yield and quality of sugarcane and soil fertility

3.0 Title : Amelioration of acid soil through dolomite application and its effects on nutrient availability, growth and yield of sugarcane

Soil Physics

4.0 Title : Influence of minimum tillage and organic amendments on sugarcane growth, yield and soil properties

Soil Microbiology

5.0 Title : Isolation and characterization of plant growth promoting bacteria (PGPB) from sugarcane soil and its effectiveness study

PROGRAMME IN DETAILS

1.0 NUTRIENT REQUIREMENT FOR SUSTAINABLE SUGAR CROPS PRODUCTION UNDER DIFFERENT AEZs

1.1 TITLE : **NUTRIENT REQUIREMENT FOR SUSTAINABLE SUGARCANE PRODUCTION UNDER AEZ 4 AND 28**
LOCATION : Sirajgonj (AEZ 4) and Kapasia, Gazipur (AEZ 28), Jamalpur (AEZ 8)
INVESTIGATORS : M A Haque, K M Alam, M H Rahman, S Islam, N Islam and M A R Doel
NATURE OF STUDY : Ongoing
DURATION : Continuous
ESTIMATED COST(Tk): 75,000.00

1.1.1 DEFINITION OF THE PROBLEM:

Sugarcane is a long duration and exhaustive crop which consumes high amount of soil nutrients. Nutrient requirement of sugarcane differs from place to place according to soil and agro-climatic conditions over space and time. Yield potentiality of a crop would not reach a maximum unless proper fertilizer management is practiced. It is spectacular that the poor sugarcane yield is largely attributed to improper use of fertilizer. The inherent capacity of soil to supply nutrients is gradually declining over time for its nutrient mining due to intensive crop cultivation and some other manipulations. With the advancement of technology there would be a continuous need for updating the nutrient requirement of sugarcane at different Agro-Ecological Zones. In view of this, the experiment has been undertaken to find out the nutrient requirement for sugarcane cultivation in different AEZs that will be helpful for updating the next Fertilizer Recommendation Guide.

1.1.2 OBJECTIVE:

To find out the optimum and economic nutrient requirement for sustainable sugarcane production in different AEZs.

1.1.3 METHODOLOGY:

The experiment will be conducted at three locations viz. Sirajgonj (AEZ 4), Gazipur (AEZ 28) and Jamalpur (AEZ 8).The experiments will be set up at the farmers' field following randomized complete block design with three replications.

Treatments:

T_1- Control
T_2- Recommended Fertilizer Dose
T_3- Soil Test Basis Fertilizer Dose (STB)
T_4- 75% of STB
T_5- 125% of STB
T_6- Fertilizer dose based on Khamari App

Design : RCB;
Replication : 3;
Plot size : 6m x 6m;
No. of lines/plot : 6 (6m long)
Gross area : 0.33 acre;
Planting material : 2- budded sett
Variety : BSRI Akh 46/45
RFD (kg ha-1) for AEZ-04 : $N_{183}+P_{69} + K_{183} + S_{30} + Zn_5 + B_{2.5}$
AEZ-28 : $N_{180} + P_{40} + K_{90} + S_{15} + Mg_{10} + Zn_{2.5}$

1.1.4 DATA TO BE COLLECTED:

1. Physical and chemical properties of initial and post harvest soils
2. Germination counting at 90 days after plantation (DAP)
3. Tiller counting at 150 and180 days after plantation (DAP)
4. Millable cane, cane diameter, cane height, yield and Brix at harvest

1.1.5 WORK ELEMENT:

Activity No.	Name of activity
1	Layout of the field experiments and initial soil sample collection
2	Basal fertilizer application and plantation of sett in the field
3	First top dressing of urea and MOP at 120 DAP
4	Tiller counting at 120 days after plantation (DAP)
5	Second top dressing of urea and MOP at 150 DAP
6	Tiller counting at 150 DAP and 180 DAP
7	Sucrose content before two days of harvest
8	Millable cane counting at harvest
9	Leaf tissues to be analyzed for different nutrient elements at 300 DAP
10	Yield of cane at harvest
11	Post harvest soil sample collection
12	Soil and plant analyses for different nutrients

1.1.6 TIME SCHEDULE:

AC	Year	2025				2026											
No.	Month	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→															
2			→	→	→												
3						→	→										
4,5						→	→	→									
6							→	→									
7							→	→	→								
8														→	→	→	→
9-12		→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→

1.1.7 ECONOMIC BENEFIT:

Location specific recommended fertilizers application for growing sugarcane will reduce cost of production as well as ensure higher sugarcane yield. Therefore, sugarcane growing farmers will be economically benefited.

1.1.8 EFFECT ON ENVIRONMENT:

The uses of recommended balanced dose of fertilizers based on the location specific results have no harmful effect on the soil, the crop and the consumer.

1.1.9 UTILIZATION OF RESEARCH RESULTS:

The findings of the study will be useful to the sugarcane farmers and extension workers to improve productivity and ensure good quality of sugarcane.

1.2 TITLE : NUTRIENT REQUIREMENT FOR SUSTAINABLE CHEWING SUGARCANE PRODUCTION UNDER AEZ 3, 11, 18, 28 AND 29

LOCATION : Rangpur sadar (AEZ 3), BSRI, Ishwardi (AEZ 11), Noakhali (AEZ 18), Kapasia, Gazipur (AEZ 28) and Bandarban (AEZ 29)

INVESTIGATORS : M A Haque, K M Alam, M H Rahman, R C Kabiraj, S Islam, N Islam, Z H Sabuj and M O Sheikh

NATURE OF STUDY : New

DURATION : Continuous

ESTIMATED COST(Tk): 2,50,000.00

1.2.1 DEFINITION OF THE PROBLEM:

Chewing sugarcane is cultivated more or less round the year all over Bangladesh. Sugarcane has been used for chewing since time immemorial. Infact, chewing, perhaps, was the first use of cane. Now chewing canes are in great demand during festival times, both for worship and chewing. Chewing, canes having more sugar, soft with less fiber, less rind thickness and less rind hardness are desirable. They are specifically growth for harvest during this festival season. They must be attractive in color, thick, easy to peel and split, should be juicy having more sugar, and should have less or no wax on the rind surface. "Organic Lifestyle Magazine" lists sugar cane juice, with a relatively low glycemic index of 43, as a healthy alternative to table sugar when used in moderation. It contains fructose and glucose, which, unlike sucrose-based sugars, do not require insulin for metabolism. Because your body metabolizes these plant-based sugars in your liver rather than in your small intestine, the fructose and glucose from sugar cane juice are absorbed more slowly than sucrose and do not cause wild fluctuations in your blood sugar level.

Sugarcane is a C_4 plant having high efficiency in storing solar energy and most efficient converter of solar energy to sucrose (Wang, 2013). The juice sugarcane per serving (28.35 grams) contains energy-111.13 kJ (26.56 kcal), carbohydrates-27.51 g, protein-0.27 g, calcium11.23 mg (1%), iron 0.37 mg (3%), potassium 41.96 mg (1%) and 17.01 mg (1%) sodium (http://food.ndtv.com/health/).

This is a high input demanding crop and capable of rapidly depleting soil nutrients, such as nitrogen, phosphorus, potassium and sulphur etc. A crop production system with high yield targets cannot be sustainable unless nutrient inputs to soils are balanced against nutrient removal by crops. Soil fertility is declining with the time mainly due to intensive cultivation with high yielding modern varieties and unbalanced use of chemical fertilizers with little or no use of organic fertilizers. Soil fertility degradation has been reported by many researchers in Bangladesh (Rijpma and Jahiruddin, 2004; Hasan and Alam, 2006; Hossain *et al.*, 2007; Jahiruddin and Satter, 2010; World Bank, 2010; FRG-2024). Thus soil fertility management is of utmost importance for optimizing crop nutrition on both short-term and long-term basis to achieve sustainable crop production (FAO, 2006). There was no data of fertilizers rate for chewing sugarcane cultivation in Bangladesh which will be helpful for updating the next Fertilizer Recommendation Guide. Therefore, the present study was under taken with the following objectives:

1.2.2 OBJECTIVES:

i) Determining the optimum dose of N P K S Zn & B for existing chewing cane varieties for their optimum growth, yield and quality in different AEZs and
ii) Improve soil health, minimizing the cost of production and environmental pollution

1.2.3 METHODOLOGY:

Three experiments will be conducted at Rangpur sadar (AEZ 3), BSRI Ishwardi (AEZ 11), Noakhali (AEZ 18), Kapasia, Gazipur (AEZ 28) and Bandarban (AEZ 29). Chewing cane varieties will be taken as planting material for this experiment.

Treatments:

Factor A: Variety

V_1 - BSRI Akh 42
V_2 - BSRI Akh 49

Factor B: Fertilizer

T_1 - Control;
T_2 - Recommended Fertilizer Dose(BSRI)
T_3 - Soil Test Basis Fertilizer Dose (STB)
T_4 - 125% of STB
T_5 - 150% of STB

Design : RCBD; Replication: 3
Plot size : 5m × 4m; Number of plots: 30
Method of planting : Soil bed / Poly bag seedling

1.2.4 DATA TO BE RECORDED:

i. Chemical properties of initial and post harvest soils
ii. Tiller counting at 120, 150 and180 days after plantation (DAP)
iii. Total dry matter yield at harvest
iv. Millable cane, cane diameter, cane height, Brix (%), Pol % cane, yield at harvest and BCR

1.2.5 WORK ELEMENTS

Activity No	Name of activities
1	Plot selection
2	Land preparation and initial soil collection and analysis
3	Fertilizing and Planting (sugarcane)
4	Intercultural operations
5	1st and 2nd top dressing of urea and MoP at 120 DAP 150 DAP
6	Tiller count at 90,120, 150 and180 DAP
7	Disease and pest Management
8	Millable cane, cane diameter, cane height, Brix (%),Pol% cane ,yield and at harvest
9	Post harvest soil collection
10	Data analysis (statistical, analytical & economical) and Report writing

1.2.6 TIME SCHEDULE:

Ac. No.	Year	2025				2026											
	Month	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1		→															
2			→	→													
3				→													
4					→	→	→	→	→	→	→	→	→	→			
5										→	→						
6									→	→	→						
7				→	→	→	→	→	→	→	→	→	→	→	→		
8																→	→
9																	→
10									→	→	→	→	→	→	→	→	→

1.2.7 ECONOMIC IMPACT:

This experiment will be helpful in selecting economically suitable fertilizer dose for chewing cane varieties to ensure higher yield and quality. Therefore, chewing cane growing farmers will be economically benefited.

1.2.8 EFFECT ON ENVIRONMENT:

Uses of fertilizers according to recommendation based on the results of local research have no harmful effect on the soil, the crop or the consumer and environment.

1.2.9 UTILIZATION OF RESEARCH RESULTS:

Large scale demonstration, on-farm trial and training of farmers will be required to demonstrate the economic doses of fertilizers to boost up chewing cane yield and quality, also avoid wasteful usage of commercial fertilizers.

1.3 TITLE : EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, BIOMASS YIELD, QUALITY AND NUTRIENT CONTENT OF STEVIA (*Stevia rebaudiana* Ber.)
LOCATION : BSRI Farm, Ishwardi (AEZ 11), Charghat, Rajshahi (AEZ -10) and Subarnochar, Noakhali (AEZ 18), Barishal (AEZ 13)
INVESTIGATORS : S Islam , R C Kabiraj, M A Haque, K M Alam, M H Rahman and M K Begum
NATURE OF STUDY : Modified
DURATION : 2026-2028
ESTIMATED COST(Tk): 2,00,000.00

1.3.1 DEFINITION OF THE PROBLEM:

Stevia (*Stevia rebaudiana* Bertoni) is an herbaceous perennial plant of the *Asteraceae* family. Its leaves consist of two important secondary metabolites (steviol glycoside) namely stevioside and rebaudioside A and C which make it 30 times sweeter than cane sugar surprisingly without any calorie (A.K. Baghat *et al.*, 2022). Fertilizer requirement for stevia is moderate and varies according to the environment and soil type. Due to the short time of stevia introduction as a new crop in Bangladesh, there is no information available on nutrient requirement. Though the production can be increased by supplying the nutrient through chemical fertilizers alone but long-term use of chemical fertilizers may result in deterioration of soil health. In this endeavor, a blend of organic and inorganic fertilizers (integrated nutrient management) is important not only for increasing yield but also for sustaining soil health (Larney and Hao 2007, Kumar *et al.*, 2007). The present study was proposed with the objective to study the effect of Integrated Nutrient management on the growth and yield of *Stevia rebaudiana*.

1.3.2 OBJECTIVES:

To find out the optimum nutrient management packages for stevia production in AEZ 11 and AEZ 10

1.3.3 METHODOLOGY:

The experiment will be conducted at four locations of BSRI Farm, Ishwardi (AEZ 11), Charghat, Rajshahi (AEZ 10) and Subarnochar, Noakhali (AEZ 18) and Barishal (AEZ 13) following pot and field experiment. The experiments will be set up with randomized complete block design for field experiment and completely randomized design for pot experiment with three replications under the following treatments.

T_1 - Control (Native soil fertility)
T_2 - Soil Test Based Fertilizer Dose (STB)
T_3 - 75% of STB + FYM @ 3 t ha^{-1}
T_4 - 75% of STB + Vermicompost @ 2 t ha^{-1}
T_5 - 100% of STB + FYM @ 3 t ha^{-1}
T_6 - 100% of STB + Vermicompost @ 2 t ha^{-1}
T_7 - 125% of STB + FYM @ 3 t ha^{-1}
T_8 - 125% of STB + Vermicompost @ 2 t ha^{-1}

Design : RCB;
Replication : 3;
Planting material : Stevia seedlings

1.3.4 DATA TO BE COLLECTED:

1. Physical and chemical properties of initial and post-harvest soils
2. Plant height, fresh biomass yield, fresh leave yield, dry leave yield and dry biomass yield,
3. Root length, shoot length of stevia plant.

1.3.5 WORK ELEMENTS:

Activity No.	Name of activity
1.	Layout of the field experiments and initial soil sample collection
2.	Basal fertilizer application and plantation of sett in the field
3.	First top dressing of urea and MoP
4.	Second top dressing of urea and MoP
5.	Leaf tissues to be analyzed for different nutrient elements at harvest
6.	Yield of Stevia
7.	Post-harvest soil sample collection
8.	Soil and plant analyses for different nutrients

1.3.6 TIME SCHEDULE:

AC No.	Year	2025				2026											
	Month	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→														
2						→											
3							→										
4								→									
5									→								
6-7									→								
8											→						

1.3.7 ECONOMIC IMPACT:

It is expected that stevia growers would get higher economic benefit out of the results of this experiment,the total cost of production will be reduced.

1.3.8 EFFECT ON ENVIRONMENT:

This experiment is environmental friendly and there would have no adverse effects on environment.

1.3.9 UTILIZATION OF RESEARCH RESULTS:

The findings of the study will be useful for stevia growers and also be helpful for getting higher economic benefit to the growers.

1.4 TITLE : DETERMINATION OF FERTILIZER RATE FOR LOCAL AND IMPROVED DATE PALM
LOCATION : BSRI farm (AEZ 11)
INVESTIGATORS : K M Alam, M A Haque, M H Rahman, S Islam and M S Arefin
NATURE OF STUDY : New
DURATION : 2025-2030
ESTIMATED COST(Tk): 1,50,000.00

1.4.1 DEFINITION OF THE PROBLEM:

Wild date palm (*Phoenix sylvestris* Roxb) locally familiar with the name Khejur or sugar date palm. Sugar palm mainly serves the purpose of sap and jaggery production (*Jain et al.*, 2018) and as well as provide fruits. Arabian date palm (*Phoenix dactylifera* L.) is one of the fruit crops that can grow in such soils due to its capability to tolerate drought and stress. This tree is popularizing day by day in Bangladesh. Fertilizer has a pivotal role in crop yield and quality improvement (Serri *et al.*, 2021). Nitrogen fertilizer improves the plant pigments and florescence of chlorophyll (Abou El-Enin *et el.*, 2023). Chlorophyll content of plant tissue enhances photosynthesis, produces enormous carbohydrate and increases cell juice of a plant. Phosphorus fertilizer considers as root and flower developer and potassium acts as a quality enhancer of date palm. NPK fertilizer influences date palm growth and productivity (El-merghany *et al.*, 2016). Date palms are perennial plants with a distinct trunk and live for many decades. Fertilizer rates for date palms are determined by considering several factors, including the palm's age, soil type, and the specific nutrient requirements of the palm. People of Bangladesh are less concern to apply fertilizer and do not adopt management practices to achieve higher yields of date palm. Besides, there is no systematic research on date palm fertilization for the widespread cultivation of date palm in our country. Considering the above facts, the study was undertaken to determine fertilizer rate of date palm plants for their fruit and quality juice production.

1.4.2 OBJECTIVES:

i) Finding out optimum and economic rates of fertilizers for date palm and
ii) Quantifying the fruit of juice production for applying different doses of fertilizers

1.4.3 METHODOLOGY:

The experiment will be conducted at BSRI farm (AEZ 11). The experiments will be conducted following Randomized Complete Design with three replications.

Treatments:

(For Wild date palm: age > 20 years)

T_1 = Control
$T_2 = N_{400}\ P_{100}\ K_{300}\ S_{80}\ Mg_{35}\ Zn_{50}\ B_{30}$ g plant^{-1}
$T_3 = N_{700}\ P_{200}\ K_{550}\ S_{120}\ Mg_{45}\ Zn_{75}\ B_{40}$ g plant^{-1}
$T_4 = N_{1000}\ P_{300}\ K_{800}\ S_{160}\ Mg_{55}\ Zn_{100}\ B_{50}$ g plant^{-1}

(For Arabian date palm: age > 8-10 years)

T_1 = Control
$T_2 = N_{300}\ P_{80}\ K_{300}\ S_{80}\ Mg_{30}\ Zn_{25}\ B_{20}$ g plant^{-1}
$T_3 = N_{400}\ P_{100}\ K_{400}\ S_{90}\ Mg_{40}\ Zn_{30}\ B_{25}$ g plant^{-1}
$T_4 = N_{500}\ P_{120}\ K_{700}\ S_{100}\ Mg_{50}\ Zn_{35}\ B_{30}$ g plant^{-1}

Seasonal fertilizer requirement:

For wild date palm:

Fertilizer should be applied to palm from September-October (for post-harvest recovery); March-April (for spring preparation: emerge from winter dormancy and begin active growth).

For Arabian date palm:

Fertilizer should be applied to palm from September-October (for post-harvest recovery); March-April (for spring preparation: emerge from winter dormancy and begin active growth); April-May (for pre-flowering nutrition) and June-August (for fruit development support).

Each palm tree should be applied 25 kg of cow dung.

Design: CRD; Replication: 4; Total number of selected plants: 16, Gross area: 0.33 acre; Species: *Phoenix Sylvestris* (wild date palm) and *Phoenix dactylifera* L (Arabian date palm).

1.4.4 DATA TO BE COLLECTED:

1. Chemical properties of initial and post-harvest soils
2. Number of incisions per palm
3. No. of leaves per palm
4. Yield of sap per palm
5. Brix of sap
6. Yield of sap per fruits
7. Leaf tissue analysis for different nutrient elements before and after fertilizer application
8. Number of bunches per palm
9. Number of fruits per bunch

1.4.5 WORK ELEMENT:

Activity No.	Name of activity
1	Initial soil sample collection
2	Layout of the field
3	Fertilizer application in September/October, March/April, April-May and June-August
4	Yield of sap/juice per plant
5	Leaf sample collection and leaf tissue analyses
6	Yield of sap after each incisions
7	Harvesting of date palm fruits Augaust-October
8	Post harvest soil collection

1.4.6 TIME SCHEDULE:

Act. No.	Year	2025					2026											
	Month	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→															
2			→															
3			→						→	→		→						
4							→										→	
5			→												→			
6							→										→	
7														→				
8									→									

1.4.7 ECONOMIC IMPACT:

Recommended fertilizers application for date palm will reduce cost of production as well as ensure higher sap, *gur* and fruit yield. Therefore, date palm growing farmers will be economically benefited.

1.4.8 EFFECT ON ENVIRONMENT:

The uses of recommended balanced dose of fertilizers have no harmful effect on the soil, the plant and the consumer.

1.4.9 UTILIZATION OF RESEARCH RESULTS:

The findings of the study will be useful to the wild date palm grower, owner and extension workers to improve productivity and ensure good quality of wild date palm products.

2.0 TITLE : EFFECT OF PRESSMUD ON THE YIELD AND QUALITY OF SUGARCANE AND SOIL FERTILITY

LOCATION : BSRI Farm, Ishwardi (AEZ 11) and Thakurgaon (AEZ 1)

INVESTIGATORS : M H Rahman, S Islam , K M Alam, M A Haque and M S Hossain

NATURE OF STUDY : New

DURATION : 2025-2028

ESTIMATED COST(Tk): 1,50,000.00

2.1 DEFINITION OF THE PROBLEM:

Pressmud is renowned organic manure, uses in sugarcane production. Sugarcane pressmud compost as organic material acts as a slow-release fertilizer; it has an effect long enough to support plant growth. This organic waste has a high nutrient and carbon content so that it has the potential to increase soil humus. According to Kumar *et al.* (2017), sugarcane pressmud, a form of bioproduct, has great potential to be used as an organic fertilizer, improving soil health and sustainable agronomic productivity. The composition of the nutrient content in this material varies from one sugar factory to another. The difference in nutrient content is influenced by the sugarcane variety and the soil type. According to Supari *et al.* (2015), sugar cane factory waste in the form of bagasse contains a complete element as an organic fertilizer. The experimental results of Halifah *et al.* (2014) proved that giving composted sugarcane bagasse can increase the weight of plant biomass. Sugarcane press mud or sugarcane filter-cake is waste from the sugar industry (Diaz, 2016). This material is in the form of a blackish-brown solid with a high enough fiber content. This material can be used as a source of organic matter to increase the productivity of soils. This study is aimed to examine the potential of sugarcane pressmud compost as organic compost to increase cane yield, quality and soil fertility.

2.2 OBJECTIVES:

i) To determine the optimum dose of pressmud for sugarcane cultivation and
ii) To evaluate the effects of pressmud on soil fertility status.

2.3 METHODOLOGY:

The experiment will be conducted at BSRI Farm, Ishwardi (AEZ 11) and RSRS Thakurgaon (AEZ -1). The design of the experiment will be randomized complete block design (RCBD) with three replications.

Treatments:

T_0 - Control (No fertilizer and manure)
T_1 - Recommended Fertilizer Dose for Sugarcane (FRG, 2024)
T_2 - 75 % of T_1+ 2.5 t ha^{-1} pressmud
T_3 - 75 % of T_1 +5 t ha^{-1} pressmud
T_4 - 75 % of T_1 + 7.5 t ha^{-1} pressmud
T_5 - T_1+ 2.5 t ha^{-1} pressmud
T_6 - T_1 +5 t ha^{-1} pressmud
T_7 - T_1 + 7.5 t ha^{-1} pressmud

RFD- Recommended fertilizer Dose'2024

Plot size : 8m × 6m;
Gross Area : 0.31 acre
Variety : BSRI Akh 48;
Planting material : Soil bed seedling
RFD (kg ha-1) for AEZ-1 : $N_{180}+P_{44} + K_{180} + S_{30} + Zn_5 + B_3$
AEZ-11 : $N_{183} + P_{69} + K_{122} + S_{26} + Zn_3 + B_{2.5}$

2.4 DATA TO BE COLLECTED:

1. Physio-chemical properties of initial and post-harvest soil (Soil texture, O C, pH, N ,P, K and S)
2. Tiller population dynamics across the growing period
3. Determination of N, P, K and S content of cane leaves at 120 days after transplanting (DAT), 240 DAT and 360 DAT
4. Leaf area index (LAI) and Total dry matter (TDM) production at 120, 240 and 360 DAT
5. Millable cane stalks, cane height, cane girth, yield and sucrose content of sugarcane.

2.5 WORK ELEMENTS:

Ac. No.	Name of Activity
1	Raising of settling
2	Lay out of the field and initial soil sample collection
3	Basal fertilizer application and transplanting of settling in the field
4	First top dressing of urea and MP between 120 and 150 days after transplanting (DAT)
5	Tiller count at 120, 150 and 180 DAT
6	Leaf sample collection at 120 and 300 DAT for analyzing nutrients
7	Second top dressing of rest of the urea and MP one month after application
8	Cane height (m), cane diameter (cm), no. of internodes $plant^{-1}$, no. of millable cane ('000' ha^{-1}), yield of leaves (tha^{-1}), yield of cane (tha^{-1}), and brix (%)
9	Post harvest soil sample collection

2.6 TIME SCHEDULE:

Ac. No.	Months																			
	2025						2026												2027	
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
1				→	→															
2					→	→														
3					→	→	→													
4									→	→										
5									→	→	→	→								
6									→	→				→	→					
7									→	→	→									
8																→	→			
9																		→	→	

2.7 ECONOMIC IMPACT:

Use of Pressmud for sugarcane in the soils will increase organic matter, water holding capacity, availability of P, K, Ca and Mg status which ensure the optimum use of fertilizers for better quality and yield of sugarcane and higher economic return to the farmers.

2.8 EFFECT ON ENVIRONMENT:

Application of pressmud in sugarcane might encourage microbial growth in soil and the process of biological nitrogen fixation.

2.9 UTILIZATION OF RESEARCH RESULTS:

Results of this experiment will be useful in determining the efficacy of pressmud on the improvement of soil as well as sugarcane yield and quality. The benefit of this research result will largely depend on successful demonstration in farmers' field and sugar mills farm through field day, training of farmers as well as extension workers

3.0 TITLE : AMELIORATION OF ACID SOIL THROUGH DOLOMITE APPLICATION AND ITS EFFECTS ON NUTRIENT AVAILABILITY, GROWTH AND YIELD OF SUGARCANE
LOCATION : Ranisankail, Thakurgaon (AEZ -1) and Nawabganj, Dinajpur (AEZ -1)
INVESTIGATORS : S Islam , K M Alam, M A Haque, M H Rahman and M S Hossain
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk): 1,00,000.00

3.1 DEFINITION OF THE PROBLEM:

Acidic soils are characterized by nutrient deficiencies-particularly of N, P, K, Ca, Mg and the presence of harmful ions such as H^+, Al, and Mn. These conditions negatively affect biological nitrogen fixation and increase the risk of soil erosion and compaction. (Fageria & Nascente 2014). Among soil amelioration strategies, liming is recognized as an effective and extensively researched method for alleviating acidity related constraints and improving agricultural output (Fageria & Baligar 2008). Amelioration of acid soil by different liming materials can raise soil pH, benefiting soil properties and plant (Adams, 1984; Edmeades and Ridley, 2003; Conyers, 2006). There are plenty of liming materials that can be used to neutralize soil acidity, but majority of them comes from ground limestone such as calcite and dolomite. Application of dolomite increase soil P^H, as a result P and Mo become more available. It also improves symbiotic N_2 fixation in association with bacteria and Nitrogen uptake efficiency in acidic soil s (Fageria and Baligar, 2005a; Fageria and Bali gar, 2008; Fageria, 2009). Liming induces mineralization of organic matter that enhances the availability of Phosphorous (Lathwell, 1979). Phosphorus (P), next to nitrogen, is often the most limiting nutrient for crop and forage production. The primary role of phosphorus in a plant is to store and transfer energy produced by photosynthesis for use in growth and reproductive processes. Adequate P levels promote root growth and winter hardiness, stimulate tillering, and hasten maturity. Low soil pH severely limits P availability to plants, which may cause deficiency symptoms even where high soil test P levels exist. Only about 20 percent of fertilizer phosphorus is taken up by a crop in the year of application. The remainder is fixed in the soil. Acidic soil also reduces root growth, which is critical to P uptake. In Bangladesh more than 3.9 million ha land are very strongly to strongly acidic that cover 45.67 % of arable land. Similarly; above 2.1 million ha land is slightly acidic which belongs to 25.42% of cultivable land (SRDI, 2020). That is the major concern to grow sugarcane in this large acid soil area. The present study has been taken to investigate the effect of liming on nutrients availability of soil as well as on yield of sugarcane.

3.2 OBJECTIVES:

i) To evaluate the effect of liming on nutrients availability in acidic soil and
ii) To evaluate the effect of liming on growth and yield of sugarcane in acidic soil.

3.3 METHODOLOGY:

The experiment will be conducted at extremely acidic upazila Ranisankail, Thakurgaon under Old Himalayan Piedmont Plain (AEZ 1) and Nawabganj upazila, Dinajpur (AEZ-1). The design of the experiment will be randomized complete block design (RCBD) with three replications.

Treatments:

T_1 - Control (No fertilizer)
T_2 - RFD (FRG 2024)
T_3 - RFD + Calcium carbonate (0.5 t ha^{-1})
T_4 - RFD + Calcium carbonate (1.0 t ha^{-1})
T_5 - RFD + Calcium carbonate (1.5 t ha^{-1})
T_6 - RFD + Calcium carbonate (2.0 t ha^{-1})

RFD- Recommended fertilizer Dose'2024
Plot size : 8m × 6m;
Gross Area : 0.31 acre
Variety : BSRI Akh 45;
Planting material : Soil bed seedling
RFD (kg ha^{-1}) for AEZ-1 : N_{180} P_{44} + K_{180} + S_{30} + Zn_5 + B_3

3.4 DATA TO BE COLLECTED:

1. Initial and post-harvest soil to be analyzed for the nutrient elements
2. Tiller count at 120, 150 and 180 days after transplanting (DAT)
3. Leaves to be analyzed for nutrient elements at 120 and 300 DAT
4. Cane height (m), cane diameter (cm), no. of internodes $plant^{-1}$, no. of millable cane (10^3 ha^{-1}), yield of leaves (tha^{-1}), yield of cane (tha^{-1}), and brix (%)

3.5 WORK ELEMENTS:

Ac. No.	Name of Activity
1	Raising of settling
2	Lay out of the field and initial soil sample collection
3	Basal fertilizer application and transplanting of settling in the field
4	First top dressing of urea and MP between 120 and 150 days after transplanting (DAT)
5	Tiller count at 120, 150 and 180 DAT
6	Leaf sample collection at 120 and 300 DAT for analyzing nutrients
7	Second top dressing of rest of the urea and MP one month after application
8	Cane height (m), cane diameter (cm), no. of internodes $plant^{-1}$, no. of millable cane ('000' ha^{-1}), yield of leaves (tha^{-1}), yield of cane (tha^{-1}), and brix (%)
9	Post harvest soil sample collection

3.6 TIME SCHEDULE:

Ac. No.	Months																				
	2025						2026												2027		
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
1			→	→																	
2				→	→																
3				→	→																
4								→													
5								→	→	→	→										
6								→						→	→						
7								→	→	→											
8															→	→					
9																	→	→	→		

3.7 ECONOMIC IMPACT:

Use of dolomite for sugarcane in the acid soils will increase availability of P, Ca and Mg status which ensure the optimum use of fertilizers for better quality and yield of sugarcane and higher economic return to the farmers.

3.8 EFFECT ON ENVIRONMENT:

Application of dolomite in sugarcane might encourage microbial growth in soil and the process of biological nitrogen fixation. Besides, this could increase the availability of some macronutrients in soil and plant. Thus, they could check environmental pollution by curtailing the higher rates of fertilization in sugarcane.

3.9 UTILIZATION OF RESEARCH RESULTS:

Results of this study would be useful in determining the proper nutrient management strategy due to use of dolomite in sugarcane cultivation in acid soils of Bangladesh. The findings can lead to necessary correction of the present fertilizer recommendation for optimum productivity of sugarcane in acid soil. The benefit of this research can be greatly promoted among sugarcane growers through demonstration in farmers' fields.

Soil Physics

4.0 TITLE : INFLUENCE OF MINIMUM TILLAGE AND ORGANIC AMENDMENT ON SUGARCANE YIELD AND SOIL PROPERTIES

LOCATION : BSRI Farm (AEZ 11)

INVESTIGATORS : K M Alam, S Islam, M A Haque, M H Rahman, T A Apon and M S Tabriz

NATURE OF STUDY : New

DURATION : 2025-2030

ESTIMATED COST(Tk): 1,00,000.00

4.1 DEFINITION OF THE PROBLEM:

In recent years, inappropriate agricultural practices, such as intensive and conventional tillage systems that leave soil surfaces bare are main driving forces for agricultural soil degradation (Blanco-Moure *et al.*, 2012). Conservation tillage practices such as no-tillage and straw mulching have been paid more and more attention. It has been observed that subsoiling tillage treatment can effectively break the plow pan of cultivated land soil, improve soil structure and increase soil porosity and water retention capacity (Laura *et al.* 2019 and Sun *et al.* 2017). The effect of no-till treatment on soil bulk density is not as obvious as that of ST. Advantages of stubble mulching no-till are related to SOM, the activity of microorganisms, the number of aggregates and the stability of soil structure, which can create stable cultivation layer that will be conducive to the growth of crops (Steele *et al.* 2012; Huang *et al.* 2015; Martínez *et al.* 2016 and Suzuki *et al.* 2013). Nowadays, it is well known that the application to the soil of organic amendments derived from urban, agricultural, industrial, or municipal activity has several agronomic and environmental effects. This addition can be a good strategy to maintain or even increase the levels of organic carbon in the soil; to improve physical properties such as stability of aggregates and soil porosity (Annabi *et al.* 2011; Grosbellet *et al.* 2011 and Schjønning *et al.* 2016); to incorporate nutrients such as N, P, and K, thus avoiding the high fossil energy costs and therefore the impact on global warming due to the production and the use of synthetic fertilizers; and to help cushion climate change through the sequestration of atmospheric CO_2 by the organic compounds of the soil. Considering the physical properties and the soil organic carbon (SOC), organic matter amendments can increase water holding capacity, soil porosity, water infiltration, and percolation while decreasing soil crusting and bulk density. One of the main measurable effects of the repeated application in the soil of organic wastes is the increase of soil porosity and, therefore, the decrease in the bulk density of the soil. Hence this study was undertaken to determine the influence of minimum tillage and organic amendments on sugarcane yield and soil physical properties.

4.2 OBJECTIVE

1. To study the effect of minimum tillage and organic amendments on sugarcane productivity and
2. To observe the effect of minimum tillage and organic amendments on soil physical properties.

4.3 METHODOLOGY:

The experiment will be conducted at BSRI Farm (AEZ 11). The experiments will be conducted following randomized complete block design with four replications. The following treatments will be considered for the experiment.

Treatments:

Factor A (Tillage)

T_1 = Conventional tillage

T_2 = Zero tillage (No- till)
T_3 = Minimum tillage

Factor B (Organic Amendments)
O_1 = Control
O_2 = Green Manuring/Intercrop
O_3 = Residue Mulch
O_4 = Green Manuring/Intercrop + Residue Mulch

Design : RCB;
Replication : 4;
Plot size : 6m x 6m;
No. of lines/plot : 6 (6m long)
Gross area : 0.33 acre;
Planting material : Soil bed settlings
Variety : BSRI Akh 45

4.4 DATA TO BE COLLECTED:

1. Physical (bulk density, particle density, porosity, soil texture, water holding capacity, Infiltration rate) and chemical (pH, SOC, SOM, CEC, NPKS status of soil and plant) properties of initial and post harvest soils
2. Establishment percentage at 30 days after transplanting (DAT)
3. Tiller counting at 120 and150 days after transplanting (DAT)
4. Sheath and leaf blades to be analyzed for different nutrient elements during harvest
5. Millable cane, cane diameter, cane height, yield and Brix at harvest
6. Weather data

4.5 WORK ELEMENT:

Activity No.	Name of activity
1	Layout of the field experiments and initial soil sample collection
2	Basal fertilizer application and plantation of sett in the field
3	First top dressing of urea and MOP at 120 DAP
4	Tiller counting at 120 days after plantation (DAP)
5	Leaf tissues to be analyzed for different nutrient elements at 120 DAP
6	Second top dressing of urea and MOP at 150 DAP
7	Tiller counting at 150 DAP and 180 DAP
8	Leaf tissues to be analyzed for different nutrient elements at 300 DAP
9	Sucrose content before two days of harvest
10	Millable cane counting at harvest
11	Yield of cane at harvest
12	Post harvest soil sample collection
13	Soil and plant analyses for different nutrients

4.6 TIME SCHEDULE:

AC No.	Year	2025				2026											
	Month	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→														
2			→	→													
3							→										
4,5							→										
6,7								→		→							
8												→	→				
9-12														→			
13			→	→	→	→	→	→	→	→	→	→	→	→	→		

4.7 ECONOMIC IMPACT:

Positive economic impact is expected. Use of minimum tillage and organic source of nutrients in sugarcane production will be profitable due to low cost and it will improve soil fertility and sustain productivity.

4.8 EFFECT ON ENVIRONMENT:

Use of minimum tillage and organic amendments in crop production has no adverse effect on environment. It improves soil physical, chemical and biological properties, enhances carbon sequestration, conserve soil moisture, reduce GHG emission etc. Thus this experiment is environment friendly.

4.9 UTILIZATION OF RESEARCH RESULTS:

The findings of the study will help farmers, researchers and extension personnel to understand the benefit and adoption of low cost minimum tillage organic source of nutrients for sustainable production of sugarcane.

Soil Microbiology

5.0 Title : ISOLATION AND CHARACTERIZATION OF PLANT GROWTH PROMOTING BACTERIA (PGPB) FROM SUGARCANE SOIL AND ITS EFFECTIVENESS STUDY

LOCATION : BSRI Microbiology laboratory.

INVESTIGATORS : K M Alam, S Islam, , M H Rahman and M A Haque

NATURE OF STUDY : New

DURATION : 2025-2027

ESTIMATED COST(Tk): 150,000.00

5.1 DEFINITION OF THE PROBLEM:

Sugarcane (*Saccharum officinarum* L) is important cash cum industrial crop of Bangladesh. This crop depends on soil nutrients, mainly nitrogen (N), and previous studies have shown that the biological nitrogen fixation (BNF) may contribute significantly for the total N required by the crop (Taulé *et al.*, 2012). BNF is carried out by a group of bacteria commonly known as plant growth-promoting bacteria (PGPB), which can be found in several ecosystems, and establish symbiosis or association with plants. These bacteria contribute to plant growth through the N supply, and also by some specific mechanisms, such as the production of hormones, phosphate solubilization, and antagonism to pathogens (Moreira *et al.*, 2010). The mechanisms used by PGPB during the promotion of plant growth are well known, and include plant nutrient-acquisition strategies, such as through BNF and the excretion of hormones that modulate the plant growth (Pandya *et al.*, 2015). There is a high diversity of PGPB associated with the rhizosphere and shoot of sugarcane, and the knowledge of the diversity of PGPB associated with sugarcane is an important step to prospect bacteria responsible for promoting BNF and plant growth, and consequently, improving the crop productivity (Pisa *et al.*, 2011). On the hand, the number of species associated with the rhizosphere of sugarcane and identified as PGPB has increased considerably in recent years due to the development of molecular tools (Chauhan *et al.*, 2015). On the other hand, there is little information about PGPB associated with leaves and stalk of sugarcane in tropical regions. Therefore, this study was carried out to isolate and characterize promising PGPBs with potential as N fixers and growth promoters in sugarcane.

5.2 OBJECTIVES:

i. Isolation of PGPB from rhizosphere, rhizoplane, roots and stem of the sugarcane;
ii. Determination of biochemical and genetic characterization of bacteria and
iii. Investigation of performance of PGPB on sugarcane growth, yield and quality.

5.3 METHODOLOGY

Isolation of bacteria

Approximately 10g of soil sample will be taken into the 250 ml conical flask with 90 ml sterilized water. Several glass bids will be added. Sample will be mixed thoroughly with the water and mixture will be shaked on a shaker. 1 ml suspension will be taken in a vial contained with 9 ml sterile water. For root sample, 1g of healthy roots will be weighed, wash with distilled water to remove adhering soil particles and again wash. Then the roots will be washed 6-7 times with sterile water. The roots will be finely grounded with the pestle and mortar. Serial dilutions of the suspension will be made up and form dilution series of 10-2 to 10-7. Then 0.1 ml of each

suspension will be spread on a solid LB media. Different types of colonies appearing on plates will be picked and streaked on fresh LB agar plates. Then, all the different types of colonies will be spread in nitrogen free (NFb) minimal lacted media. Single colonies will be visible after culturing for 48 h, it will isolate, test for purity and store at -80 ºC.

Morphology of the strains

Bacterial growth from nitrogenase-positive vials, will be streaked on LGIM agar plates and incubate for 72 h. The morphology will be observed. The gram stain reactions will be observed on an optical microscope.

Physiological and biochemical tests

Bacterial motility, oxydase, catalase and utilization of carbon sources will be examined. For the enzymatic activity of the isolates, api ZYM test kit will be used. Phenotypic characterizations of the strains will be performed according to the Bergey's Manual of Determinative Bacteriology.

Acetylene reduction assay and colorimetric estimation of indoleacetic acid production

The nitrogenase activity of the isolates will be carried out by acetylene reduction assay. Indoleacetic acid production will be estimated by Salkowski reagent and following the absorbance at 535 nm after 30 min in the dark.

Isolation of PSB from rhizosphere soils:

Phosphate solubilizing bacteria will be isolated from different rhizosphere soils by serial dilution techniques (Subba Rao, 1999). A series of 10 fold dilutions will be prepared up to 10-8 of rhizosphere and non-rhizosphere soil and the populations will be determined using most-probable member (MPN) method in Pikovskaya's solid medium.

Determinate of phosphate solubilization by PSB on Pikovskaya's solid medium

Phosphate solubilizing efficiency by different PSB isolates will be determined on Pikovskaya's solid medium. About 50 µl of each PSB culture will seperately spotted on Pikovskaya's solid medium. All the plate will be incubate at 30ºC for 7 days. Then the diameter of the bacterial coloies (C) and colony + halozone (Z) will measure in centimeter of each isolate. Phosphare solubilizing index will calculate by deducting colony size from the colony size+ halozone divided by colony diameter and multiplying with 100 which will be shown by the following formula (Edi Premono *et al.* 1997; Kundu *et al.* 2006).

Phosphare solubilizing index (%)= (Z-C)/C×100.

Screening of PSB isolates on P solubiliztion capacity and phosphatase activity on inorganic and organic P compounds in liquid media

To detect the phosphate solubilising bacteria, isolated strains will streak onto Pikovskaya's agar medium, which contains (per liter): 0.5g yeast extract, 10g dextrose, 5g $Ca_3(PO_4)_2$' 0.5g $(NH_4)_2SO_4$, 0.2g KCl, 0.1g $MgSO_4.7H_2O$, 0.0001 g $MnSO_4$. H_2O, 0.0001g $FeSO_4.7H_2O$ and 15g agar. After 3 days of incubation at 28ºC, strains that will produced clear zone around the colonies will consider as positive. Determination of phosphate solubilising activity by the strains will carried out following standard method. Briefly, cells will grown in liquid medium (pH 7.0) at 28ºC up to 10 days and on 1, 3, 5, 7 and 10 day an aliquot of 5 ml will collect and cells will remove by centrifugation at 10,000 rpm for 20 min. Soluble free phosphate in culture supernatant will estimate from the absorbance values obtain using the calibration curve with KH_2PO_4 at 600 nm for each strain. Also, pH variation in Pikovskaya's medium during the growth of each strain will also observe.

DNA extraction

The isolates will be grown in nutrient agar medium at 28ºC for 24 h and centrifuged at 12,300xg. The pellets will be washed with TE buffer and suspend in 10 ml of TE (1×) containing 3 ml of 5% SDS in TE (1×) and 3 ml of proteinase K (2.5 mg/ml). The suspensions will be incubated 37ºC for 1 h. After 1 h, the cleaned lysates will be extracted with phenol: chloroform: isoamyl alcohol (25:24:1). DNA will be precipitated by adding 0.1 volume of 3 M sodium acetate (pH 5.2) and 2.5 volumes of ethanol to the supernatant. The dried pellets will be dissolved in TE (1×) buffer. This work and its following work will be done at Biotechnology Division, BSRI and Centre of Advance Scientific Research, Dhaka University.

PCR amplification and sequencing of 16S rRNA genes

The 16S rRNA genes will be amplified by PCR using universal primers F27 (5 ●-AGAGTTTGATCATGGCTCAG-3●) and R1492 (5●-TACGGTTACC TTGTTACGACTT-3●). The obtained sequences will be compared with the sequences in the database of GenBank (www. ncbi.nlm.nih.gov) using BLAST software.

PCR amplification and sequencing of the *nifH* genes

For the sequences of *nifH*, forward and reverse primers will be used and amplify the PCR product. The purified PCR products will be sequenced. The obtained sequences will be compared with the sequences of database of GenBank (www. ncbi.nlm.nih.gov) using BLAST software.

DNA sequencing and phylogenetic analysis

DNA sequences will be aligned using the multiple alignments CLUSTAL W with 16S rRNA gene sequences of type strains. The evolutionary distance will be determined by construction of a phylogenetic tree using the Maximum Composite Likelihood method in the MEGA 4 program.

Statistical analyses

Basic statistical parameters and analyses of variance (ANOVA) will be performed using statistix 10 software.

Nucleotide sequence accession numbers

The nucleotide sequences determined in this study will be deposited in the GenBank.

Preparation of inoculants:

The bacterial strains will be grown in respective broth culture for two days. Then the broth will be centrifuged at 6000 rpm for 5 minutes. After that supernatant will be discarded and cell pellets will be washed two times with sterile water and will be collected in a 30 ml bottle. This solution will be centrifuged by vortex mixture to homogenize the strains in sterile water. Bacterial concentration will be adjusted using a spectrophotometer at 540 nm and 0.1 ml of suspension containing 108 cells will be inoculated.

Setts soaking with inoculants:

Two eyed sugarcane sets will be soaked in 40 L suspension containing 500 ml bacterial culture for 30 minutes for the bacteria to adhere to the setts.

Fertilizer application:

One third of nitrogen and one half of potassium and total phosphorus, sulphur and zinc will be applied as basal dose and thoroughly mixed with the soil before planting. Remaining potassium and one third nitrogen will be applied as top dressing at tillering stage (120-150 days). The rest amount nitrogen will be top dressed after completion of tillering (about 180 days).

Inoculants application rate:

40 L bacterial suspension will be prepared with 500 ml bacterial culture for inoculating 1 acre land. Inoculants will be applied at the base of seedling at 120 and 180 DAP.

Treatments:

T_1 = control
T_2 = RFD (FRG 2024)
T_3 = RFD (except N) + N_2 fixing bacteria
T_4 = RFD (except P) + P solubilizing bacteria
T_5 = RFD (except N & P) + N_2 fixing bacteria + P solubilizing bacteria
T_6 = RFD + N_2 fixing bacteria + P solubilizing bacteria
T_7 = 75% N & P of RFD and full amount of KSMgZnB + N_2 fixing bacteria + P solubilizing bacteria
T_8 = 50 % N & P of RFD and full amount of KSMgZnB + N_2 fixing bacteria + P solubilizing bacteria

Variety : BSRI Akh 45; Design : RCBD with 3 replication; RFD-2024-N_{183} P_{69} $K1_{22}$ S_{26} Zn_3 $B_{2.5}$ kg ha^{-1}; All fertilized plots will be provided with full amount of P, K, S, Zn & B.

5.4 DATA TO BE RECORDED:

1. Germination percentage
2. Tiller count at 120, 150 and 180 DAT
3. Millable cane and yield of cane at harvest.
4. Leaf chlorophyll content
5. Nitrogen content in leaf
6. Nitrogen fixing capacity nitrogen and phosphate solubiliztion capacity
7. Initial and post harvest soil analysis for N, P, K, S, and Zn
8. Brix, pol and purity at harvest

5.5 WORK ELEMENT:

Activity No.	Name of activity
1	Layout of the field experiments and initial soil sample collection
2	Basal fertilizer application and plantation of sett in the field
3	First top dressing of urea and MOP at 120 DAP
4	Tiller counting at 120 days after plantation (DAP)
5	Second top dressing of urea and MOP at 150 DAP
6	Tiller counting at 150 DAP and 180 DAP
7	Leaf tissues to be analyzed for different nutrient elements at 300 DAP
8	Millable cane counting at harvest Yield Brix, Pol % of cane at harvest
9	Post harvest soil sample collection
10	Soil and plant analyses for different nutrients

5.6 TIME SCHEDULE:

AC No.	Year	2025				2026											
	Month	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→															
2		→	→														
3				→	→	→											
4,5					→	→	→										
6						→	→	→									
7						→	→	→									
8 -10		→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	

5.7 ECONOMIC IMPACT:

Biofertilizers offer positive economic impacts by increasing sugarcane yields, reducing reliance on expensive chemical fertilizers, improving soil health, and lowering farmer costs through decreased purchase and transportation expenses for chemical fertilizers.

5.8 EFFECT ON ENVIRONMENT:

Biofertilizers have overwhelmingly positive environmental effects by enhancing soil health, improving nutrient cycling, reducing the need for chemicals, and decreasing water pollution and greenhouse gas emissions.

5.9 UTILIZATION OF RESEARCH RESULTS:

The findings of the study will be helpful to the farmers, researchers and extension personnel to understand the benefits of biofertilizer for enhancing crop yield, improve nutrient uptake, and reduce reliance on chemical fertilizers.

ON-FARM RESEARCH DIVISION

Rationale

Verification of BSRI bred advanced promising clones and their management at different agro-ecological zones under farmers' field is the prerequisite of the National Seed Board (NSB). The performance of advanced clones compared with the released variety BSRI Akh 46 under farmers' field and On-Farm evaluation of acceptability of newly released varieties and their management technologies will be evaluated. Newly released suitable sugarcane varieties will be identified in charland ecosystem. Suitability of different chewing cane under farmers' fieldin different region of Bangladesh would be investigated. The experiment effect of boron oncracking chewing cane is one of the major concern for reduced market demand and economical loss. So it is very necessary to minimize caracking behavior of chewing cane. On-farm trial of BSRI developed Power Mounted Weeder and trencher is also under taken. Sequential intercrops with different high value pulses and vegetable crops followed by summer mungbean under farmers' condition in different AEZ would also be investigated.

LIST OF EXPERIMENTS

PROGRAMME IN DETAILS

1.0 TITLE : **ON-FARM TRIAL OF PROMISING SUGARCANE CLONES AT FARMERS' FIELD OF DIFFERENT AEZs**

LOCATION : Thakurgaon [AEZ 1], Joypurhat [AEZ 3], Rajshahi (Barind Tract) [AEZ 26] and Jamalpur [AEZ 9]

INVESTIGATORS : M M Hossain, M R Islam, S Rasul and Respective Scientist

NATURE OF STUDY : On-going (Modified)

DURATION : Continuous

ESTIMATED COST(Tk): 1,20,000/-

1.1 DEFINITION OF THE PROBLEM:

Modern varieties of sugarcane are developed through introduction, hybridization and selection programme. During varietal development,clones are developed systematically by following a series of stages where new genotypes are tested for adaptability in different agro-ecological conditions. The performance of advanced clone(s) at farmers' field of different AEZs is the National Seed Board (NSB) prerequisite for releasing new commercial varietie(s). Given the above consideration the experiment has been undertaken to fulfill the following objectives.

1.2 OBJECTIVES:

i. To evaluate the field level performance of advanced clones/lines in different AEZs and
ii. To collect farmers opinion about the advanced clones/lines.

1.3 METHODOLOGY:

The methodologies of the study are stated below-

Treatments: Clones will be provided by Breeding Division

Design	:RCB
Replications	:3
Plot size	:8m x 6m
Total No. of Plots	:12
Method of planting	:STP (Polybag settlings)/Double budded sett
Time of planting	: November to December 2025

Data to be recorded:

a) Sugarcane:

i. No. of tillerin the month of March and May
ii. No. of millable cane in August and at Harvest
iii. Plant height
iv. Girth (mm)
v. Brix%
vi. Yield (tha^{-1})

b) Farmers' opinion

1.4 WORK ELEMENTS:

Activity No.	Name of Activities
i.	Site and Farmer selection
ii.	Land preparation
iii.	Transplanting of cane
iv.	Establishment of settlings record
v.	Intercultural operation
vi.	Fertilizer application(basal and top dressing)
vii.	Pest control
viii.	Tiller count (March and May)
ix.	Millable cane count
x.	Brix % record
xi.	Height, Girth, Harvesting and yield record.

1.5 TIME SCHEDULE:

AC No.	Year	2025					2026											
	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
i.																		
ii.																		
iii.																		
iv.																		
v.																		
vi.																		
vii.																		
viii.																		
ix.																		
x.																		
xi.																		

1.6 ECONOMIC IMPACT: Assume to be highly profitable.

1.7 EFFECT ON ENVIRONMENT: Assume to be friendly to soil andenvironment.

1.8 UTILIZATION OF RESEARCH RESULTS:

The result of the study will fulfill the requirement of NSB for releasing a new variety for commercial cultivation.

Soil Microbiology

2.0 TITLE : PERFORMANCE OF BSRI RELEASED SUGARCANE VARIETIES IN CHAR LAND ECOSYSTEM

LOCATION : Jamalpur, Sirajganj, Gaibandha

INVESTIGATORS : S Rasul, M R Islam, M M Hossain and Respective Station incharge

NATURE OF STUDY : On-going

DURATION : Continuous

ESTIMATED COST(Tk): 1,00,000/-

2.1 DEFINITION OF THE PROBLEM:

The diversified ecosystems of Bangladesh are prone to various environmental hazards. Climate change is an added threat to the Bangladesh's agriculture and vulnerable to ecosystem. Moreover, the cultivable land of Bangladesh is deceasing by 1% every year but the population is increasing at an alarming rate. So, to feed the ever increasing population, crop production measures in unfavourable eco-systems like char land areas under the context of changing climate should be strengthened to ensure food security. Bangladesh has about 0.83 million hectares char land of which about 0.52 - 0.79 million hectares are cultivable.

Based on locations char land are of two types i.e.,island chars and attached chars. Island chars are distributed sporadically in the main channel of the rivers and attached chars which eventually become an integral part of the mainland. 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 farmers in char lands cultivate local varieties of sugarcane. Moreover, they follow their traditional own crop production techniques which are the main causes of low yield in char areas. Scientists of On-farm Research Division, BSRI are engaged in introducing modern varieties of sugarcane along with suitable management practices for improving the livelihood of the poor farmers of char land areas.

2.2 OBJECTIVES:

1. To identify suitable BSRI released varietie(s) for Charlands and
2. To assess the economic profitability of BSRI released varieties in the Charlands.

2.3. METHODOLOGY:

Treatments:

T_0 = Isd 34 (Check)
T_1 = Isd 37
T_2 = BSRI Akh 44
T_3 = BSRI Akh 45
T_4 = BSRI Akh 46

Design : RCB
Replications : 3
Plot size : 8m X 6m
Number of plots : 15
Method of planting : Conventional
Time of planting : November-December, 2025

DATA TO BE RECORDED:

a) Sugarcane:

i. No. of tiller at 120,150, and 180 DAP
ii. No. of millable cane at harvest
iii. Plant height
iv. Girth (mm)
v. Brix%
vi. Yield (tha^{-1})
vii. Cost and Return

b) Farmers' opinion

2.4 WORK ELEMENTS:

Activity No.	Name of Activities
i.	Land & farmer selection
ii.	Land preparation supervision
iii.	Planting (sugarcane)
iv.	Germination count.
v.	Fertilizer application (Top dressing)
vi.	Tiller count (March and May)
vii.	Intercultural operation
viii.	Disease and pests control
ix.	Millable cane count
x.	Height, Girth, Harvesting and yield record.
xi.	Sucrose/Brix %.

2.5 TIME SCHEDULE:

AC No.	Year	2025												2026				
	Month	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
i.																		
ii.																		
iii.																		
iv.																		
v.																		
vi.																		
vii.																		
viii.																		
ix.																		
x.																		
xi.																		

2.6 ECONOMIC IMPACT: Assumed to be highly profitable.

2.7 EFFECT ON ENVIRONMENT: Assumed to be friendly to soil and environment.

2.8 UTILIZATION OF RESEARCH RESULT:

It will help in selecting suitable varietie(s) for cultivate sugarcane in charlands.

3.0 TITLE : ADAPTIVE TRIAL OF CHEWING CANE IN DIFFERENT REGIONS OF BANGLADESH

LOCATION : BSRI Farm, Manikganj, Barura (Comilla)

INVESTIGATORS : M R Islam, S Rasul, M M Hossain and Respective Station In-charge

NATURE OF STUDY : On-going

DURATION : Continuous

ESTIMATED COST(Tk): 1,20,000/-

3.1 JUSTIFICATION:

Chewing cane is very profitable cash crop in Bangladesh. It also uplifts the nutritional status of the rural people. Cultivation of chewing cane can create huge rural employment and poverty reduction for the rural people. BSRI has been working with several chewing cane varieties in recent years which can also be grown round the year. The Institute released BSRI Akh 41 as a chewing cane in 2012 and BSRI Akh 42 in 2014. Generally, marginal cane growers traditionally cultivate chewing cane using local varieties with little or no management practices in some selected areas of the country. Cane yield is also lower in farmers' field. To popularize chewing canes among the farmers, appropriate variety and improved production technology need to be demonstrated for getting higher yield and monitary return. Therefore, the present study will be undertaken to fulfill the following objectives.

3.2 OBJECTIVES:

i. To evaluate the performance of chewing cane in the farmers field and
ii. To select suitable high yielding chewing varieties for higher production and income at farmers level.

3.3 METHODOLOGY:

Treatments:

Sugarcane variety:

T_1 = BSRI Akh 41
T_2 = BSRI Akh 42
T_3 = Black Ruby (Proposed Variety as BSRI Akh 49)
T_4 = Madhumala
T_5 = Q 69
T_6 = Local variety

Design : RCB
Replications : 3
Plot size : 8m X 6m
Number of plots : 18
Method of planting : Conventional
Time of planting : September-October, 2025

Data to be recorded:

a) Sugarcane:

i. Tiller production at 120, 150 and 180 DAP
ii. Number of chewable cane at harvest
iii. Plant height at harvest
iv. Sucrose/Brix % at different DAP
v. Yield (tha^{-1})
vi. Price/stalk
vii. Cost and return analysis

b) Farmers' opinion

3.4 WORK ELEMENTS:

Activity No.	Name of Activities
i.	Land & farmer selection
ii.	Land preparation supervision
iii.	Planting (sugarcane)
iv.	Germination count.
v.	Fertilizer application
vi.	Tiller count (March and May)
vii.	Disease and pests control
viii.	Millable cane count
ix.	Harvesting and yield record.
x.	Sucrose / Brix %.

3.5 TIME SCHEDULE:

AC	Year	2025												2026					
No.	Month	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
i.																			
ii.																			
iii.																			
iv.																			
v.																			
vi.																			
vii.																			
viii.																			
ix.																			
x.																			

3.6 ECONOMIC IMPACT: Assumed to be highly profitable.

3.7 EFFECT ON ENVIRONMENT: Assumed to be friendly to soil and environment.

3.8 UTILIZATION OF RESEARCH RESULT:

The result of the study will encourage the farmers to cultivate highly profitable chewing cane varieties in different regions of Bangladesh.

4.0 TITLE : EFFECT OF BORON ON YIELD, QUALITY AND CRACKING OF CHEWING CANE IN DIFFERENT REGION OF BANGLADESH

LOCATION : Bandarban, Manikganj, Rangpur

INVESTIGATORS : M R Islam, S Rasul, M M Hossain, M A Sayeed & Respective station incharge

NATURE OF STUDY : Ongoing

DURATION : 2025-26

ESTIMATED COST(Tk): 1,12,500/-

4.1 DEFINITION OF THE PROBLEM:

Sugarcane is considered as main sugar crop for sugar production in Bangladesh. Besides sugar production, it is used for chewing purposes. Now a days, sugarcane has gained an important position in Chittagong hill tracts and non mill areas as a chewing cane. There are some chewing canes particularly Rangbilash (BSRI Akh 42) which is gaining popularity among the farmers due to its good yield and high market price. But currently growth cracks are found in BSRI Akh 42 chewing cane which is now a problem for the farmers to get good market price. In general two types of cracks are sometimes found on the surface of the stalk; harmless, small corky cracks, which are restricted to the epidermis, and growth cracks which may be deep and run the whole length of the internodes. Growth cracks are harmful since they allow increased water loss and expose the stalk to disease organisms and insects. Growth cracks are dependent on variety and growing conditions. Some findings reported that sugarcane cracking is reduced or to remove by application of boron in soil (1.5-2 kg B ha^{-1}) or foliar spray at 1-1.5 gl^{-1}. However sugarcane has high requirements for boron (B). Boron is required for all plant growth. Adequate B nutrition is critical for high yields and quality of crops. Boron increases the rate of transport of sugars (which are produced by photosynthesis in mature plant leaves) to actively growing regions.

4.2 OBJECTIVES:

i. To find out the suitable dose of boron to check the growth cracks of sugarcane stem and
ii. To identify the effective application method of boron for chewing cane cultivation.

4.3 METHODOLOGY:

Treatments:

T_1 - RFD as per FRG, 2024 (Boron control)
T_2 - RFD + Boron soil application @ 1.5 kg ha^{-1} from Solubor
T_3 - RFD + Boron soil application @ 2.5 kg ha^{-1} from Solubor
T_4 - RFD + Boron soil application @ 3.5 kg ha^{-1} from Solubor
T_5 - RFD + Boron spray @ 1.5 g/L at four split from Solubor
T_6 - RFD + Boron spray @ 2.5 g/L at four split from Solubor
T_7 - RFD + Boron spray @ 3.5 g/L at four split from Solubor

RFD= Recommended fertilizer dose, FRG= Fertilizer recommendation guide

Methods of boron application:

Soil application : Full dose of Boron will be applied in trench as basal.
Spray application : 1st spray: after stalk formation (120 DAP)
2nd spray: after 20 days of 1st spray
3rd spray: after 20 days of 2nd spray
4th spray: after 20 days of 3rd spray

Design : RCBD with three replications
Plot size : 8 m x 6 m;
Variety : BSRI Akh 42;
Planting material : STP seedling/Double budded sett

4.4 DATA TO BE COLLECTED:

1. Tiller data will be recorded at 120 and 150 DAP
2. Cracking percentage will be recorded
3. No. of millable cane in August and at Harvest

4. Yield of cane
5. Brix%
6. Initial and Post harvest Analysis of Soil

4.5 WORK ELEMENT:

Activity No.	Name of Activity
1	Lay out of the field and initial soil sample collection
2	Basal fertilizer application and plantation of the experiment
3	Percent germination will be recorded at 60 days after planting (DAP)
4	Boron spray at 120 DAP
5	Tiller count at 120 and 150 DAP
6	Top dressing of the rest of N, P and K fertilizer
7	Millable cane, sucrose content and yield of cane at harvest
8	Post harvest soil sample collection and analysis

4.6 TIME SCHEDULE:

Ac.	Year	2025				2026											
No.	Month	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→														
2			→														
3				→													
4							→										
5							→		→								
6							→		→		→						
7														→	→		
8															→		

4.7 ECONOMIC IMPACT:

Farmers of Hill tracts region will be economically benefited by selling good quality of chewing cane in market.

4.8 EFFECT ON ENVIRONMENT:

It will reduce the excessive boron application that is friendly to environment.

4.9 UTILIZATION OF RESEARCH RESULTS:

This study highlights the importance of boron in improving sugarcane yield and quality, offering valuable insights for farmers in Bangladesh. By optimizing boron application, they can enhance plant health, reduce cracking, and boost productivity. The findings also emphasize the need for further research on boron's impact on chewing cane cracking.

Soil Microbiology

5.0 TITLE : ON-FARM TRIAL OF BSRI DEVELOPED BED FORMER CUM TRENCHER, WEEDER AND EARTHING-UP MACHINE

LOCATION : Ishwardi and Pabna

INVESTIGATORS : M M Hossain, R Islam, S Rasul and S S Tabriz

NATURE OF STUDY : New

DURATION : 2025-26

ESTIMATED COST(Tk): 35,000/-

5.1 DEFINITION OF THE PROBLEM:

Weeds are serious problem in sugarcane field. There are many broad, semi-broad and narrow leave weed found in sugarcane field. The loss in cane productivity due to weed infestation was estimated up to 75% (Singh and Moolani, 1975). Hand weeding (manually) is the most common weed control practice in our country

which is expensive, laborious and ineffective in many cases. In modern farm practices of the developed countries, weeder is successfully used for efficient weed control. But in Bangladesh there is no use of weeder in sugarcane field. Adopting appropriate weed control practices can minimize production cost. Therefore, in the present study, an attempt has been initiated to study the feasibility of using weeder for successful cane cultivation in farmers' field.

5.2 OBJECTIVES :

i. To determine the effectiveness of different BSRI developed machineries on sugarcane farming and
ii. Increasing productivity and profitability per unit area from sugarcane field.

5.3 METHODOLOGY :

BSRI developed bed former cum trencher will use for land preparation and that will compare with conventional land preparation method. Weeder and earthing-up machine will use in the same field during respective intercultural operation. Weeding will be done at 45,90 and 120 DAP by using BSRI developed Power Mounted Weeder and that will compare with no weeding, manual weeding and herbicide application. Earthing-up machine will compare with conventional method. A field day arranged at the time of final weeding (120 DAP).

Cane Variety : Isd 39
Gross area : 0.30 ha

Data to be collected:

For sugarcane:

i) Tiller population at 120, 150 and 180 DAT
ii) Millable cane at harvest
iii) Unit stalk weight/height/girth
iv) Cane yield
v) Pol (%) in cane juice at harvest
vi) Crop productivity evaluation

5.4 WORK ELEMENTS:

1. Collection of seed
2. Raising of settling
3. Transplanting, herbicide application and fertilization
4. Establishment of settling count
5. Weeding and mulching
6. Irrigation
7. Fertilizer application (top dressing)
8. Insect and pest control
9. Harvesting of cane
10. Data collection

5.5 TIME SCHEDULE :

Activity No.	MONTHS																	
	2025					2026												
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
1	→																	
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3			→															
4				→														
5					→	→												
6					→	→	→	→	→									
7					→	→	→											
8					→	→	→	→	→									
9											→							
10					→	→	→	→	→	→	→							

5.6 ECONOMIC IMPACT : Positive economic impact is expected.

5.7 EFFECTS ON ENVIRONMENT : Friendly to soil and environment.

5.8 UTILIZATION OF RESEARCH RESULTS:

It will help to minimize the cost of weeding sugarcane production and increase sugarcane yield and economic benefit by efficient weed management.

6.0 TITLE : ENHANCING CROP PRODUCTIVITY THROUGH SEQUENTIAL INTERCROPS PRODUCTION UNDER WIDER ROW SPACING OF SUGARCANE

LOCATION : BSRI Khamar, Chunarughat (Habiganj) and Sirajganj
INVESTIGATORS : M M Hossain, S Rasul, R Islam and respective scientists
NATURE OF STUDY : New
DURATION : 2025-26
ESTIMATED COST(Tk): 120,000/-

6.1 DEFINITION OF THE PROBLEM :

With the increased crop competition the very existence of long duration sugarcane crop is under threat especially for high and medium high fertile land. In order to sustain sugarcane as profitable crop, cultivation of intercrops and Pulses especially high value vegetables and pulses as major sources of protein for the poor peoples in Bangladesh must be practiced and be made an integral part of sugarcane cultivation to add additional and high interim income to the farmer. Yield of intercrops always depends upon appropriate planting time, method, as well as intercropping system. The performance of intercrop packages needs to be verified under farmers' condition at different AEZ focusing on the feasibility of growing Summer Mungbean as a second intercrop with paired row cane.

6.2 OBJECTIVES :

1) To find out the most suitable pulses and vegetables as first inter-crop with sugarcane for obtaining higher sugarcane equivalent yield at farmer's level;
2) To see the feasibility of growing summer mungbeen as 2nd inter-crop with wider row cane and
3) To increase the system productivity of cane based production system by introducing double inter-crops cultivation.

6.3 METHODOLOGY :

Treatments:

T_1 : Wider Row Cane (WRC) + Farmers practice
T_2 : WRC+ Lentil-Summer mungbean
T_3 : WRC+ Chickpea-Summer mungbean
T_4 : WRC+ Potato – summer mungbean
T_5 : WRC+ Cauliflower – summer mungbean
T_6 : WRC + Cabbage – summer mungbean

Design : RCB,
Replication : 3,
Plot size : 6m x 8m
Total plots : 18,
Cane variety : BSRI AKh 41

Variety of inter-crops : Latest developed varieties from BARI and BINA suitable for intercrop with sugarcane
Method of planting cane : Conventional cane in paired row system
Method of sowing inter-crops : Line sowing
Date of planting cane : October to November.
1st Inter-crop sowing : Immediate after transplanting of sugarcane.
2nd Inter-crop sowing : Just after harvesting 1st inter-crops.
Intercultural operation : Fertilizer-
For Sugarcane : Recommended doses for different AEZ.
For intercrops : Recommended doses for different AEZ.
Weeding : As per recommendation

Data to be recorded :

a.) Sugarcane:

(i) Germination percentage

(ii) Plant height (one month interval)
Tiller population at 120, and 180 DAT

(iii) No. of millable cane at harvest

(iv) Yield of cane at harvest

(v) Brix % at harvest

b.) Intercrops:

(i) Yield of 1st inter-crops and 2nd inter-crops (ton/ha)

c.) Farmers attitude/reaction:

Cost and return of sugarcane based production system

6.4 WORK ELEMENT:

Activity No.	Name of Activities
1	Land and Farmer selection
2	Land preparation.
3	Planting of sugarcane
4	Planting of first intercrops
5	Germination count
6	Harvesting first intercrop and planting second intercrops
7	Fertilizer application (Top dressing)
8	Harvesting second intercrops
9	Tiller count
10	Intercultural operations
11	Pest control
12	Millable cane count
13	Harvesting and yield record
14	Sucrose/Brix%

6.5 TIME SCHEDULE:

AC	Year	2025										2026					
No.	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																		
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11																		
12																		
13																		
14																		

6.6 ECONOMIC IMPACT: Highly profitable.

6.7 EFFECT ON ENVIRONMENT: Positive effect on environment.

6.8 UTILIZATION OF RESEARCH RESULTS/EXPECTED OUT PUT :

The results obtain from this experiment may help the sugarcane growers to select suitable pulses and vegetable as intercrop with sugarcane at different agro- ecological zones. It may help to maintain soil health.

AGRICULTURAL ENGINEERING DIVISION

Rationale

Agricultural Engineering Division of BSRI conducts research on (i) Farm Power & Agricultural machinery (ii) Irrigation water management and drainage related to sugar crop cultivation and (iii) Post harvest technology for sugar crop.

The higher production cost of crops can be reduced by means of mechanization. A sugarcane planter is important to increase the efficiency of sugarcane planting and reduce the need for manual labour. It can also help to save water, fertilizer, seed as well as increase yield and profit of sugarcane farming. Besides that bed former cum trencher is an important land preparation implement in sugarcane farming that will not only reduce cost of production but also facilitates intercropping. Popularity of jaggery and jaggery powder is increasing day by day considering it's nutritional value. Sugarcane crusher is the essential machine for jaggery making from sugarcane. So, we need an efficient sugarcane crusher. Pollen dryers are crucial for preserving the quality and extending the shelf life of harvested pollen. Drying prevents spoilage, microbial growth, and fermentation, making the pollen suitable for long-term storage and various applications. So we have to develop a pollen dryer. Conservation agriculture approach may be introduced for sugarcane as natural resource saving cultivation practice. Besides that, IoT-based drip irrigation ensures precise water delivery to sugarcane, reducing wastage and improving yield. It monitors soil moisture and weather in real time for efficient irrigation scheduling. This technology saves water, energy, and fertilizer, promoting sustainable farming. In Bangladesh, it supports higher productivity amid water scarcity and climate challenges.

Among the agricultural machinery already developed at BSRI, Power-tiller operated BSRI Bed former cum trencher is need further test for evaluating performances and/or necessary modification.

On the basis of the problems delineated above 7 research experiments have been proposed for 2025-2026: (i) Development and performance evaluation of a real cut sugarcane planter; (ii) Design and development of tractor operated bed former cum trencher for sugarcane cultivation ; (iii) Modification of Bangladesh Sugarcrop Research Institute developed sugarcane crusher for comfortable cane feeding; (iv) Design and development of a pollen dryer; (v) Conservation agriculture approach for sustainable sugarcane farming in Bangladesh (vi) IoT-Driven Precision Drip Irrigation System at field level for Sustainable Sugarcane Production in Bangladesh and (vii) Field performance test of BSRI developed agricultural engineering technologies.

Successful completion of these experiments will generate appropriate technologies for sugar crops growers that will promote appropriate technological options for sustainable sugar crop cultivation.

LIST OF EXPERIMENTS

Programme area: farm power and machinery

1.0 Title : Development and performance evaluation of a real cut sugarcane planter

2.0 Title : Design and development of tractor operated rider type bed former cum trencher for sugarcane cultivation

3.0 Title : Modification and improvement of BSRI developed sugarcane power crusher

4.0 Title : Design and development of pollen dryer

5.0 Title : Conservation agriculture approach for sustainable sugarcane farming in Bangladesh

Programme area: Smart agriculture and irrigation

6.0 Title : IoT-Driven Precision Drip Irrigation System at field level for Sustainable Sugarcane Production in Bangladesh

Programme area: transfer of technology

7.0 Title : Field performance test of BSRI developed agricultural engineering technologies

PROGRAMME IN DETAILS

1.0 TITLE : **DEVELOPMENT AND PERFORMANCE EVALUATION OF A REAL CUT SUGARCANE PLANTER**
LOCATION : BSRI Workshop
INVESTIGATORS : M A Rahman, S S Tabriz and M S Hossen
NATURE OF STUDY : Ongoing
DURATION : 2025-2027
ESTIMATED COST(Tk): 7,50,000/-

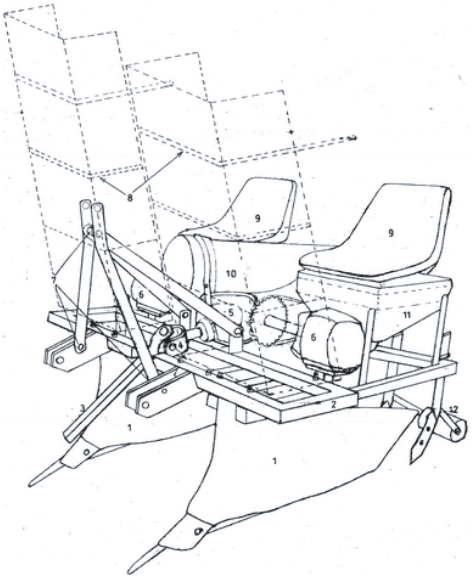
1.1 DEFINITION OF THE PROBLEM:

Sugarcane is an important food-cum-cash crop in Bangladesh. It is cultivated in an area of about 60 thousand hectares in Bangladesh, with an annual production of about 783121 tonnes of sugarcane. Planting of sugarcane is highly labour and time intensive operation. It involves sett cutting for preparing seed material, furrow opening, placing setts in furrows, mixing of fertilizer and application of insecticide and then coverage of setts with soil. These operations are arduous, energy, labour and drudgery intensive. Conventionally, partially opening of furrow using 4WT tractor operated trencher are only mechanized operation and rest of the sugarcane planting operations are done manually. Conventionally, most of the furrow planting method made by manually using spade is practiced in Bangladersh. Furrow method of planting in deep furrows facilitates furrow irrigation which is the most efficient surface irrigation method. Furrow method of sugarcane planting also reduces the lodging of sugarcane due to better and deep root growth. It also helps in better ratooning. In addition to this, the bud damage due to excessive handling of seed cane, desiccation of setts and loss of soil moisture could hardly be checked. Bangladesh Sugarcrop Research Institute, Ishwardi, Pabna (BSRI) have already been developed an individual machines for cutting setts for planting them in the soil. Therefore, in view of the above, it is a need of time to design and develop a new planting machine at BSRI for performing all unit operations involved in sugarcane planting simultaneously in its single pass.

1.2 OBJECTIVES:

i. Designing and development of a sugarcane planter and
ii. To perform low cost and timeliness operation of sugarcane planting.

1.3 METHODOLOGY: Drawing and Design



1 : Furrow opener
2 : Maim frame
3 : Propeller shaft
4 : Universal joint
5 : Gear box
6 : Bevel gear box
7 : 3 point linkage
8 : Seed cane tray
9 : PVC seat
10: Insectiside solution Tank
11: Fertilizer box
12: Soil covering shovel & roller

Fig-1. Drawing of a Real-Cut Sugarcane Planter

1.4 WORK ELEMENT:

1. Drawing of the implement
2. Selection and collection of materials
3. Fabrication of the implement according to drawing
4. Field test
5. Modification and improvement as per requirement

1.5 TIME SCHEDULE:

Sl.	2025					2026											
No	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	This activity has already been done.																
2	→	→															
3		→	→	→													
4				→	→	→	→	→							→	→	→
5						→	→	→								→	→

1.6 ECONOMIC IMPACT: Developed sugarcane planter will reduce cost of plantation.

1.7 EFFECT OF ENVIRONMENT: No adverse impact on environment.

1.8 UTILIZATION OF RESEARCH RESULT:

The program will result in the creation of a functional prototype of a sugarcane planter.

2.0 TITLE : DESIGN AND DEVELOPMENT OF TRACTOR OPERATED BED FORMER CUM TRENCHER FOR SUGARCANE CULTIVATION

LOCATION : BSRI Workshop

INVESTIGATORS : M A Rahman, S S Tabriz and M S Hossen

NATURE OF STUDY : New

DURATION : 2025-2027

ESTIMATED COST(Tk): 2,50,000/-

2.1 DEFINITION OF THE PROBLEM:

A tractor operated bed former cum trencher for sugarcane cultivation including intercropping is a machine to create raised beds and trenches simultaneously. That can facilitate sugarcane planting, inter-cropping and improving water management. This type of machine combines the functions of a bed former, which shapes the soil into raised planting areas, and a trencher, which creates furrows or trenches for sugarcane plantation. The design and development of such a machine can significantly improve the efficiency and effectiveness of sugarcane and intercropping cultivation that increasing land use efficiency and farmer income.

2.2 OBJECTIVES:

i. Designing and development of a tractor operated bed former cum trencher and
ii. To perform low cost and timeliness operation of land preparation for sugarcane and intercropping.

2.3 METHODOLOGY:

The strength, durability workability and economy of any farm machinery or implement depends largely upon selection and quality of material used in its fabrication. In the construction during designing the implement, it will consider to eliminate as many castings as possible and to use pressed, stamped and tabular steel.

This will result in reduction of weight and cost of an implement in addition to retaining the required strength, durability and case in case of repairs.

The selection of the material for development of the implement will on the basis of following factors.

1. Comparatively low cost of material.
2. Easy and locally available material.
3. Appropriateness of material to fulfill the demand.

4. Reliability during operation.

Here's a more detailed look at the design and development process:

1. Design Considerations:

- **Integration of Functions:**

The core challenge is integrating the bed forming and trenching mechanisms into a single, tractor-mounted unit. This requires careful consideration of the spacing, depth, and angle of the beds and trenches to suit local sugarcane cultivation practices.

- **Soil Types and Conditions:**

The design must be adaptable to various soil types (e.g., sandy loam, clay loam) and field conditions, including variations in soil moisture and texture.

- **Tractor Compatibility:**

The machine needs to be designed to be compatible with standard tractors, typically using a three-point linkage system for mounting.

- **Adjustability:**

Adjustable components are essential to accommodate different row spacing, bed widths, and trench depths, depending on the specific sugarcane variety and farming practices.

- **Material Selection:**

Durable and robust materials are crucial for with standing the stresses of field operation. Mild steel is commonly used for the frame and structural components, while hardened steel may be used for cutting edges and other wear parts.

- **Safety Features:**

Safety measures, such as shields and guards, should be incorporated to protect the operator and others from moving parts.

2. Key Components:

- **Frame:**

A sturdy frame, often made of mild steel, provides the structural support for all other components.

- **Bed Former:**

This component typically consists of moldboards or wings that shape the soil into raised beds. Adjustable wings allow for variations in bed width.

- **Trencher:**

This can be a chisel plow, disc coulter, or other cutting mechanism that creates the trenches between the beds.

- **Depth Control Mechanism:**

A system, such as adjustable depth wheels or linkage arms, is used to control the depth of both the beds and the trenches.

- **Toolbar Frame:**

This provides a platform for mounting the chisel ploughs and other components.

3. Development Process:

- **Conceptual Design:**

Based on research and field observations, a conceptual design will be done using computer aided design (CAD)/solid works.

Outlining the overall layout and key features of the machine:

- **Fabrication:**

The machine is fabricated based on the design and drawing, using locally available materials and skilled labor.

- **Field Testing and Evaluation:**

The fabricated machine is field-tested to evaluate its performance in terms of field capacity, fuel consumption, soil disturbance, and other relevant parameters.

- **Performance Analysis:**

The field test data is analyzed to identify areas for improvement and further optimization of the machine's design.

2.4 WORK ELEMENT:

1. Drawing of the implement
2. Selection and collection of materials
3. Fabrication of the implement according to drawing
4. Field test
5. Modification and improvement as per requirement

2.5 TIME SCHEDULE:

Sl.	2025					2026											
No	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	→	→															
2		→	→														
3			→	→	→												
4					→	→	→	→								→	→
5								→	→							→	→

2.6 ECONOMIC IMPACT:

Developed tractor operated bed former cum trencher will reduce land preparation cost for sugarcane and intercrop cultivation. Thus successful implementation of such a machine can lead to significant improvements in sugarcane production and sustainability.

2.7 EFFECT OF ENVIRONMENT: No adverse impact on environment.

2.8 UTILIZATION OF RESEARCH RESULT:

The program will result in the creation of a functional prototype of a tractor operated bed former cum trencher.

3.0 TITLE : MODIFICATION AND IMPROVEMENT OF BSRI DEVELOPED SUGARCANE POWER CRUSHER
LOCATION : BSRI Workshop
INVESTIGATORS : M A Rahman, S S Tabriz and M S Hossen
NATURE OF STUDY : New
DURATION : 2025-2026
ESTIMATED COST(Tk): 2,00,000/-

3.1 DEFINITION OF THE PROBLEM:

The Bangladesh Sugarcrop Research Institute (BSRI) developed a sugarcane crusher. The design incorporates five rollers, with one cutter-roller having chevron-grooved to cut and guide the cane into the pressing rollers, reducing jamming and making the feeding process smoother. During the time of field test in the farmer's field, the reports of crushing and feeding performances was satisfactory but feedback from farmers had that there have some scope of improvement in case of easily feeding with sitting down and easily transportation. Hence, it requires some modifications and improvement for the user-friendliness of the sugarcane crushing specially modifications for easier feeding and transportation.

3.2 OBJECTIVES:

i. To improve the user-friendly operation and transportation of sugarcane crushing machines through some modifications.

3.3 METHODOLOGY:

Position of the rollers will be moved down so that operators can feed cane at sitting condition. Also, the position of the rollers will be rearranged in such a way that the rollers can be easily opened and fitted.

3.4 WORK ELEMENT:

1. Modification and improvement as per requirement
2. Field test at farmers' field

3.5 TIME SCHEDULE:

Sl. No	2025					2026											
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→	→	→	→	→	→										
2				→	→	→	→	→									

3.6 ECONOMIC IMPACT:

A *gur* maker can increase *gur* production around 10% by reducing post harvest process loss during crushing. Thus *gur* maker can be financially benefited. Finally national *gur* production will increase by reducing post harvest process loss during crushing.

3.7 EFFECT OF ENVIRONMENT: No adverse impact on environment.

3.8 UTILIZATION OF RESEARCH RESULT:

The program will results in the creation of a functional prototype of an efficient and operators friendly crusher.

4.0 TITLE : DESIGN AND DEVELOPMENT OF POLLEN DRYER
LOCATION : BSRI Workshop
INVESTIGATORS : S S Tabriz, M A Rahman, M S Hossen and N Sultana
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk): 1,50,000/-

4.1 DEFINITION OF THE PROBLEM:

Bee Pollen is a kind of natural health-care good product, wherein contains various nutrients and the functional component, needed by human, it is called as in the world" complete nutrition product". Bee Pollen is rich in the various active materials such as the multiple nutritional components such as protein, amino acid, carbohydrate, vitamin, lipid and enzyme, coenzyme, hormone, flavones, polypeptide, trace element, improves immunity and physical endurance, prevention and treatment hyperplasia of prostate and beauty treatment, the multiple efficacies such as fat-reducing. Fresh bee pollen typically contains between 20-30% moisture. This high moisture content makes it susceptible to microbial growth. So pollen needs to be dried or moisture needs to be reduced between 2.5% and 6%. Drying should be done carefully, ideally below 40°C (104°F), to preserve nutritional value. Freeze-drying is also an effective method for long-term storage but freezing or thawing can lead to issues like microbial contamination, clumping, and a decrease in certain beneficial compounds. Additionally, long-term frozen storage can impact the pollen's texture and potentially affect its taste. At present commonly used pollen drying methods are Solarization, Cool air drying, microwave drying, vacuum constant temperature drying, vacuum freeze drying etc. Solarization method is popular for pollen drying in Bangladesh, but this method is time consuming, restricted by weather condition, easily pollutes in the dry run, and the pollens nutrition material damage is more, and moisture content is difficult to be down to 5%. Cool air drying is also a time consuming method and difficult to be down to 5% moisture. Normal pressure freeze-day with 80°C temperature depletes the nutriment content of pollen. In microwave drying method changes the pollen color and brightness which deteriorates marketability. Since pollen is a heat sensitive (heat damages the nutrient quality) material, vacuum impulse dryer technology can be used for drying this material. It realizes barometric gradient between Bee Pollen particle surface steam partial pressure and the drying medium steam partial pressure, realize the low temperature rapid drying of Bee Pollen, reduce drying cost, and reduce the loss of functional component in the pollen dry run.

4.2 OBJECTIVES:

1. Drying of various fresh flower honeybee pollen without hampering the nutrient quality and
2. Developing a low cost and time saving pollen preservation technology maintaining color and shine.

4.3 METHODOLOGY:

The dryer will consist of a drying chamber, heater, blower, temperature and humidity sensor, microcontroller based control board etc. It will operated by electric power.

DATA TO BE RECORDED:

i. Capacity of dryer
ii. Drying time
iii. Nutrient status after drying

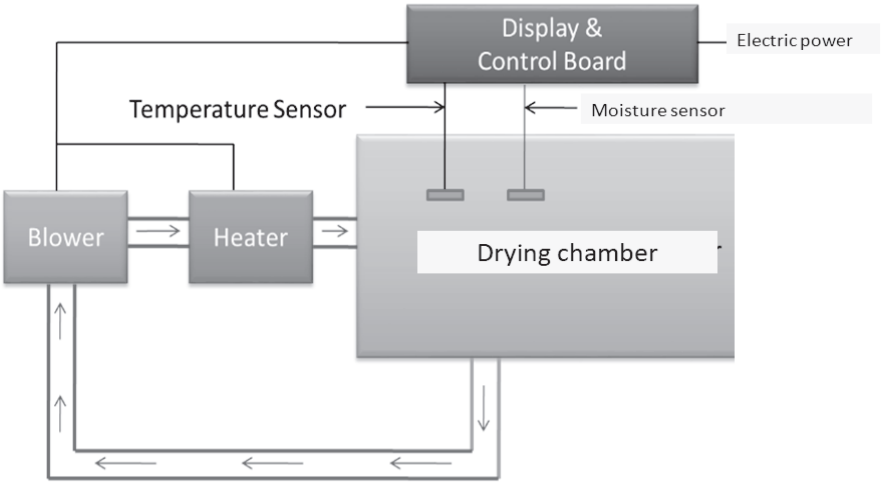


Fig-2. Flow chart of drying system

4.4 WORK ELEMENT:

1. Design of the Dryer
2. Purchasing of materials (SS sheet, heater, blower, microcontroller etc.)
3. Fabrication according to design
4. Tested at the lab
5. Problem Identification and analysis
6. Modification according to problems
7. Again, tested at field
8. Then modification again if needed and finalization

4.5 TIME SCHEDULE:

Sl.	2025					2026											
No	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	→	→															
2		→	→														
3				→	→												
4						→	→										
5						→	→										
6							→	→									
7								→	→								
8								→	→								

4.6 ECONOMIC IMPACT:

Pollen is a costly product and pollen dryer will increase profitable for the bee keeper.

4.7 EFFECT OF ENVIRONMENT: Environment friendly.

4.8 UTILIZATION OF RESEARCH RESULT: Bee keeper will be benefited by pollen collection.

5.0 TITLE : CONSERVATION AGRICULTURE APPROACH FOR SUSTAINABLE SUGARCANE FARMING IN BANGLADESH
LOCATION : BSRI Farm
INVESTIGATORS : S S Tabriz, M A Rahman, M S Hossen, M A Haque and K M Alam
NATURE OF STUDY : On going
DURATION : 2024-2028
ESTIMATED COST(Tk): 15,000/-

5.1 DEFINITION OF THE PROBLEM:

Conservation agriculture (CA) offers a pathway to sustainable sugarcane farming in Bangladesh by promoting resource efficiency, reducing costs, and enhancing environmental sustainability. Key principles include minimum tillage, crop residue management, and diverse cropping systems like intercropping, which can lead to increased yields and reduced negative impacts of monoculture. But concept of CA in sugarcane farming is new for Bangladesh.

5.2 OBJECTIVES:

i. Evaluating of conservation tillage on sugarcane farming and
ii. Finding out effects of residue management.

5.3 METHODOLOGY:

During conducting this experiment we have two types of tillage and two types of residue management combinations in RCBD with four replications for 5 years. First year is for plant-cane and rest are ratoon-cane.

TREATMENTS:

T_1 : Conventional Tillage
T_2 : Conservation Tillage
T_3 : Conventional Tillage + Residue Mulch
T_4 : Strip Tillage + Residue Mulch

DATA TO BE RECORDED:

i. Tillering
ii. Millable cane
iii. yield,
iv. Brix% and
v. Soil nutrient status

5.4 WORK ELEMENT:

1. Site Selection
2. Land Preparation
3. Plantation as per Experimental Design
4. Intercultural Operation
5. Data Collection
6. Soil Sample Collection for Physical and Chemical Analyses
7. Analysis and report writing

5.5 TIME SCHEDULE:

Sl. No	2025					2026											
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	Done																
2	Done																
3	Done																
4	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
5	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
6																	→
7						→											→

5.6 ECONOMIC IMPACT:

Natural resource saving management system will be developed of sugarcane farming.

5.7 EFFECT OF ENVIRONMENT: Environment friendly.

5.8 UTILIZATION OF RESEARCH RESULT:

The program will result a suitable resources saving and CA management system for sugarcane farming in Bangladesh.

6.0 TITLE : IoT-DRIVEN PRECISION DRIP IRRIGATION SYSTEM AT FIELD LEVEL FOR SUSTAINABLE SUGARCANE PRODUCTION IN BANGLADESH
LOCATION : BSRI Farm
INVESTIGATORS : S S Tabriz, M A Rahman and M S Hossen
NATURE OF STUDY : New
DURATION : 2026-2029
ESTIMATED COST(Tk): 2,50,000/-

6.1 DEFINITION OF THE PROBLEM:

Sugarcane is one of the major cash crops in Bangladesh, but its production is often constrained by inefficient water use and the impacts of irregular rainfall patterns. Traditional irrigation methods, such as flood or furrow irrigation, lead to significant water loss through evaporation and deep percolation, increasing production costs and reducing overall water productivity. With the growing challenges of water scarcity and climate variability, there is an urgent need for smarter, more sustainable irrigation solutions.

An IoT-driven precision drip irrigation system offers a practical approach to address these challenges. By integrating sensors, controllers, and automated water delivery mechanisms, such a system can supply the exact amount of water required by the crop at the right time. This not only conserves water but also enhances soil health, nutrient uptake, and crop yield.

Implementing this technology at the field level in Bangladesh will help optimize resource use, lower production costs, and support sustainable sugarcane farming practices. Furthermore, the outcomes of this experiment can serve as a model for introducing IoT-based precision agriculture techniques in other water-intensive crops across the country, contributing to national goals of sustainable agricultural development and food security.

6.2 OBJECTIVES:

i. Developing an IoT-based precision drip irrigation system for sugarcane fields;
ii. Monitoring real-time soil moisture and environmental conditions for efficient water use;
iii. To evaluate system performance in terms of yield and water-use efficiency;
iv. Comparing the IoT-based system with traditional irrigation practices and
v. To promote sustainable and cost-effective sugarcane production in Bangladesh.

6.3 METHODOLOGY:

Site Selection and Preparation: Choose a representative sugarcane field with suitable soil and water access. Prepare the land for installation of the drip irrigation layout.

System Design and Development: Design an IoT-based drip irrigation system including sensors, microcontrollers, solenoid valves, and communication modules. Develop software for real-time data collection and automated irrigation control. Flow diagram of the system is attached below.

Installation and Calibration: Install soil moisture, temperature, and humidity sensors in the field. Set up drip lines, control units, and data transmission systems. Calibrate sensors and test system accuracy before operation.

Data Collection and Monitoring: Record soil moisture, temperature, humidity, and water usage data continuously. Monitor crop growth, yield parameters, and system performance over the growing season.

Comparison with Conventional Irrigation: Establish a control plot with traditional irrigation practices. Compare water use efficiency, crop yield, and cost-benefit between both systems.

Data Analysis and Evaluation: Analyze collected data to evaluate the efficiency and sustainability of the IoT-based system. Assess potential savings in water, energy, and labor.

Reporting and Recommendations: Prepare a comprehensive report summarizing results, findings, and recommendations. Suggest guidelines for scaling up IoT-based precision drip irrigation in sugarcane farming across Bangladesh.

TREATMENTS:

i) No irrigation,
ii) conventional furrow irrigation and
ii) IoT based drip irrigation

DATA TO BE RECORDED: Soil moisture, temperature, humidity, and water use efficiency vs Irrigation use efficiency data continuously. Monitor crop growth, yield parameters, and system performance over the growing season.

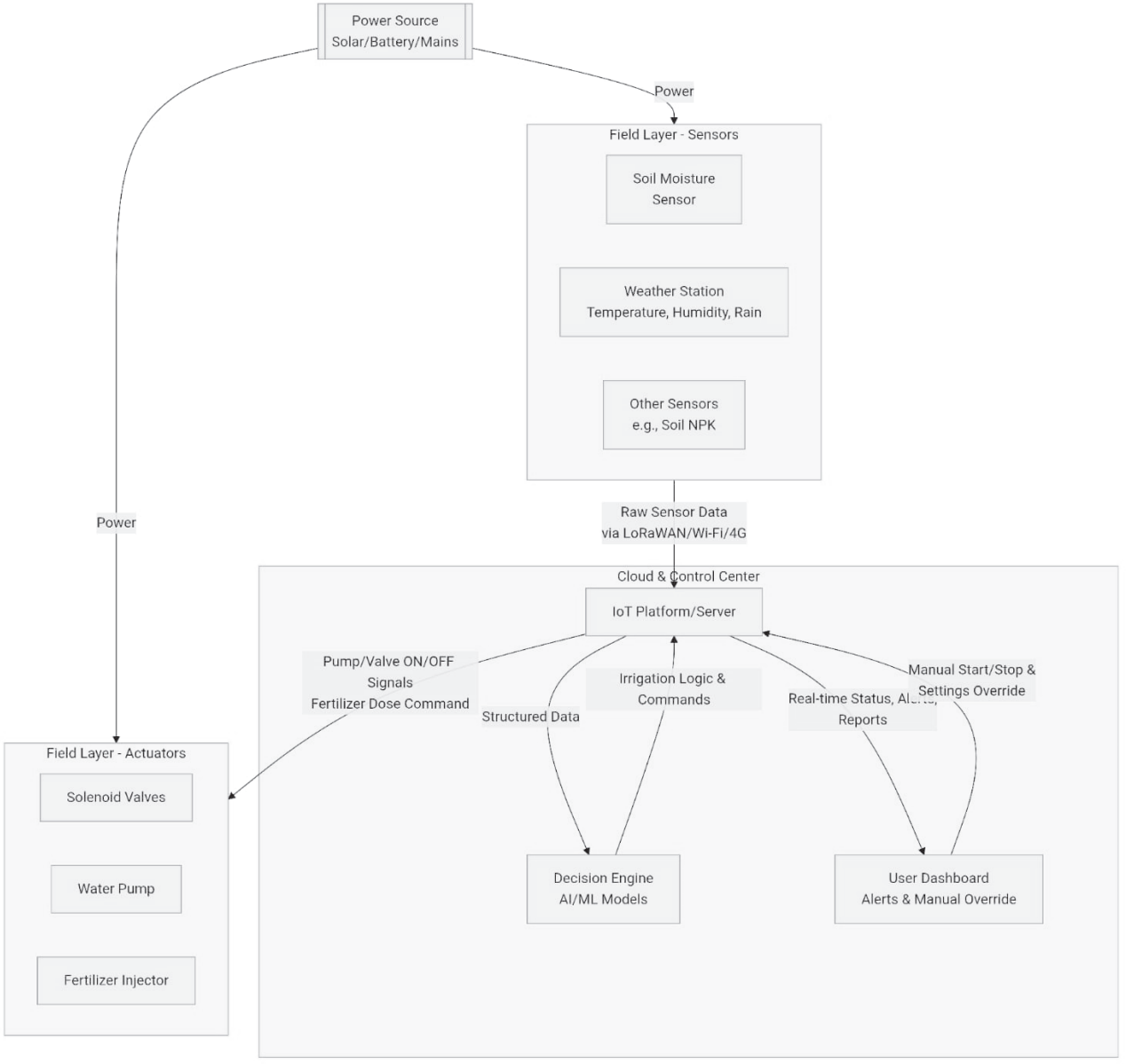


Fig-3. Flow chart of an IoT-based drip irrigation system for sugarcane

6.4 WORK ELEMENT:

i. Site Selection and Preparation
ii. System Design and Development
iii. Installation and Calibration
iv. Data Collection and Monitoring
v. Comparison with Conventional Irrigation
vi. Data Analysis and Evaluation
vii. Reporting and Recommendations

6.5 TIME SCHEDULE:

Sl.	2025					2026											
No	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1				→	→												
2					→	→											
3						→	→										
4						→	→	→	→	→	→	→	→	→	→	→	→
5							→	→	→	→	→	→	→	→	→	→	→
6																→	→
7																→	→

6.6 ECONOMIC IMPACT:

Energy/Electricity cost savings, Lower labour costs, Improved yield/better crop quality, Reduced fertilizer/nutrient waste, Longer ratoon life (more harvests per planting), Faster return on investment.

6.7 EFFECT OF ENVIRONMENT: Environment friendly.

6.8 UTILIZATION OF RESEARCH RESULT:

The research results on IoT-driven precision drip irrigation can help farmers increase sugarcane yield and reduce water use. Policymakers may adopt these findings to support smart agriculture strategies. Technology developers can use the data to improve irrigation tools. The outcomes also support training programs for sustainable farming practices.

7.0 TITLE : FIELD PERFORMANCE TEST OF BSRI DEVELOPED AGRICULTURAL ENGINEERING TECHNOLOGIES
LOCATION : Farmer's field & farm's field (Pabna Sadar & Ishwardi)
INVESTIGATORS : M A Rahman, S S Tabriz and M S Hossen
NATURE OF STUDY : Continuous
DURATION : Not applicable
ESTIMATED COST(Tk): 70,000/-

7.1 DEFINITION OF THE PROBLEM:

Agricultural Engineering Division of Bangladesh Sugarcrop Research Institute, developed machinery and tools, which are working satisfactorily at research field. In spite of their good performance, they are not widely used due to lack of field trial at farmers' field, training and extension works. BSRI developed power-tiller operated bed former cum trencher, earthing up machine and crusher are needed to disseminate the technologies among farmers in the mill zone and non-mill zones. So it will be tested in farmers' field. The feedback from the users will help to improve/modify these machines if needed.

7.2 OBJECTIVES:

i. Performance evaluation of BSRI developed power-tiller operated bed former cum trencher, earthing up machine and crusher for sugar cane among the farmer's;
ii. Improving the workmanship of the machines/tools getting feedback from the demonstration;
iii. Creating interest among the farmers on the use of these machines and
iv. To stimulate local manufacturers for manufacturing these machines.

7.3 METHODOLOGY:

One unit of power-tiller operated bed former cum trencher, earthing up machine and crusher will be demonstrated for land preparation, intercultural operation and post harvest processing at sugarcane farmers' field in mill and non mill zone.

DATA TO BE RECORDED:

i. Field capacity and efficiency
ii. Land preparation cost
iii. Yield
iv. Brix
v. Farmer's opinion.

7.4 WORK ELEMENT:

1. One unit of bed former cum trencher, earthing up machine and crusher will be supplied to sugarcane farmers
2. Land preparation/operation of these machines at field level.
3. Plantation
4. Intercultural operation
5. harvesting
6. Data collection

7.5 TIME SCHEDULE:

Sl.	2025					2026											
No	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→	→													
2			→	→	→	→	→										
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7.6 ECONOMIC IMPACT:

Implementation of BSRI technologies has led to decrease input costs, especially labor cost and improve farm profitability.

7.7 EFFECT OF ENVIRONMENT: Reduce Carbone dioxide emission. Environment friendly.

7.8 UTILIZATION OF RESEARCH RESULT:

The program will result a suitable, user-friendly, durable, effective and profitable machines for sustainable production of sugarcane and reduced post-harvest process loss for sugarcane farming in Bangladesh.

ENTOMOLOGY DIVISION

Rationale

Entomology division of Bangladesh Sugarcrop Research Institute (BSRI) is responsible for crop protection research in related to insect pest management and development works for BSRI mandated crops. About 87 species of insect and mites have been identified in different sugarcrop, of which 70 species in sugarcane, 10 species in sugarbeet, 3 species in date palm, 1 species in nipa palm and 3 species of honeybee. These are grouped into borers, suckers, defoliators and underground pests. The estimated yield loss in sugarcane is about 20% and loss in recovery is about 15% per annum. However, major sugarcane pests are ESB, TSB, RSB, SB, WG, Termite, MB, SI, BLH and PLH. All these are persistent pests and cause considerable damage to the crops and thus of economic importance. TSB and SB are havoc throughout the country. RSB, WG and TM are regional and/or soil textural problem. PLH is a sporadic pest and in some years serious damage is experienced. Black beetle, scale insect, black leaf hopper and woolly aphis infestation are increasing day by day. On the other hand, the black beetle infestation has been increasing. Grasshopper infestation has been observed in Faridpur Sugar Mills Area. Also for last 4 year, leaf eating caterpillar infestation has been observed in BSRI farm and North Bengal Sugar Mills area. Scale insect infestation has been observed in mill and non-mill zones areas of Bangladesh. In sugarbeet yield loss is estimated about 18% by infesting different insect pest. In tropical sugarbeet, caterpillar, cutworm, aphid, red mite etc are major. In recent year, sugarbeet caterpillar and its infestation is markedly observed in sugarbeet growing areas of Bangladesh. In date palm yield loss is estimated about 30% globally. In date palm, red palm weevil is the major. In recent year, red palm weevil and its infestation is markedly observed in different date palm growing areas of Bangladesh. Their management practices have been brought under 5 major groups' viz. resistant variety, cultural, mechanical, biological and chemical control methods. Research plan has been chalked out in accordance with institute's master plan which is again prepared in the light of mandate. Problems have been prioritized and future programme has been designed.

This division has so far developed and recommended some cultural, mechanical and biological tactics for controlling different insect pests of sugarcrops. For their chemical control 329 insecticides of different chemical groups have been recommended and thereby approved by the Government. There are about 50 natural enemies of pests have been identified which are beneficial to the sugarcrop growers and the farmer. About 08 natural enemies of pests have been identified which are beneficial to the sugarbeet and the farmer. The strategy of integrated pest management (IPM) has been patronized where importance of cultural, mechanical and biological control measures has been emphasized and use of insecticides should be considered only when would seem bare necessary and applied as the last resort. But now a days, Bio-rational based management technique is preferred most. Moreover, we conduct several research programmes and have recommended only those insecticides which have to apply in the soil thus advocating least contamination of the microclimate in favour of human health, natural enemies and ultimately to the environment. With the changing situation some chemicals and Bio-rational based management technique have been chosen for foliar and so on application having very short residual effect against target pests.

Research programme for 2025-2026 has been developed to address the very urgent needs of the farmers of those plains, char land, saline belt, coastal and Hill areas. Priority has been given on varietal screening programme to find out resistant/susceptible varieties, which includes promising clones. Resistant/susceptible variety is the cheapest and easiest technology for farmers. To reduce the dependence on chemical insecticides, experiments on cultural practice, mechanical control, use of bio-insecticides, microbial insecticides, biological control, use of sex pheromone and lastly chemical insecticides have undertaken in the research programme. Mass rearing of bio-agents and use of those against sugarcrops insect pests has been included. The programme is in consonance with IPM and Bio-rational based philosophy. New research has been developed to identify bio-pesticides and address date palm and honeybee insect pest management.

LIST OF EXPERIMENTS

PROGRAMME IN DETAILS

PROGRAMME AREA : VARIETAL IMPROVEMENT
1.0 TITLE : SCREENING OF SELECTED SUGARCANE CLONES IN ZYT I, II & III FOR RESISTANCE AGAINST MAJOR INSECT PESTS IN THE FIELD
LOCATION : I. BSRI Farm, Ishwardi and
ii. RSRS, Thakurgaon.
INVESTIGATORS : M N Alam, M E Reza, M N A. Siddiquee, M S Islam and M A Rahman
NATURE OF STUDY : Continuous
DURATION : 2025
ESTIMATED COST(Tk): 100,000.00

1.1 DEFINITION OF THE PROBLEM:

Screening for resistant variety is of great importance. Every year the Breeding division develops some promising clones/strains for release as varieties through National Seed Board (NSB). Pest status of those clones/strains is a requirement of NSB. Besides the screening study it will help to sort/resistant out tolerant varieties to insect pests. Varietal resistance is a component of IPM; thus, the finding will help to grow resistant/tolerant varieties by farmers consequently help in minimum use of chemical insecticides.

1.2 OBJECTIVE(S):

i) Screening advance clones for possible resistance to top shoot borer, early shoot borer, rootstock borer, stem borer, pyrilla leaf hopper, black leaf hopper, scale insect, mealy bug, termites and white grubs
ii) Comparing selected clones with the standard varieties to fulfill the requirement of National Seed Board (NSB).

1.3 METHODOLOGY:

Screening will be carried out for resistance to the above-mentioned insect pests. The experiment will be laid out in RCB design having three replications. The plot size will be 6m x 6m. Plot to plot distance will be maintained 2m and block to block distance will be maintained 2m. The total area will be 0.50 ha and net area will be 0.30 ha. For comparison two varieties (one resistant and one susceptible) will be included in the experiment. Following clones/strains will be considered in the study:

TREATMENTS:

ZTY I: Clones will be collected from Breeding Division
ZYT II: I 5-20, I 8-20, I 23-20, I 27-20, I 31-20, I 39-20, I 100-20, I 118-20, I 122-20, I 1 131-20, I 137-20 and BSRI Akh 46
ZYT III: I 70-19, I 138-19, I 149-19, I 182-19, I 190-19 and BSRI Akh 46

DATA TO BE RECORDED:

Data will be collected on different insect pest infestation like top shoot borer, early shoot borer, rootstock borer, stem borer, pyrilla leaf hopper, black leaf hopper, scale insect, mealy bug, termites and white grubs etc. in three times from beginning.

1.4 WORK ELEMENTS:

1. Collection of advanced clones/strains from Breeding division, BSRI
2. Preparation of seed materials with proper labelling
3. Planting in the field in replicated plots (Nov.25)
4. Fertilization (Feb.-Mar.'26)
5. Weeding (Feb.-Mar.'26)
6. Irrigation (Mar.-Jun'26)
7. Data collection for ESB, TSB, RSB, WG and Termites (Mar.-April.'26)
8. Data collection for TSB, SB and available pests (Jul.-Aug.'26)
9. Data collection on RSB, WG at harvest (Nov.-Dec.'26)
10. Recording temperature, humidity and rainfall data (Nov.25-Dec,26) and
11. Yield record at harvest (Dec.'25-Jan.'27)

1.5 TIME SCHEDULE:

Activity No.	Months														
	2025		2026												2027
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1,2,3	→	→	→												
4,5				→	→										
6					→	→	→	→							
7				→	→										
8					→	→									
9							→	→	→	→	→				
10													→	→	
11	→	→	→	→	→	→	→	→	→	→	→	→	→		
12														→	→

1.6 ECONOMIC IMPACT:

It is a fundamental study to find out the insect pest reaction to a clone/ strain for requirement of National Seed Board (NSB). Use of a resistant variety cost nothing to a farmer in pest management.

1.7 EFFECT ON ENVIRONMENT:

Insect pest resistant varieties have no adverse effect on the environment, rather an environment friendly technology.

1.8 UTILIZATION OF RESEARCH RESULTS:

After the completion of three years experiment, findings regarding the pest reaction to different strains will be compared with the standard variety and the result will be submitted to the Breeding Division for further processing to fulfil the requirement of National Seed Board (NSB). When NSB approves the strains as varieties/clones it will be released for commercial cultivation in different sugar mill areas through multiplication of the strains/varieties at BSRI/Sugar mills. Pest reaction to the particular variety will be provided. Pest resistant varieties, if any, will be recommended to incorporate in IPM programme.

PROGRAMME AREA : PEST MANAGEMENT
2.0 TITLE : FIELD EVALUATION OF *Trichogramma chilonis* FOR THE BIOLOGICAL CONTROL OF SUGARCANE STEM BORER
LOCATION : BSRI, Ishwardi, Pabna
INVESTIGATORS : N Sultana, M N Alam, M E Reza, M N A Siddiquee, M S Islam and M A Rahman
NATURE OF STUDY : Continuous
DURATION : 2015-
ESTIMATED COST(Tk): 1,00,000.00

2.1 DEFINITION OF THE PROBLEM:

Bio-agents are used in Biological control programme of insect pests. Biological control is the integral part in integrated pest management. Sugarcane stem borer is the most destructive pest of sugarcane in Bangladesh. Bio-rational insecticides are not so hazardous to human health and natural enemies. Insecticides application is costly and hazardous to human health. Application of bio-agent like *Trichogramma chilonis* needs thorough study for the control of stem borer. *T. chilonis* is mass cultured on eggs of Rice meal moth, *Corcyra cephalonica* is an alternate host which is again mass reared on grind wheat. Rearing of the parasitoid and its alternate host need much care. For their development temperature and humidity are to be maintained properly which needs 25-30ºC temperature and 75-85% RH. Experiment conducted showed that rearing of *T. chilonis* in the laboratory is feasible and its application in the field was found successful in controlling the target pests. Therefore, the present study will be taken on mass rearing of *T. chilonis* in the BSRI Entomology laboratory to facilitate biological control of sugarcane stem borer.

2.2 OBJECTIVE(S):

i) Production of mass quantity of *Trichogramma chilonis* and ensuring their availability for field release;
ii) Evaluating its field performance of *Trichogramma chilonis* against sugarcane stem borer and
iii) Finding the effective management practice(s) against stem borer.

2.3 METHODOLOGY:

Laboratory Rearing of *Trichogramma chilonis*

In the laboratory rearing of *Trichogramma* and its alternate host *Corcyra* will be carried out. The laboratory will have 2 separate rooms, one for *Trichogramma* and the other for *Corcyra* larvae and *Corcyra* moth. *Corcyra* will be reared on ground wheat in plastic bowl. Eggs of *Corcyra* will be collected for rearing *Trichogramma*. Adults (moths) of rice meal moth will be captured every morning in the emergence room and poured in glass boyams where they mate and lay eggs. These eggs are collected, cleaned, and spread inside the wall of glass Jar that is kept in refrigerator for 2-3 minutes. Eggs of *Corcyra* are attached on the wall of glass jar due to moisture. Newly emerged *Trichogramma chilonis* is to be placed in Jar where they parasitize *Corcyra* eggs. Thus, the process is repeated and continued for generations. The excess eggs of *Corcyra* are used for recycling of it. The eggs are spread on ground wheat contained in plastic bowl. The eggs hatch and larvae feeds on ground wheat, their diet and pupates and finally *Corcyra* moths emerge into the bowl, from where they are collected.

1. Rearing of alternate host *Corcyra* throughout the year
2. Rearing of egg parasitoid *Trichogramma* throughout the year and releasing in sugarcane field from May to October.

Field evaluation of *Trichogramma chilonis* against Sugarcane stem borer:

Stem borer incidence generally starts from May (personal observation) therefore; monthly monitoring on stem borer attack will be done through frequent visit to the field up to harvest of cane. Regular data collection will be done to observe the deployment of the proposed management practices. Management practices and their frequencies will depend on the level of infestation. No control measures will be followed in check plots.

TREATMENTS:

T_0 : Control (untreated)
T_1 : Release of *Trichogramma chilonis* @ 1g ha^{-1}/week from May–Oct.'26
T_2 : Complete package from May–Oct.'26

Design : RCBD
Replication : 3
Plot size : 20mx20m
Total area : 0.14 ha
Net area : 0.12 ha

DATA TO BE RECORDED:

Data will be collected on number of larvae parasitized by *Trichogramma* and infested cane.

2.4 WORK ELEMENTS:

1. Land preparation (Oct.–Nov.'25)
2. Plantation and fertilizer application (Nov.–Dec.'25)
3. Weeding, mulching, Irrigation (Jan.–May'26)
4. Top dressing (Mar.–Jun.'26)
5. Earthing up (Jun.–Jul.'26)
6. Removal of Primary infested cane (May-Jul.'26)
7. Monthly Detrashing (Jul.–Oct.'26)
8. Release of *Trichogramma chilonis* (May–Oct.'26)
9. Insecticide application (Jun.–Aug.'26)
10. Data collection (May–Dec.'26)
11. Harvest (Dec.'26)

2.5 TIME SCHEDULE:

Activity No.	Months														
	2025			2026											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1	→	→													
2		→	→												
3			→	→	→	→	→	→							
4						→	→	→	→						
5								→	→	→					
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8								→	→	→	→	→	→		
9									→	→	→				
10								→	→	→	→	→	→	→	→
11															→

2.6 ECONOMIC IMPACT:

It is a study of mass rearing of *Trichogramma* and alternate hosts *Corcyra* in the laboratory. Chemical-based insecticides are too expensive, so the use of bio agent is considered as a cost-effective insect management practice.

2.7 EFFECT ON ENVIRONMENT:

It is the study of rearing bio-control agents is eco friendly insect management technique, which has no adverse effect on environment or nature. It will reduce the use of chemical insecticide and preserves the other beneficial insect.

2.8 UTILIZATION OF RESEARCH RESULTS:

Integrated pest management, though popular term, but tittle work has been done on it in controlling sugarcane stem borer in Bangladesh. The farmers are very often advised to adopt IPM. Proper experimentation is needed to guide the end users that will actually implement IPM. The present study will give a clear-cut concept about IPM and strengthen skill and knowledge on this strategy and help implement IPM in sugarcane.

PROGRAMME AREA : PEST MANAGEMENT

3.0 TITLE : EVALUATION OF NEW INSECTICIDES FOR THE MANAGEMENT OF MAJOR INSECT PESTS OF SUGARCANE

LOCATION : i) BSRI, Ishwardi, Pabna
ii) RSRS farm and Mohon Farm, Thakurgoan
iii) Bhabanipur Farm, NBSM Ltd, Natore
iv) Farmers plot PBSM, Pabna
V) Akandobaria Farm, Carew & Co. BD Ltd.
vi) Rajshahi

INVESTIGATORS : M A Rahman, M S Islam, M N Alam, N Sultana, M E Reza and M N A Siddiquee

NATURE OF STUDY : Modified

DURATION : 2025

ESTIMATED COST(Tk): 120,000.00

3.1 DEFINITION OF THE PROBLEM:

Top shoot borer, rootstock borer and stem borer are the internal feeders. After hatching from egg the larva immediately enters into the plant. Due to the concealed habit of the pest foliar application of chemicals does not work against the pest. The granular pesticides will be applied in the soil at the root zone may be taken up by the plants and kill the pest. White grubs are serious pests of sugarcane. It may cause 50-100% incidence. However, their attack is more in the Northern and North Western part of Bangladesh. Recently their infestation is in havoc in Rangpur, Joypurhat, Rajshahi, Chuadanga and Rajbari district. Generally, cane damage due to white grubs may be as high as 100%. Most of the insecticides approved against WG are

Carbamate compound. So, alternate insecticides are needed against this pest. Termites are social insects. They live in colony forming termitorium. Cane setts are attacked by pest after plantation through cut ends. Application of chemicals in the trenches as a prophylactic measure will help to control the pest giving ensured germination. Grown up canes/ standing canes are also attacked for which chemicals should be applied at the base of the plants in later months. For the purpose several experiments, for controlling of several pests likes TSB, WG and Termites have been planned under this experiment.

3.2 OBJECTIVE(S):

i. Comparing the effectiveness of new insecticides;
ii. Documenting intensity of insect pests infestation against different insecticides;
iii. Finding suitable and effective insecticides and
iv. Measuring more chemical control measure for the farmers.

3.3 METHODOLOGY:

The proposed insecticides are of granular and EC formulation. The granular will be applied at the root zone in the trenches on both side of cane rows while EC formulation will be applied in plants by sprayer. The chemicals will be applied in June + July + August for Stem borer and March + May + July application of chemicals for Rootstock borer.

TREATMENTS:

Treatments for Top shoot borer (BSRI farm and RSRS, Thakurgaon):

T_0 : Control (untreated)
T_1 : Durbar 5G (Clothianidin) @ 1.4 kg a.i. ha^{-1} at March + May
T_2 : Team effort 25SC (Clorantraniliprole 12.5%+Indoxacarb 12.5%) @ 80ml ha^{-1} at March + May
T_3 : Cipronil 0.4GR(Clorantraniliprole) @ 100g ha^{-1} at March + May
T_4 : Safenil 0.4GR (Clorantraniliprole) @ 80g ha^{-1} at March + May
T_5 : Constel 52.5 SC (Clorantraniliprole) @ 80g ha^{-1} at March + May
T_6 : Nora 1GR @ (Clorantraniliprole) @ 80 g a.i. ha^{-1} at March + May
T_7 : Shenzi 35WDG (Clorantraniliprole) @ 80 g a.i. ha^{-1} at March + May
T_8 : Tackle 1.6 GR (Clorantraniliprole + Clothianidin) @ 80 g a.i. ha^{-1} at March + May
T_9 : Holesoft 5GR (Clothianidin) @ 1.4 kg a.i. ha^{-1} at March + May
T_{10} : Codin 1.6 GR (Clorantraniliprole + Clothianidin) @ 80 g a.i. ha^{-1} at March + May
T_{11} : Silicon 1% GR (Clorantraniliprole) @ 80 g a.i. ha^{-1} at March + May
T_{12} : Pellet 0.4 GR (Clorantraniliprole) @ 80 g a.i. ha^{-1} at March + May
T_{13} : Fertera 0.4 GR (Clorantraniliprole) @ 80 g a.i. ha^{-1} at March + May (Std)

Design : RCBD
Replication : 3
Plot Size : 6m x 6m
Total area : 0.16 ha
Net area : 0.09 ha

Treatments for Stem borer:

T_0 : Control (untreated)
T_1 : Nigel 4GR (Chlorantraniliprole) @ 100g a.i ha^{-1} at June + July + August
T_2 : D-fire 0.4 GR (Chlorantraniliprole) @ 100g a.i ha^{-1} at June + July + August
T_3 : Fair-Dhan 5GR (Clothianidin) @ 1.4 kg a.i ha^{-1} at June + July + August
T_4 : Agridin 5GR (Clothianidin) @ 1.4kg a.i ha^{-1} at June + July + August
T_5 : Farmpole 40 WG (Chlorantraniliprole 20%+Thiamethoxam 20%) @ 120g a.i ha^{-1}
T_6 : King 2.5 EC WDG(Lamda-cyhalathrin)@ 1 ml per litre of water a.i ha^{-1} at June+ July + August
T_7 : Barud 5 GR (Clothianidin) @ 1.4 kg a.i ha^{-1} at June+July+August
T_8 : Guru 2.5 EC @1 ml LW a.i ha^{-1} at June+ July + August
T_9 : Udhan 5GR (Clothianidin) @ 1.4kg a.i ha^{-1} at June + July + August
T_{10} : Farm dhan 5GR (Clothianidin) @ 1.4kg a.i ha^{-1} at June + July + August
T_{11} : K tap 4GR (Cartao hydrocloride) @ 3kg a.i ha^{-1} at June+ July + August
T_{12} : Pellet 0.4 GR (Clorantraniliprole) 100g a.i ha^{-1} at June + July + August
T_{13} : Virtako 40WG (Chlorantraniliprole 20%+Thiamethoxam 20%) @120 g a.i ha^{-1} at June+ July+ August (std)

Design : RCBD,
Replication : 3
Plot Size : 6m x 6m
Total area : 0.14 ha
Net area : 0.08 ha

Treatments for White grubs (RSRS and Mohon Farm Thakurgaon):

T_0 : Control (untreated)
T_1 : Safenil 0.4 GR (Chlorantraniliprole) @ 80g a.i ha^{-1} at March + April
T_2 : Cipronil 0.4 GR (Chlorantraniliprole) @ 80g a.i ha^{-1} at March + April
T_3 : Chomok 5 G (Clothianidin) @ 1.4 kg a.i ha^{-1} at March + April
T_4 : Durbar 5 G (Clothianidin) @ 1.4 kg a.i ha^{-1} at March + April
T_5 : Zia-M 5 GR (Clothianidin) @ 1.4 kg a.i ha^{-1} at March + April
T_6 : D-fire 0.4 GR (Chlorantraniliprole) @ 80g a.i ha^{-1} at March + April
T_7 : Nigel 4 GR (Chlorantraniliprole) @ 80g a.i ha^{-1} at March + April
T_8 : Kalam 50 WDG (Clothianidin) @ 1.4 kg a.i ha^{-1} at March + April
T_9 : Pellet 0.4 GR (Chlorantraniliprole) 100g a.i ha^{-1} at June + July + August
T_{10} : Goolee 3 GR @ 100 g a.i ha^{-1} at March + April

Design : RCBD,
Replication : 3
Plot Size : 6m x 6m
Total area : 0.16 ha
Net area : 0.09 ha

Treatments for Termite (Bhabanipur farm, NBSM and Akandobaria farm, Carew & Co. Bangladesh Ltd.):

T_0 : Control (untreated)
T_1 : D-Fire 0.4GR (Chlorantraniliprole) @ 100g a.i ha^{-1} at Planting
T_2 : Power XL 18.5 SL (Chlorantraniliprole) @ 100g a.i ha^{-1} at Planting
T_3 : Keya Gold 55EC (Chlorpyriphos + Cypermethrin)@ 2.25L a.i ha^{-1} at Planting+ March+May
T_4 : Control 50 WDG (Emmamectin Benzoate+Lufenuron) @ 100g a.i ha^{-1} at Planting
T_5 : Nippy 80 WDG (Nitenpyram+Pymetrozine) @ 240g a.i ha^{-1} at Planting
T_6 : Ustad 10 EC (Cypermethirn) @ 200ml a.i ha^{-1} at Planting
T_7 : Imidacel 20 SL (Imidacloprid) @ 200 ml a.i. ha^{-1} at Planting
T_8 : Premier 200 SL (Imidacloprid) @ 200 ml a.i. ha^{-1} at Planting
T_9 : Bananza 3 GR (Fipronil) @ 50g a.i. ha^{-1} at Planting
T_{10} : Pido 20 SL (Imidacloprid) @ 200 ml a.i. ha^{-1} at Planting
T_{11} : Silicon 1% (Chlorantraniliprole) @ 200g a.i ha^{-1} at Planting
T_{12} : Codin 1.6 GR (Clorantraniliprole + Clothianidin) @ 200g a.i ha^{-1} at Planting
T_{13} : Canon 20 SL (Imidacloprid) @ 200 ml a.i. ha^{-1} at Planting
T_{14} : Tabdo 20 SL (Imidacloprid) @ 200 ml a.i. ha^{-1} at Planting
T_{15} : Regent 3GR (Fipronil) @ 50g a.i. ha^{-1} at Planting (std)

DATA TO BE RECORDED:

Data will be collected on number of infested cane, number of insect population, brix% and yield of cane.

3.4 WORK ELEMENT:

1. Plantation & fertilization (Nov.–Dec.'25)
2. Germination count (Feb.–Mar.'26)
3. Weeding and mulching (Feb.–Apr. '26)
4. Application of insecticides as per schedule (Nov. 25- Aug. 25)
5. Irrigation (two times) (Mar.–May'26)
6. Top dressing (two times) (Mar.–May'26)
7. Data collection (Apr.-Sept.'26)
8. Harvest (Dec.'26)
9. Statistical analysis/interpretation (Jan.'27)

3.5 TIME SCHEDULE:

Activity No.	Months														
	2025		2026												2027
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	→	→													
2,3				→	→	→									
4	→	→	→	→	→	→	→	→	→	→					
5,6					→	→	→								
7						→	→	→	→	→	→				
8														→	
9															→

3.6 ECONOMIC IMPACT:

Using chemical insecticides for pest control offers economic benefits, mainly by increasing crop yields and reducing agricultural losses, which boosts farmers' income and helps stabilize food prices. Additionally, overuse can lead to pest resistance, increasing future costs for pest management. For lasting economic gains, it's essential to balance insecticide use with sustainable pest control practices.

3.7 EFFECT ON ENVIRONMENT:

Insecticides are in general harmful for the environment but they are not equally hazardous. Granular formulation is always better concerning environment. Granular insecticides will be applied in soils. Otova 10 EC and Virtako 40 WG are non systemic and remains active for a month. Both wetable granular and emulcifiable concentrate will be applied in upland soil hence there is little chance to be toxic to the environment. When more insecticides will be available to the end users the price will automatically be come down.

3.8 UTILIZATION OF RESEARCH RESULTS:

The research results will be communicated to the BSFIC, sugarcane farmer and DAE for extension. The growers may be communicated through class room training or by setting large scale demonstration with the chemicals. Finally the farmers will adopt the technology. The result will be published in Annual reports, Journals through which end users will be benefited also.

PROGRAMME AREA : PEST MANAGEMENT
4.0 TITLE : EFFICACY OF DIFFERENT INSECTICIDES AGAINST THE INCIDENCE OF SUGARCANE MEALY BUG
LOCATION : i) BSRI farm, Ishwardi, Pabna ii) FSM, Faridpur and iii) TSM, Thakurgaon
INVESTIGATORS : M N Alam, M E Reza, M N A. Siddiquee, M S Islam, N Sultana and M A Rahman
NATURE OF STUDY : Continuous
DURATION : 2023-2026
ESTIMATED COST(Tk): 60,000.00

4.1 DEFINITION OF THE PROBLEM:

Different insect pest in the world reduces sugarcane production. Among them mealy bug is one of the insect pest which widely spread throughout the world. According to Williams (1970), thirty species of mealybugs are known to attack sugarcane in different regions of the world. And nine species of mealybugs are known to occur in India. In Bangladesh, there are two species of mealybugs are available in sugarcane, *Kiritshenkella sacchari* and *Pseudococcus saccharicola*. It can multiply profusely inflicting loss in tonnage as also as sugar recovery. Nymphs and adults suck the sap from leaves, nodes and internodes of canes. The damage caused by the mealybugs insect occurs partly by sucking the plant sap and so leading to yellowing of leaves, stunting of canes and poor germination. The most serious loss occurs from the industrial point of view, as the residues of wax, honeydew and sooty mold that persist for months (Jayanthi 1986). Due to severe infestation of mealybugs in canes reduced sucrose content by 24.1% and brix by 16.2% (Kalra and Sidhu,1964). Therefore, the study has taken to evaluate the chemical insecticide against mealybug control for increasing the sugarcane yield.

4.2 OBJECTIVE (S):

i) Finding the effective management practices for sugarcane mealy bugs insect and
ii) Estimating the effects of mealy bugs insect on yield of sugarcane.

4.3 METHODOLOGY:

The experiment will be conducted at experimental farm of Faridpur Sugar Mills Ltd. The sugarcane variety Isd 34/Isd 37 will be conventionally planted with two bud setts. The following management practices will be applied as per schedule. Scale insect infestation will be recorded in September and November. Data on brix will be recorded at harvest.

Treatments:

T_0 : Control (untreated)
T_1 : Sett dipping in Chlorantraniliprole 18.5 SC for 30 minutes before plantation
T_2 : Emamectin benzoate (Proclaim 5 SG) @ 1.0 g/ 1 litre of water (July + August + September)
T_3 : Spinosad 45 SC (Tracer) @ 1.0 litre ha^{-1} (July + August + September)
T_4 : Bio-Clean (Potassium salt of fatty acid) @ 1.0 ml/L water (July + August + September)
T_5 : Ultima plus 40WG @ 500g ha^{-1} (July + August + September)
T_6 : Virtako 40WG @ 300.0 g ha^{-1} (July + August + September)
T_7 : Nitro 505 EC @ 3.0 litre ha^{-1} (July + August + September)
T_8 : M-Pede 49SL @ 10ml/L water (July + August + September

Design : RCBD
Replication : 3
Plot Size : 6mx6m
Total area : 0.17 ha
Net area : 0.10 ha

DATA TO BE RECORDED:

Data will be collected on infestation level of mealy bug and brix content of infested cane and healthy cane.

4.4 WORK ELEMENTS:

1. Land selection and preparation (Sept.- Oct'25)
2. Planting of sugarcane (Nov.'25)
3. Irrigation, weeding, mulching and earthing-up (Feb.'25–Jun'26)
4. Fertilizer top dressing (Mar.–May'26)
5. Detrashing (July-Oct.'26)
6. Application of insecticides (July-Sept.'26)
7. Data collection (Dec.'26)
8. Harvest (Jan.'27)
9. Data analysis (Jan.'27)

4.5 TIME SCHEDULE:

Ac. No.	Months																	
	2025				2026												2027	
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
1	→	→																
2		→	→															
3					→	→	→	→	→	→								
4						→	→	→	→									
5											→	→	→	→				
6											→	→	→					
7																→		
8																	→	
9																	→	

4.6 ECONOMIC IMPACT:

By definition IPM is the intelligent selection and use of pest control actions that will fulfil economical, ecological and sociological consequences. Since detrashing, use of insect free setts etc. are cultural control measures and these are not too costly, could be considered as economical in IPM of Scale insect. Unnecessary excess actions/expenses are avoided.

4.7 EFFECT ON ENVIRONMENT:

Ecological consequences are considered in IPM. Actually, the concept of IPM is to manage the pest in favour of environment. Non chemical control measures are encouraged, whereas, chemical control measures are abandoned and only used as the last resort. Detrashing and use of insect free setts will be environmentally friendly practices.

4.8 UTILIZATION OF RESEARCH RESULTS:

The results obtained from this study may be helps the sugarcane growers to manage the Scale insect economically.

5.0 TITLE : EFFICACY OF DIFFERENT INSECTICIDES ON THE INCIDENCE OF SCALE INSECT (*Melanaspis glomerata* Green) AND ITS EFFECT ON YIELD AND QUALITY OF SUGARCANE

LOCATION : i) BSRI, Ishwardi, Pabna
ii) Chuadanga
iii) RSRS, Thakurgaon

INVESTIGATORS : M N Alam, M E Reza, M N A Siddiquee, M S Islam, N Sultana, M O Sheikh and M A Rahman

NATURE OF STUDY : Continuous

DURATION : 2024-2027

ESTIMATED COST(Tk): 60,000.00

5.1 DEFINITION OF THE PROBLEM:

In Bangladesh, the scale insect (*Melanaspis glomerata* Green) is a minor pest of sugarcane but nowadays it is becoming a major pest that affecting both productivity of cane and quality of juice. A wide range of climatic conditions high to moderate temperatures and humidity helps to abundant scale insect in sugarcane. It promotes mainly from July onwards until harvest. In Andhra Pradesh, a study indicated that heavy infestations by *M. glomerata* reduced cane weight, juice brix, sucrose content of the juice and purity by 51.6, 27.7, 39.0 and 13.4%, respectively (Goel *et al.*, 1983). It is also noted that scale infestation reduced cane yield by 32.6% and sugar recovery by 1.5 - 2.5% (DACNET, 2012). After harvesting of the main crop the pest remains in the underground stubble and acts as a primary source of infestation in ratoon crops. During growth period at stalk formation it would be effective and economical spraying insecticides followed by detrashing. Agarwal and Sunil Kumar (1973) and Venugopala Rao *et al.* (1983), emphasized the need for trashing the cane before applying insecticidal sprays for checking the pest build up. Jhansi and Babu (2001) also reported that spraying 0.1% malathion followed by 0.03% dimethoate preceded by detrashing significantly reduced the scale insect infestation. Therefore, in view of the above circumstances, the present investigation was carried out to test insecticide from different chemical groups so to reduce the risk of cross resistance to scale insect.

5.2 OBJECTIVE (S):

i) Finding out the effective insecticides for controlling scale insect of sugarcane and
ii) Evaluating the yield and quality loss of sugarcane due to infestation of scale insect.

5.3 METHODOLOGY:

Studies on the efficacy of selected insecticides against scale insect (*Malanaspis glomerata* Green) on sugarcane will be conducted at the BSRI farm and Regional Station at Thakurgaon from 2024 to 2026 with eight treatments including control replicated three times, laid out in Randomised Block Design. The sugarcane setts will be treated with the test insecticides for before planting. Then the foliar sprays of the seven insecticides were applied after assessing the scale insect incidence in August, September and October. Treatments will be applied using a spray volume of 1000 litre/ha preceded by detrashing of the older leaves. The incidence of scale insect will be assessed by counting the number of nodes and the number of infested nodes per cane at the time of harvest in 20 randomly selected canes in each plot. Values will be converted into percentage

incidence of scale insect per plot. The scale incrustation will be scraped from all these infested cane stalks and the weight of the scale incrustation will be recorded as mg/cane in each treatment. Juice analysis (per cent sucrose and purity) will be carried out before the harvest of the crop and estimated for each treatment. Cane yield and number of millable canes (NMC) will be recorded at harvest. The data on per cent incidence of scale insect, scale incrustation, cane yield, NMC/ha and quality parameters will be analysed by using statistical tools.

Treatments:

T_1 : Control
T_2 : Sett treatment with imidacloprid 200SL@ 1 ml/L and spraying @ 1 ml/lt.
T_3 : Sett treatment with acephate 75SP @ 1 g/L and spraying of acephate @ 1 g/lt
T_4 : Sett treatment with acetamiprid 20SP@ 1 g/L and spraying of acetamiprid @ 1 g/lt
T_5 : Sett treatment with dimethoate 30 EC @ 1 ml/L and spraying of diemethoate @ 1 ml/lt
T_6 : Sett treatment with phenthoate 40EC @ 1 ml/L and spraying of phenthoate 40EC @ 1 ml/lt.
T_7 : Sett treatment with malathion 57EC @ 3 ml/L and spraying of malathion @ 3 ml/lt
T_8 : Sett treatment with acephate 50%+Imidaclorprid 25% 70WP @ 1 g/L and spraying of current @ 1 g/lt.
T_9 : Sett treatment with potassium salt of fatty acid 49SL @ 10ml/L water and spraying @ 10 ml/L water

DATA TO BE RECORDED:

Data will be recorded on the infested cane, level of infestation and brix% content of sugarcane.

5.4 WORK ELEMENTS:

1. Sett treatment with insecticides and planting in field
2. Intercultural operations and fertlilizer application
3. Detrashing and spraying insecticides
4. Collection data and analysed

5.5 TIME SCHEDULE:

Activity No.	Months															
	2025			2026												2027
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	→	→														
2			→	→	→	→	→	→	→	→	→	→	→			
3										→	→	→	→	→		
4															→	→

5.6 ECONOMIC IMPACT:

Farmers are thoughtful about the insect pests throughout the cane growing areas of Bangladesh. These are serious problem in cane cultivation and without managing the pest it is difficult to achieve good harvest. Very recently scale insect becomes as a serious pest of sugarcane due to climate change. There was no insecticide recommended for controlling scale insects of sugarcane. Cheaper and effective chemicals are needed for farmers to control this insect.

5.7 EFFECT ON ENVIRONMENT:

Insecticides are in general harmful for the environment but they are not equally hazardous. When more insecticides will be available to the end users the price will automatically be come down.

5.8 UTILIZATION OF RESEARCH RESULTS:

The research results will be communicated to the BSFIC, sugarcane farmer and DAE for extension. Finally, the farmers will be adopted the technology. The result will be published in Annual reports, Journals through which end users will be benefited also.

PROGRAMME AREA : PEST MANAGEMENT

6.0 TITLE : ISOLATION, SCREENING AND CHARACTERIZATION OF ENTOMOPATHOGENIC FUNGI FROM AGRICULTURAL SOILS OF BANGLADESH

LOCATION : i. BSRI, Ishwardi, Pabna
ii. NIB laboratory, Savar, Dhaka
iii. BRRI Lab, Gazipur

INVESTIGATORS : M S Islam, M A Rahman, M N Alam, M N A Siddiquee, M E Reza and N Sultana

NATURE OF STUDY : New

DURATION : 2025-2027

ESTIMATED COST(Tk): 300,000.00

6.1 DEFINITION OF THE PROBLEM:

Farmers are generally oriented towards chemical control because it provides immediate control of insect pests. But the indiscriminate use of chemical insecticides has serious environmental impacts, such as harmful effects on environmentally friendly organisms, causing resistance to insect pests, contamination, and an increase in toxic substances in food, endangering human health as well as that of animals and wildlife, and disrupting natural control systems in the field. Subsequently, it can cause insecticide-induced diseases such as kidney and liver failure, cancer, and genetic disorders in humans (Usman *et al.*, 2021; Ambethgar, 2009). In view of the issues mentioned above, it is, therefore, an urgent need to develop safe, environmentally friendly, effective, and sustainable strategies for the management of insect pests. Biological control agents (BCAs) are environmentally friendly alternatives to chemical insecticides. Among the BCAs, entomopathogenic fungi (EPFs) are specific in action, safe, compatible with IPM tactics, and are not harmful to natural enemies and the environment. They are key regulatory factors in insect pest populations and considered very promising biological control agents (Du *et al.*, 2020). Soil is an important habitat for entomopathogenic fungi. Local isolates have many advantages over exotic isolates in that they can have ecological compatibility with insect pest species. The EPFs can adapt to their environmental conditions, such as habitat types and climatic conditions. Moreover, the virulence of EPFs is strain-dependent and influenced by environmental conditions (Gürlek *et al.*, 2018; Kryukov *et al.*, 2010). In view of the above, it is necessary to isolate local EPFs that are adapted to the local environment and therefore more effective in controlling the pest population in related areas to ensure the production of biopesticides for the replacement of conventionally used chemical insecticides. Concerning the importance of EPFs as effective biocontrol agents for the insect population, it is essential to correctly identify entomopathogenic fungi at the species level. The morphological characteristics of fungi isolates represent fundamental information for researchers in the identification of fungi to the genus level. However, the identification of fungi at the species level is very difficult, even for an expert, due to the high similarity of the morphological features. As reported by Druzhinina *et al.* (2005), only morphological features are not reliable and sufficient for fungi species identification. Therefore, for the correct identification of EPFs species, it is essential to combine morphological characterization and molecular data analysis. Different EPFs have been extensively and successfully tested on various species of insect pests by many researchers, and EPFs have been reported to be useful and potential agents for the biological control of insect pests (Liu *et al.*, 2022; Sayed *et al.*, 2019; Ramanujam *et al.*, 2018; Lopez *et al.*, 2014; Kepenekci *et al.*, 2014). But previously no study has been conducted on the efficacy of locally isolated EPFs towards the major insect pest of sugarcrop in Bangladesh. From this point of view, this study will be undertaken.

6.2 OBJECTIVE (S):

To isolate, screen, and identify entomopathogenic fungi species based on a combination of morphological characteristics and molecular data analysis.

6.3 METHODOLOGY:

A. Isolation of Entomopathogenic Fungi

i. Collection of Soil Samples
ii. Collection of Insect Samples
iii. Preparation of Selective Media
iv. Isolation by Soil Dilution Method
v. Isolation by the Insect Bait Method (IBM)

B. Protease-base Screening of the Isolates

i. Preparation of Skimmed Milk Agar (SMA) Medium
ii. Protease Assay

C. Morphological Analysis

a. Macroscopic Characterization

A number of groups of fungi colonies will be observed for morphological characteristics for the identification of fungi species. From the stock slants, isolates will be cultured under aseptic conditions in SDAY in 90mm Petri dish and then incubated for 5–15 days at a temperature of 28ºC and a humidity of 70%. The isolates were grouped according to the following characteristics: growing pattern of the colony; the color of the colony on both sides of the Petri dish; mycelium density; and appearance of the colony (Luangsa-Ard *et al.*, 2011; Houbraken *et al.*, 2011; Visagie *et al.*, 2020).

b. Microscopic Characterization

Slide culture technique will be used for microscopic observation of the isolates. The slide culture will be prepared using a Petri dish (90 mm) containing the u-shaped glass rod on sterile filter paper. About 4 mL of sterile water will be poured onto the filter paper to wet it completely. This step will be performed to maintain the humidity necessary for the growth of the fungi. From the agar plate, a thin agar block (one cm square) will be cut using a sterile blade and transferred to the center of the slide that was placed on the glass rod. After that, the agar blocks will be inoculated by the fungal spores with the sterile inoculating loop. Next, a sterile cover slip will be placed on the upper surface of the agar cube. Subsequently, the slide will be incubated for 2-4 days at room temperature (28 ± 2°C). Then, the slide will be observed in a light microscope with 100× and 400× magnifications. Observations were conducted on the branching pattern of the conidiophores, the presence of phialides, the color, size, and shape of the conidia (Luangsa-Ard *et al.*, 2011; Houbraken *et al.*, 2011; Visagie *et al.*, 2020; Siddiquee, 2017).

D. Molecular Identification of Isolates

a. DNA Extraction

The genomic DNA of the isolates will be extracted following the Cetyltrimethylammonium Bromide (CTAB) method according to Cubero *et al.* (1999). Approximately 100 mg of fresh mycelia of each isolate will be collected from three to seven-day-old culture plates and taken into a 1.5 mL Eppendorf tube using a sterilized inoculating loop. Then, 500 µL of CTAB buffer (20 g CTAB, 280 mL 5 M NaCl, 100 mL 1 M Tris HCl pH 8.0, 40 mL 0.5 M EDTA, and adjusted to 1,000 mL with sterile distilled water) will be added to each sample and vortexed (Minishaker IKA MS1). The mixture will be incubated at 60°C for one hour at 85 g (Thermomixer Comfort, Eppendorf). Next, 5 µL of RNase A (10 mg/mL) will be added to the sample mixture and incubated once again for 15 min. A cold mixture of 500 µL of phenol-chloroform-isoamyl alcohol (25: 24: 1, v / v) will be then added to the tubes under a fume hood and will be inverted 40-50 times and centrifuged at 17949 g for 10 min at 4°C. Next, the top aqueous layer will be transferred to a new Eppendorf tube (1.5 mL). Then, an equal volume of isopropanol will be added, inverted several times, and incubated at 4°C for 30 min. Subsequently, the tube will be centrifuged at 4°C for 10 min at 17949 g. The supernatant will be removed and the resulting DNA pellet will be washed two times with 500 µL of ice-cold 70% ethanol. Each washing step included centrifugation at 4°C for 10 min at 17949 g. Then, the DNA pellet will be dried in a speed vac at 45°C for 15 min. After that, the DNA will be resuspended in a 50 µL Tris-EDTA (TE) buffer. DNA purity and quantity will be determined by agarose gel electrophoresis (1%) and UV spectrophotometry (NanoVue, Thermo Scientific). The absorbance ratio (A_{260}/A_{280}) between 1.8 and 2.0 was considered good quality DNA. The final eluted DNA will be kept at -20°C until the next use.

b. DNA Amplification and Visualization

The polymerase chain reaction (PCR) will be performed to amplify the ITS 1–5.8 S-ITS 2 regions of the rDNA using two primers, ITS1 (5'-TCC GTA GGT GAA CCT GCG G-3') and ITS4 (5'-TCC TCC GCT TAT TGA TAT GC-3') (White *et al.*, 1990). The PCR reactions will be performed with an automated thermal cycler (PTC-200 Peltier Thermal Cycler) using 25 µL of reaction mixtures containing 2.5 µL of 10× PCR buffer, 2.0 µL of 25 mM magnesium chloride (MgCl2), 0.5 µL of 10 mM PCR deoxynucleotide triphosphate mix (dNTPs), 0.25 µL of 5 Units of Taq DNA polymerase, 0.625 µL of each 10 µM primers

(ITS1 and ITS4), 16.5 µL of sterile distilled water (ddH2O) and 2.0 µL of 100 ng/µL template DNA. The ITS 1-5.8 S-ITS 2 regions of the rDNA will be amplified according to the following PCR protocols: initial denaturation at 95°C for 4 min, followed by 39 cycles of denaturation at 95°C for 45 sec, primer annealing at 55°C to 58.8°C for 45 sec, and extension at 72°C for 1 min. The amplification will be completed with one additional step of final extension at 72°C for 10 min.

A total of 5 µL of the PCR products will be electrophoresed in 1% (w/v) of agarose gel in 1 × Tris-borate-EDTA (TBE) buffer (89 mM Tris Base, 89 mM Boric acid, and 2 mM EDTA, pH 8.0) at 70 V for 50 min. The approximate sizes of the amplified fragments will be determined by comparing them with a 100 bp DNA ladder (GeneRuler, 100 bp Plus DNA Ladder, 1st BASE). The gel was stained with Ethidium Bromide (EtBr) for 15 min and observed visually under UV light and photographed using the AlphaImager® HO.

c. Purification of PCR Products

Purification of the amplified PCR products of each isolate will be performed using the QIAquick® PCR Purification Kit (QIAGEN) based on the instructions of the manufacturer. First, the binding buffer (PB buffer) will be added to the PCR products in a ratio of 5:1 and mixed thoroughly. For binding the DNA, the mixture will be transferred to the QIAquick spin column that will be placed in a collection tube (2 mL) and centrifuged at 17949 g for 1 min. The flow-through will be discarded and the QIAquick column will be backed to the same collection tube. A 750 µL of wash buffer (PE buffer) will be added to the QIAquick column and centrifuged at 17949 g for 1 min. The flow-through will be discarded once again, and then the QIAquick column will be backed to the collection tube. The QIAquick column will be centrifuged for an additional 1 min to remove any remaining wash buffer. Next, the QIAquick column will be placed in a new sterile microcentrifuge tube (1.5 mL) and 50 µL of elution buffer (buffer EB) will be added to the center of the Qiaquick membrane. The tube will be centrifuged at 17949 g for 1 min to elute the purified PCR products. Then, the purified PCR products will be electrophoresed in 1% (w/v) of agarose gel in 1× Tris-borate-EDTA (TBE) buffer and their concentration will be determined by using a UV spectrophotometry (NanoVue, Thermo Scientific). Finally, the purified PCR products (50 µL) will be sent to the NIB, Sava, Dhaka for DNA sequencing.

d. Sequence Analysis of ITS 1-5.8 S-ITS 2 Regions of the rDNA

DNA sequencing will be performed NIB, Savar, Dhaka. The sequences of the ITS 1–5.8 S–ITS 2 regions of the rDNA will be checked and edited manually with BioEdit Sequence Alignment Editor. The forward and reverse sequences will be aligned and formed a consensus sequence. The sequences will be compared with information from public databases in NCBI (National Center for Biotechnology Information, Bethesda, MD, USA) (http://www.ncbi.nlm.nih.gov/BLAST/) using the Base Local Alignment Search Tool (BLAST). According to the BLAST results, the sequences will be taken based on the similarity value >97% with known sequences in the NCBI database (Castillo *et al.*, 2012).

e. Phylogenetic Analysis

The ITS 1-5.8 S-ITS 2 phylogenetic tree of the rDNA will be performed by comparing it with the sequences from NCBI. The trees will be constructed according to the unweighted pair-group method based on the arithmetic average (UPGMA) (Sneath *et al.*, 1973) using molecular evolutionary genetics analysis (MEGA X) software version 10 (Kumar *et al.*, 2018). The reliability and interior branches and the validity of the trees will be tested with 10,000 replications using bootstrap.

6.4 WORK ELEMENTS:

1. Collection of soil and insect samples (2025-2027)
2. Isolation of fungi (2025-2027)
3. Screening of protease producing fungi (2025-2027)
4. Morphological analysis of the isolates (2025-2027)
5. Molecular identification of the isolates (2025-2028)

6.5 TIME SCHEDULE:

Activity No.	2025	2026	2027	2028
1	→	→	→	
2	→	→	→	→
3	→	→	→	→
4	→	→	→	→
5	→	→	→	→

6.6 ECONOMIC IMPACT:

Entomopathogenic fungal-based biopesticides are expected to be an alternative to chemical-based insecticides for the sustainable management of insect pests in agricultural crops. Since chemical-based insecticides are too costly, EPF-based biopesticides are considered economical in pest management.

6.7 EFFECT ON ENVIRONMENT:

In recent times, there has been a substantial increase in activities related to the commercial development of EPFs-based biopesticides (Wraight *et al.*, 2001). The increased usage of bio-pesticides is owing to the ban of some chemical pesticides and the phase-out of others. In addition, chemical-based insecticides are well-known to pollute groundwater, enter the foodstuff and harm health of human being (Butt *et al.*, 2001). The benefits of entomopathogenic fungal-based biopesticides over chemical-based insecticides incorporate human and non-target organism safety, improved biodiversity, reduced pesticide residues in food, and conservation of other beneficial organisms (Lacey *et al.*, 2001). It provides better ecological insect pest control compared to chemical-based insecticides (Moore and Prior, 1993).

6.8 UTILIZATION OF RESEARCH RESULTS:

Identified entomopathogenic fungal-based biopesticides will be evaluated for their virulence on sugarcrop insect pest management through laboratory bioassay and field application.Mass production of local virulent isolate will be done using available products such as broken rice, wheat, maize, etc. to control different kinds of insects such as leaf sap suckers, leaf feeders, borers and underground feeders.

PROGRAMME AREA : PEST MANAGEMENT
7.0 TITLE : EFFECTS OF DIETARY SUPPLEMENTS TO IMPROVE THE HEALTH OF HONEY BEE COLONY (*Apis mellifera*)
LOCATION : i) Biological Control Laboratory, BSRI, Ishwardi, Pabna and
ii) Honey grower's apiary, Pabna.
INVESTIGATORS : N Sultana, M E Reza, M S Islam, M A Rahman, M N A. Siddiquee, and M N Alam
NATURE OF STUDY : Continuous
DURATION : 2024-2027
ESTIMATED COST(Tk): 1,00000.00

7.1 DEFINITION OF THE PROBLEM:

Apiculture plays an important role in improving crop productivity all over the world. Honeybees play a crucial role as beneficial insects, collecting nectar and pollen to produce honey and serving as pollinators to enhance crop productivity. The enrichment and enhancement of apiculture lies in the good health and hygiene of honey bees. Honeybees require pollen and nectar from rich flowers to satisfy their nutritional requirements. But such flowers of bee's interest are not available round the year. The period of the year when there is a lack of flower that attracts bees is referred to as the dearth period. Therefore, honey bees require special care and management during dearth periods. Like all other animals, honey bees do have specific nutritional requirements. Pollen collected by bees from flowers are the major sources of protein, carbohydrates, minerals and vitamins whereas, nectar is the source of energy. During prolonged dearth periods, lack of pollen result into low nutritional reserves which reduces the longevity, negatively impact the brood's rearing, poor growth of hypopharyngeal gland, less honey and royal jelly production, inferior growth of worker larvae and young bees colonies may be attacked by various pest and diseases. To avoid this situation, colonies are either physically moved to a bee flora rich region or provision of feeding pollen are made. There are some disadvantages to both

migration and pollen feeding. The shifting of bee colonies is a tedious work, which causes huge loss to honey bees in term of mortality during transportation. Also a lot of time and labour is required for packaging and moving the colonies to distant places. Secondly, beekeepers do not collect and feed natural pollen to bee colonies, also pollen is not available in the market commercially. Further, commercial pollen may be contaminated with various pathogens. Dietary supplements provide additional nutrients that are missing from the regular meal like sugar syrup. This experiment will help to formulate highly palatable and nutritionally balanced dietary substitute during dearth period so as to further strengthen commercial beekeeping in Bangladesh. Supply of artificial dietary supplements during the dearth period makes the bee colonies stronger as well as strong colony during dearth period is a witness of early build-up and more foraging bees during the subsequent floral period for augmenting honey production and better pollination service.

7.2 OBJECTIVE (S)

i) To supplement dietary substitutes among the honey bee colonies in dearth period and
ii) To screening of different pollen substitutes to improve the health of honeybee colony.

7.3 METHODOLOGY

The field experiment will be conducted in Bio-control Lab., Entomology Division, BSRI, Ishwardi, Pabna and honey grower's apiary, Pabna from July 2025- September 2025. Five different treatments will be applied to give different dietary substitutes. In case of treatment two, 10g yeast will be added into boiling hot 900ml sugar syrup and make the solution cool for supplying dietary supplements at 15 days interval. The pollen substitutes (in T_3, T_4, T_5 treatment) will be supplied in 75 g for each treatments at 15 days interval. Sugar syrup will be added with every treatment as a regular food substitutes. In treatment one, only sugar syrup will be added as a control treatment. No dietary substitute will be added in treatment one. Each treatment repeated after 3 boxes. The amount of food consumption will be collected by weighing the dietary supplements before and after consumption. Each honeybee rearing box will be treated with different treatments and the number of brood cell, honey cell, pollen cell of the hive will be counted before and after application of every treatment. The design of the experiment is Randomized Complete Block Design with three replications.

TREATMENTS:

T_1 : Sugar syrup (July'26 – Sep. '26)
T_2 : Sugar syrup + Yeast (900ml Sugar syrup + 10g yeast) (July'26 – Sept. '26)
T_3 : Soybean flour (75g) (July'26 – Sep. '26)
T_4 : Mungbean flour (75g) (July'26 – Sep. '26)
T_5 : Soybean flour + Mungbean flour + Chick pea flour + Maize flour+ Scented Rice flour (15g Flour each) (July'26 – Sep. '26)

DATA TO BE RECORDED:

Data will be collected on the amount of food consumption and the number of brood cell, honey cell, pollen cell of the hive.

7.4 WORK ELEMENTS:

1. Selection of different Honeybee colonies (July '25)
2. Application of different treatments (July'25 - Sep. '25)
3. Data Collection (July'25 - Sep. '25)

7.5 TIME SCHEDULE:

Activity No.	Months													
	2025		2026											
	Nov	Dec	Jan	Feb	Mar	April	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1									→					
2									→	→	→			
3									→	→	→			

7.6 ECONOMIC IMPACT:

Every year bee farmers face problem to maintain honeybee population in lacking of flower and spend a lot of money to feed them. This technique minimizes the cost of bee keeping as well as it contributes to improve the health of honeybee colony in the dearth period.

7.7 EFFECT ON ENVIRONMENT:

Honeybees are beneficial insect. They are great pollinator for the environment. They also produce honey which is very nutritious and has a great medicinal value. This experiment reduces the cost of rearing honey bees during the dearth period as well as it reduces the total honey price in Bangladesh. There is no adverse effect on the environment and human being.

7.8 UTILIZATION OF RESEARCH RESULTS:

The results obtained from this study may be helpful for the commercial honey growers and other honeybee researcher.

PROGRAMME AREA : PEST MANAGEMENT
8.0 TITLE : MANAGEMENT OF SMALL HIVE BEETLE IN HONEYBEE, *Apis mellifera* COLONIES
LOCATION : i. Biological Control Laboratory, BSRI, Ishwardi, Pabna
ii. Apiary BSRI, Ishwardi, Pabna
INVESTIGATORS : N Sultana, M E Reza, M A Rahman, M N A Siddiquee, M N Alam and M S Islam
NATURE OF STUDY : Modified
DURATION : 2025-2026
ESTIMATED COST(Tk): 80,000.00

8.1 DEFINITION OF THE PROBLEM:

The small hive beetle, *Aethina tumida* (SHB) is an invasive pest of bee hives, originally from sub Saharan Africa. These beetles inhabit almost all honey bee colonies in their native range, but they do little damage there and are rarely considered a serious hive pest. Small hive beetles are opportunistic scavengers, closely related to sap and pollen beetles. In honey bee colonies they feed on pollen, honey and occasionally brood. The damage associated with an SHB infestation is caused by the larval stage; adults have little negative impact on a colony besides distracting worker bees from their normal hive duties. Unfortunately, once a beekeeper notices larval damage, it is usually too late to expect a hive to recover. Larvae appear suddenly and in large numbers typically hundreds to thousands and immediately begin tunneling into comb. The small hive beetle has been a threat to beekeeping industry specially, in dearth period and now a potential threat to Bangladesh apiculture. Keeping in view of the serious threat of small hive beetle in beekeeping and several constraints for its control, the present investigation was carried out to develop safe and effective management option for the small hive beetle population. The present work aimed to determine the effective control of small hive beetle by using some traps and chemicals in the hive of *A. mellifera* colonies.

8.2 OBJECTIVE (S):

i) Development of effective management practice(s) against small hive beetle and
ii) Evaluating of different management options.

8.3 METHODOLOGY:

The experiment will be conducted in apiary BSRI, Ishwardi, Pabna. This experiment will be conducted from December, 2025 to January, 2027. Five different treatments will be applied to manage small hive beetle. Each treatment repeated after 15 days interval. Each honeybee rearing box will be treated with different treatment and the number of SHB in the traps or bottom of the hive will be counted. The design of the experiment is Randomized Complete Block Design with three replications.

Treatments:

T_0 : Control (untreated)
T_1 : Manually clean Bee box once a week
T_2 : Regent (Fipronil) 3GR @ 0.13kg/decimal
T_3 : CD cover trap @ 1/box
T_4 : Use neem leaf dust
T_5 : Use of Garlic dust
T_6 : $T_1 + T_2 + T_3$

8.4 WORK ELEMENTS:

1. Selection of SHB infested Honeybee colonies (June. '25)
2. Application of different treatments (June.'25 – Aug. '25)
3. Data Collection (June.'25 – Aug. '25)

8.5 TIME SCHEDULE:

Activity No.	Months													
	2025		2026											
	Nov	Dec	Jan	Feb	Mar	Aprl	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1								→						
2								→	→	→				
3								→	→	→				

8.6 ECONOMIC IMPACT:

Every year SHB destroys many honeybee colonies. Our honey growers faced huge economical loss due to this pest. A suitable management practice will minimize their loss.

8.7 EFFECT ON ENVIRONMENT:

Honeybees are beneficial insect. They are great pollinator for the environment. They also produce honey which is very nutritious and has great medicinal value. This experiment will be done in favoured to the honeybee. There is no adverse effect on the environment and human being.

8.8 UTILIZATION OF RESEARCH RESULTS:

The results obtained from this study may be helpful for the commercial honey growers and other honeybee researcher.

PROGRAMME AREA : PEST MANAGEMENT

9.0 TITLE : DEVELOPMENT OF IoT (Internet of Things) BASED EARLY DETECTION SYSTEM OF RED PALM WEEVIL INFESTATION ON DATE PALM IN BANGLADESH

LOCATION : BSRI, Ishwardi, Pabna

INVESTIGATORS : M E Reza, M S Hossain, M S Hossain, H P Roy, N Sultana, M S Islam, M N A Siddiquee, M N Alam, S Akhter and M A Rahman

NATURE OF STUDY : New

DURATION : 2025-2027

ESTIMATED COST(Tk): 1,80,000.00

9.1 DEFINITION OF THE PROBLEM:

Red palm weevil (*Rhynchophorus ferrugineus*) infestation remains a significant and escalating problem for palm tree cultivation worldwide. This pest, native to Southeast Asia, has spread to various regions including the Middle East, North Africa, and parts of Europe, inflicting considerable damage to date palms and other palm species. Infestations are often characterized by the larvae's destructive feeding habits, which cause internal damage to the palm's trunk and can lead to tree death if not promptly addressed. Studies indicate that the red palm weevil can cause up to 50% yield loss in heavily infested plantations, with economic impacts reaching millions annually (EPPO, 2023). The red palm weevil poses a severe threat to palm trees, often resulting in substantial economic losses due to late or ineffective detection using traditional methods. Despite efforts to manage the pest through chemical treatments and manual inspections, these methods have proven inadequate for comprehensive control due to the weevil's rapid reproduction and elusive nature. Hence, integrating advanced monitoring systems like IoT-based solutions is increasingly seen as a crucial strategy to improve early detection and management of red palm weevil infestations.

The development of an IoT-based red palm weevil detection system is crucial for improving pest management in palm plantations. By integrating IoT technology, the system enables continuous, real-time monitoring of environmental conditions and pest activity through strategically placed sensors. This proactive

approach facilitates early detection of infestations, which helps in mitigating damage and reducing the need for labor-intensive inspections. Furthermore, the system's ability to provide actionable data supports informed decision-making and efficient resource allocation, making it a cost-effective and scalable solution for managing red palm weevil outbreaks and protecting valuable crops like date palm.

9.2 OBJECTIVE (S):

i) To develop IoT based sensors for early detection of RPW
ii) To deploy smart sensor and collect sound related data for possible early detection system of RPW.

9.3 METHODOLOGY:

The experiment for developing the IoT-based early detection system for red palm weevil infestation involves several key steps. First, deploy a network of IoT sensors in a palm trees to continuously monitor critical environmental factors such as temperature, humidity, vibrations specially sound that produced by a RPW inside a palm tree. These sensors will transmit real-time data to a central cloud-based platform via a wireless network. Next, implement data analytics and machine learning algorithms on the platform to analyze the incoming data for patterns and anomalies associated with red palm weevil activity. The system will generate alerts and recommendations based on detected infestation risks, allowing for prompt and targeted intervention. Regular calibration and updates will ensure the system's accuracy and effectiveness in varying environmental conditions.

9.4 WORK ELEMENTS:

1. Selection of Iot based smart sensors for development a device for early sound detection (Nov.'25-Feb. 26)
2. Deploy the device in three different palm trees (Apr.'26 – Oct. '26)
3. Data Collection (Mar.'26 – Oct. '26)

9.5 TIME SCHEDULE:

Activity No.	Months													
	2025		2026											
	Nov	Dec	Jan	Feb	Mar	Aprl	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1	→	→	→	→	→									
2						→	→	→	→	→	→			
3					→	→	→	→	→	→	→			

9.6 ECONOMIC IMPACT:

Every year red palm weevil infestation is increasing day by day. It will be projected that RPW can reduce 50% of palm production. Sometimes severe attack can damage the whole tree that why a huge economic loss may occur due to this pest. An early detection system can be a solution for the problem and can save the palm tree from huge economical losses by RPW.

9.7 EFFECT ON ENVIRONMENT:

The development of an IoT-based early detection system for red palm weevil infestation is likely to have positive environmental effects. By enabling early detection and targeted intervention, the system can significantly reduce the need for widespread chemical pesticide applications, which are often harmful to non-target organisms and ecosystems. This precision approach minimizes environmental contamination and preserves beneficial insects and soil health. Additionally, it promotes more sustainable palm cultivation practices by reducing the overall use of pesticides, which can lead to improved biodiversity and ecosystem resilience in affected areas. Overall, the IoT-based system supports environment friendly pest management tool that maintaining the health of palm tree cultivation.

9.8 UTILIZATION OF RESEARCH RESULTS:

The results obtained from this study may be helpful for the date palm orchard owner and other research fellows, researcher.

PATHOLOGY DIVISION

Rationale

The use of resistant cultivar is the least expensive and most practical means of controlling diseases. In the variety development programme, it is a prime need to sort out the resistant or tolerant clones to major diseases having good qualities with other agronomic characters. Hence research programme has been undertaken on varietal resistance trial against major diseases like red rot, wilt, pineapple and smut disease.

Sett rot is one of the major problems in profitable cultivation of sugarcane. It causes germination failure as a result crop stand is reduced and eventually yield of cane declined significantly. To protect sett from the attack of soil borne sett rotting fungi, we generally use different sett treating fungicides. The Sub PTAC recommends setting a trial of some chemicals against sett rot. That is why pathology division set trial with recommended chemicals.

There are no satisfactory chemical or biological control measures available that can control red rot efficiently. An experiment has taken to find out comparative efficacy of the different fungicides and bio-control agents against the *C. falcatum* Went. to obtain an effective control measure for recommendation to the farmer. Sugarcane production through ratoon management is a common and profitable practice among the farmers. But ratoon cane is susceptible to several diseases, that's why an experiment on finding out the suitable fungicides and bio agents in controlling seed- borne diseases in ratoon cane has been taken.

There are some other sugar crops namely date palm, stevia which are also mandate crop for BSRI. In Bangladesh, identification, documentation and management of diseases of above mentioned crops are negligible till to date, that's why an experiment has been undertaken in order to identify, document and find out suitable management practices of their diseases. To maintain up to date knowledge for the incidence of existing and new diseases if any in mill and non-mill zones and suggested appropriate control measures in time for current and future outbreak of diseases in Bangladesh the present study has been undertaken.

To meet up the demands of disease free clean seeds, to minimize experimental error, to set up experiments of different divisions as well as to supply to different mills and non mill zones, programme of production and distribution of breeder and foundation seed has been undertaken. Date palm is widely cultivated across the world and its economic importance for producing fruits, juice and goor has been increased over the years. Seed propagation of date palm is not a viable method. Hence, the cultivation of date palm requires true-to-type disease free planting materials which can only be produced through tissue culture technique.

The research program proposed by pathology division is directed towards developing disease resistant varieties and to find out effective disease management practices for the benefit of sugarcrop farming community.

LIST OF EXPERIMENTS

PROGRAMME AREA : VARIETAL IMPROVEMENT

1.0 Title : Screening of sugarcane genotypes under commercial varieties, ZYT-III, ZYT-II, ZYT-I, AYT, PYT and advanced clones to red rot

2.0 Title : Screening of sugarcane genotypes under commercial varieties, ZYT-III, ZYT-II and ZYT-I against wilt disease

3.0 Title : Screening of sugarcane genotypes under commercial varieties, ZYT-III, ZYT-II, ZYT-I and AYT against smut disease

4.0 Title : Screening of sugarcane genotypes under commercial varieties, ZYT-III, ZYT-II and ZYT-I against pineapple disease

PROGRAMME AREA : DISEASE MANAGEMENT

5.0 Title : Performance of different sett treating chemicals in controlling sett rot disease of sugarcane

6.0 Title : Management of red rot of sugarcane through chemical and biological means

7.0 Title : Efficacy of fungicides and bioagents in controlling seed-borne diseases in ratoon cane

8.0 Title : Identification, documentation and management of date palm and stevia diseases in Bangladesh

9.0 Title : Monitoring of sugarcane disease in the mill and non mill zones

PROGRAMME AREA : SEED TECHNOLOGY

10.0 Title : Production, quality control and distribution of disease free clean seed of sugarcane

11.0 Title : Production of disease free date palm seedlings through tissue culture technique

PROGRAMME IN DETAILS

PROGRAMME AREA : VARIETAL IMPROVEMENT
1.0 TITLE : SCREENING OF SUGARCANE GENOTYPES UNDER COMMERCIAL VARIETIES, ZYT-III, ZYT-II, ZYT-I, AYT, PYT AND ADVANCED CLONES TO RED ROT
LOCATION : BSRI, Ishwardi and RSRS, Thakurgaon
INVESTIGATORS : BSRI Ishwardi: M I Hossain, M A Rahman, S Sultana and M R Islam
RSRS, Thakurgaon: M A Rahman, M I Hossain, S Sultana and M R Islam
NATURE OF STUDY : On-going
DURATION : Continuous
ESTIMATED COST(Tk): 60000.00

1.1 DEFINITION OF THE PROBLEM:

Red rot caused by *Colletotrichum falcatum* Went. is the most serious disease of sugarcane in Bangladesh. It is the oldest known disease of sugarcane that is mainly responsible for the deterioration and eradication of a good number of promising cultivars. The disease causes extensive losses in yield and quality and has been aptly called *the cancer of sugarcane*. The losses due to this disease may go up to 80-100% when occurs in epidemic form (Annon, 2024). Red rot pathogen *Colletotrichum falcatum* possess different pathotypes. There are no satisfactory chemical or physical control measures available that can control this disease efficiently. Therefore, breeding for disease resistance has become the main procedure to combat the red rot menace (Dattamajumdar and Singh, 1999). For that reason evaluation process has to be continued without break so that resistant clones are ready in the pipeline to replace susceptible ones in the endemic areas. Cultivation of sugarcane varieties having higher level of resistance is the crying need to mitigate the loss caused by red rot disease. Aiming this, field screening is being conducted to find out the level of resistance in the promising clones/varieties of sugarcane against different isolates of red rot pathogen. Moreover, normally higher sugar content of a variety leads to greater susceptibility.

1.2 OBJECTIVES:

1. Identifying and selecting the sugarcane genotypes having higher level of resistance against red rot disease and
2. Recommending new resistant varieties/tolerant clones for final release to the growers and to preserve in the gene bank for breeding purposes.

1.3 METHODOLOGY:

Sugarcane genotypes under ZYT-III, II, I, AYT, PYT, tissue culture derived clones and irradiated clones with resistant and susceptible standard will be planted at BSRI and RSRS, Thakurgaon farm. Isolates of *C. falcatum* of different cane growing zones will be used for inoculation. The pathogen collected from different zones will be maintained in the oat meal agar slant. Artificial inoculation with different isolates will be done at the age of 8-10 months of the test clones. Eight to ten days old sporulating cultures of the fungus will be used for inoculation. Inoculation will be made with individual as well as with mixed isolates of *C. falcatum*. Fifteen healthy canes of each clone will be inoculated by spore suspension (spore conc.106/ml) with the help of hypodermic syringe method. After two months of inoculation, data on disease development in the canes will be recorded. On the basis of disease index the clones will be categorized as Resistant, Moderately Resistant, Moderately Susceptible, Susceptible and Highly Susceptible to this disease.

1.4 WORK ELEMENTS:

1. Land selection, seed selection and planting.
2. Collection, isolation and culturing of different isolates of *C. falcatum.*
3. Inoculation of sugarcane plants with red rot pathogen in a selected pre planted canes
4. Data collection on disease development in the inoculated canes and naturally infected canes.
5. Data analysis and reporting.

1.5 TIME SCHEDULE:

Ac. No.	2025			2026											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	→	→													
2									→	→	→				
3											→				
4												→	→		
5															→

1.6 ECONOMIC IMPACT:

Development of red rot resistant variety will definitely help in economic improvement through increased yield and sugar. By replacing red rot resistant variety the yield of cane as well as production of *gur* and sugar will be increased.

1.7 EFFECT ON ENVIRONMENT:

Development of red rot resistant variety will have positive impact on environment. It will reduce the disease incidence in the cane field.

1.8 UTILIZATION OF RESEARCH RESULTS:

With the completion of the experiment, the red rot resistant/tolerant varieties will be sorted out. With the use of resistant variety, red rot disease could be successfully controlled which will boost up sugarcane production at least by saving 6-10% losses due to this destructive disease. The other sugarcane growing countries may also be benefited through mutual exchange of these resistant/tolerant clones.

2.0 TITLE : SCREENING OF SUGARCANE GENOTYPES UNDER COMMERCIAL VARIETIES, ZYT-III, ZYT-II AND ZYT-I AGAINST WILT DISEASE
LOCATION : BSRI, Ishwardi
INVESTIGATORS : M A Rahman, S Sultana, M R Islam and M I Hossain
NATURE OF STUDY : On-going
DURATION : Continuous
ESTIMATED COST(Tk): 30,000.00

2.1 DEFINITION OF THE PROBLEM:

Wilt caused by *Fusarium sacchari*, is one of the baffling diseases of sugarcane and found to be of considerable importance especially under stress conditions such as infestation by soil pests or other soil factors (Kumar & Kumar, 2005). The disease has a wide occurrence in the cane growing areas. It reduces the germination of seed materials, dries up young shoots and subsequently the cane stalks become wilted. The pathogen is soil borne and chemical control method is not effective against this disease. Substitution of susceptible varieties with resistant one is the most successful and reliable method to curb the disease (Anonymous, 2000). Therefore, screening of varieties/clones for resistance to wilt has become a regular feature prior to go for commercial cultivation

2.2 OBJECTIVES:

1. Identifying and selecting the sugarcane genotypes having superior resistance to wilt disease and
2. Recommending new resistant varieties/tolerant clones for final release to the growers.

2.3 METHODOLOGY:

Sugarcane genotypes under ZYT-III, II, I, with resistant and susceptible standard will be planted at BSRI and RSRS Thakurgaon. Wilt affected cane samples will be collected from different cane growing zones of Bangladesh. The wilt pathogen *Fusarium sacchari* will be isolated and cultured in the laboratory and will be maintained on PDA slants. Artificial inoculation of the testing clones will be made by spore suspension of mixed inoculum of *Fusarium sacchari* collected from different agro-ecological zones. Fifteen canes of each clone will be inoculated by hypodermic syringe method. Data on disease development will be recorded after three

months of inoculation. On the basis of disease index, the genotypes will be grouped as resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible.

2.4 WORK ELEMENTS:

1. Land selection and preparation.
2. Seed selection, preparation and plantation.
3. Collection, isolation and maintenance of different isolates of wilt causing organism.
4. Inoculation of sugarcane genotypes with organism of wilt disease.
5. Data collection on wilt disease development in different clones of sugarcane.
6. Data analysis and reporting.

2.5 TIME SCHEDULE:

Ac.	2025			2026											
No.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	→	→													
2	→	→													
3									→	→					
4											→				
5													→	→	
6															→

2.6 ECONOMIC IMPACT:

By this experiment variety (s) showing resistant or tolerant reaction to wilt disease will be sorted out to release for commercial use. As a result, the farmers will be economically benefited by getting higher yield of both the cane and sugar.

2.7 EFFECT ON ENVIRONMENT: This experiment has no adverse effect on environment.

2.8 UTILIZATION OF RESEARCH RESULTS:

Wilt disease causes a great loss of cane every year. So by cultivating wilt resistant varieties the economic condition of farmers could be improved.

3.0 TITLE : SCREENING OF SUGARCANE GENOTYPES UNDER COMMERCIAL VARIETIES, ZYT-III, ZYT-II, ZYT-I AND AYT AGAINST SMUT DISEASE
LOCATION : BSRI, Ishwardi
INVESTIGATORS : S Sultana, M A Rahman, M I Hossain and M R Islam
NATURE OF STUDY : On-going
DURATION : Continuous
ESTIMATED COST(Tk): 3,0000.00

3.1 DEFINITION OF THE PROBLEM:

Smut (*Ustilago scitaminea* Sydow) is one of the most important sugarcane diseases not only in Bangladesh but also in other sugarcane growing countries of the world. The smut fungus has the potential to infect all types of cane. The loss may go 59.45 to 83.92% when naturally infected setts are planted (Rahman *et al*., 1998). Data on quality parameters indicate that in smutted canes brix, sucrose and purity are adversely affected. Chemical control and agronomic practices are not effective to reduce the infection of smut. Substitution of susceptible varieties by resistant ones is one of the most successful and reliable method to combat the disease. Resistant genotypes of sugarcane could play an important role in reducing the loss caused by the disease. Accordingly, screening of genotypes against the disease tends to be a routine work before releasing as varieties for commercial cultivation.

3.2 OBJECTIVES:

1. Identifying and selecting the sugarcane germplasms having superior resistance to smut disease and
2. Recommending new resistant varieties/tolerant clones for variety development.

3.3 METHODOLOGY:

Required quantity of two budded setts of the sugarcane clones under ZYT-III, II, I, AYT and with resistant and susceptible standard will be inoculated by dipping setts in smut spore suspension (spore conc. 106/ml) mixed with Tween 20 solution for 30 minutes before planting in order to wetting, reducing air bubble and uniform mixture of smut spores. Moreover, Tween 20 acts as adhering agent. Data on disease incidence will be recorded at an interval of one month from 60 DAP up to harvest. The plant crop will be kept for ratoon for observation in the next year. Finally, on the basis of disease index the test clones will be categorized as Resistant, Moderately Resistant, Moderately Susceptible, Susceptible and Highly Susceptible. Only the Resistant and Moderately Resistant varieties/clones will be recommended for final release as varieties. The experiment will be surrounded with 2-4 rows of first growing highly smut resistant variety as guard row.

3.4 WORK ELEMENTS:

1. Land selection and preparation
2. Seed selection, preparation, dipping setts in suspension of smut spores and plantation. The experiment will be surrounded with 2-4 rows of first growing highly smut resistant variety as guard row
3. Data recording on germination of setts on 30, 45, 60 and 75 days of plantation
4. Data collection on smut disease development on sett/ clump basis
5. Data analysis and reporting

3.5 TIME SCHEDULE:

Ac.	2025			2026												2027	
No.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
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3.6 ECONOMIC IMPACT:

Smut resistant varieties will be sorted out. This will help the growers to get expected yield by cultivating the tolerant/resistant varieties.

3.7 EFFECT ON ENVIRONMENT:

Screening for smut resistance and cultivation of resistant variety commercially will have positive effect on environment finally.

3.8 UTILIZATION OF RESEARCH RESULTS:

Smut disease not only reduces cane yield but also directly influences the juice quality and sucrose content. So by cultivating disease resistant varieties the cane yield and sugar/*gur* will be increased as well as the economic condition of farmers will be improved.

4.0 TITLE : **SCREENING OF SUGARCANE GENOTYPES UNDER COMMERCIAL VARIETIES, ZYT-III, ZYT-II AND ZYT-I AGAINST PINEAPPLE DISEASE**
LOCATION : BSRI, Ishwardi
INVESTIGATORS : M R Islam, S Sultana, M I Hossain and M A Rahman
NATURE OF STUDY : On-going
DURATION : Continuous
ESTIMATED COST(Tk): 30,000.00

4.1 DEFINITION OF THE PROBLEM:

Sugarcane crop is vulnerable to a number of diseases of which pineapple disease caused by *Ceratocystis paradoxa* is an important one (Anon, 1989). Normally, the disease is noticed severely in heavy and ill drained soils. It causes considerable losses in germination of setts. The disease can reduce sett germination

up to 47% (Anon, 1999) which subsequently hamper the yield of cane. The yield reduction due to this disease may be as high as 31-35% (Anon, 2000). It can be controlled by chemical treatment to some extent. The use of resistant cultivar is the most judicious strategy to escape the disease. That's why the screening programme has been initiated to evaluate the genotypes against pineapple organism in field condition.

4.2 OBJECTIVES:

1. Identifying and selecting the sugarcane germplasms having superior resistance to pineapple disease and
2. Recommending resistant varieties/tolerant clones for variety development.

4.3 METHODOLOGY:

Sugarcane clones under ZYT-III, II and I with resistant standard Isd 34 and susceptible standard Isd 24 will be tested at BSRI farm, Ishwardi. A good number (200) of two bud setts of the tested varieties/clones will be inoculated by spraying fungal inocula of *C. paradoxa* on the surface of setts in the furrow during planting. Equal number of setts without inoculation will be planted as control. Sett to sett and row to row spacing will be $^1/_3$ m and 1 m respectively. Data on germination of setts will be recorded on 15th, 30th, 45th, 60th and 75th days after planting. Non germinated setts will be examined to observe the presence of *C. paradoxa*. Number of millable cane production and yield of cane will be recorded at harvest. Clones with higher germination and higher yield will be treated as resistant/tolerant against pineapple disease.

4.4 WORK ELEMENTS:

1. Land selection and preparation
2. Seed selection, preparation and spraying of disease causing organisms after placement of setts in furrow
3. Data collection on germination, examination of non-germinated setts to observe pineapple disease development in different clones of sugarcane
4. Data recording on millable cane and yield of cane
5. Data analyses and reporting

4.5 TIME SCHEDULE:

Ac.	2025			2026												2027	
No.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
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4.6 ECONOMIC IMPACT:

Pineapple disease resistant varieties will be sorted out and will be released for commercial cultivation. These varieties will ensure good germination in the farmers' field that will subsequently increase the yield of cane as well as sugar and *gur*.

4.7 EFFECT ON ENVIRONMENT: This experiment has no adverse effect on environment.

4.8 UTILIZATION OF RESEARCH RESULTS:

The sorted varieties/clones will be shown expecting germination in the field. The income of farmers will be increased by cultivating pineapple disease-resistant varieties.

PROGRAMME AREA : DISEASE MANAGEMENT
5.0 TITLE : PERFORMANCE OF DIFFERENT SETT TREATING CHEMICALS IN CONTROLLING SETT ROT DISEASE OF SUGARCANE
LOCATION : BSRI, Ishwardi
INVESTIGATORS : M I Hossain, M A Rahman, S Sultana and M R Islam
NATURE OF STUDY : Modified
DURATION : Continuous
ESTIMATED COST(Tk): 15000.00

5.1 DEFINITION OF THE PROBLEM:

Sett rot is one of the major problems in profitable cultivation of sugarcane. It causes germination failure as a result crop stand is reduced and eventually yield of cane declined significantly. To protect sett from the attack of soil borne sett rotting fungi, we generally use different sett treating fungicides. The Sub PTAC recommends setting trial of some chemicals. That is why pathology division set up trial with recommended chemicals. With that aim the present research program has been proposed.

5.2 OBJECTIVES:

1. Determining the performance of new chemicals over existing recommended sett treating fungicides in controlling sett rot disease of sugarcane and
2. Recommending more fungicides in controlling sett rot disease of sugarcane.

5.3 METHODOLOGY:

Replicated soil bed will be inoculated by *Ceratocystis paradoxa* pathogen and setts will be planted on the treated soil bed. Germination of setts will be recorded at 30, 45, 60, and 75 days after planting. Non-germinated setts will be examined for infection by sett rotting fungi. Finally survival % of settling up to the age of 90 days will be recorded to evaluate the bio-agents and fungicides.

Variety: Isd 38

TREATMENTS: 27

T_0 : Control (sett dipping in water)
T_1 : Sett dipping in 0.1% solution of Bio top 32.5 Sc for 30 minutes (1mL/L)
T_2 : Sett dipping in solution of Therapi 1WP for 30 minutes (5kg/ha)
T_3 : Sett dipping in 0.1% solution of Commando 32.5 SC for 30 minutes (1mL/L)
T_4 : Sett dipping in 0.1% solution of Colazim 50 WP for 30 minutes (1gm/L)
T_5 : Sett dipping in 0.1% solution of Doyazim 50WDG for 30 minutes (1gm/L)
T_6 : Sett dipping in solution of W TONIGHT 83WP for 30 minutes 350gm/ha
T_7 : Sett dipping in 0.1% solution of Unizol 32.5 SC for 30 minutes (1mL/L)
T_8 : Sett dipping in 0.1% solution of Experts Sinaplus for 30 minutes (1mL/L)
T_9 : Sett dipping in 0.1% solution of Landzim 50 WDG for 30 min (1gm/L)
T_{10} : Sett dipping in 0.1% solution of Agrozim 50 WP for 30 min (1gm/L)
T_{11} : Sett dipping in 0.1% solution of Shicarman 75 WP for 30 minutes (1gm/L)
T_{12} : Sett dipping in solution of Orizeb 80 WP for 30 minutes (2kg/ha)
T_{13} : Sett dipping in 0.2% solution of Sunzeb 80 WP for 30 minutes (2gm/L)
T_{14} : Sett dipping in 0.1% solution of Remade 32.5 SC for 30 minutes (1gm/L)
T_{15} : Sett dipping in solution of Display 32.5 SC for 30 minutes (1L/ha)
T_{16} : Sett dipping in solution of Orvisin 50 WP for 30 minutes (600gm/ha)
T_{17} : Sett dipping in solution of Femazim 80 WP for 30 minutes (1800-2100gm/ha)
T_{18} : Sett dipping in solution of Havistin 50 WP for 30 minutes (600gm/ha)
T_{19} : Sett dipping in 0.1% solution of Skzim 50 WP for 30 minutes (1gm/L)
T_{20} : Sett dipping in 0.15% solution of Zen 80 WG for 30 minutes (1.5gm/L)
T_{21} : Sett dipping in 0.1% solution of Topper Zim 50 WP for 30 minutes (1gm/L)
T_{22} : Sett dipping in 0.1% solution of JN Zim 50 WDG for 30 minutes (1gm/L)
T_{23} : Sett dipping in 0.1% solution of A-Zim 50 WP for 30 minutes (1gm/L)

T_{24} : Sett dipping in 0.1% solution of Score 250 WP for 30 minutes (1gm/L)
T_{25} : Sett dipping in 0.1% solution of Autostin WDG 50 /Knowin WP 50 for 30 minutes (1gm/L)
T_{25} : MHAT treated Sett at 540 C for 4 hours
T_{26} : Without any soaking

Replication : 3
Design : RCB
Category of sett : 2 budded setts

5.4 WORK ELEMENTS:

1. Soil bed preparation.
2. Inoculation of soil bed with *Ceratocystis paradoxa*
3. Sett preparation, sett treatment and planting on soil bed
4. Germination count on15, 30, 45, 60 and 75 days of planting
5. Survival % of settlings on 90 days of planting

5.5 TIME SCHEDULE:

Ac.	2025			2026											
No.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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5.6 ECONOMIC IMPACT

Effective seed treating chemicals will increase germination of sugarcane setts and thereby yield of cane will be increased.

5.7 EFFECT ON ENVIRONMENT:

Use of recommended doses of chemicals has no adverse effect on environment.

5.8 UTILIZATION OF RESEARCH RESULTS:

The research results will be utilized by sugarcane growers for their financial benefit.

6.0 TITLE : MANAGEMENT OF RED ROT OF SUGARCANE THROUGH CHEMICAL AND BIOLOGICAL MEANS
LOCATION : BSRI, Ishwardi
INVESTIGATORS : M R Islam, M A Rahman, M I Hossain and S Sultana
NATURE OF STUDY : Modified
DURATION : 2025-2026
ESTIMATED COST(Tk): 20,000.00

6.1 DEFINITION OF THE PROBLEM:

In Bangladesh, the most severe disease affecting sugarcane (*Saccharum officinarum* L.) is red rot, which is caused by *Colletotrichum falcatum* Went. It is the most well-known and oldest disease that is mainly responsible for the degeneration and destruction of many promising sugarcane cultivars. The majority of chewing cane cultivars grown in Bangladesh are very sensitive to red rot. When this disease is in epidemic condition, losses can range from 80 to 100%. Red rot causing pathogen *Colletotrichum falcatum* Went. possess several patho types. So far no satisfactory chemical, physical or biological control measure is available to control this disease efficiently. However, some chemicals and bio-control agents have been used in India to control red rot disease in field condition (Malathi *et al.*, 2002; Malathi *et al.*, 2004; Singh *et al.*, 2010). Considering these aspects, the present study will be undertaken to find out the comparative efficacy of the different fungicides and bio-control agents against the *Colletotrichum falcatum* went. in order to obtain an effective control measure for recommendation to the farmer.

6.2 OBJECTIVES:

1. To investigate the efficacy of different chemicals and biocontrol agents throughout the cropping season and
2. To find out the most suitable management practice (chemical and/or biological) of red rot to suggest the farmers.

6.3 METHODOLOGY:

An experiment through ring pit method will be carried out in the semi-control condition at BSRI farm (24.1156° N, 89.0817° E), Ishwardi-6620, Pabna with a red rot susceptible chewing variety "BSRI Akh 42". The design of the experiment will be assigned in randomized complete block design (RCBD) having three replications. Five two-budded setts (12 cm long) from 10 months old sugarcane variety "BSRI Akh 42" will be used in this experiment per pit. Soil of the research field will be silty clay loam soil (Ganges-river floodplain soil) consisting of around 15.6% sand, 46.1% silt, 34.3% clay, and 4.1% organic matter, with a pH of approximate 7.3. Field soil will then be inoculated with red rot spore suspension prepared by mixing 45 isolates of red rot pathogen be cultured in the laboratory previously. Plants will be raised in those inoculated pits (radius: 70 cm). Each pit will receive a standard fertilizer dose recommended by Fertilizer Recommendation Guide 2024. The experiment consists of 11 (eleven) treatments including control which are as follows:

TREATMENTS:

T_0 : Control (No treatment)
T_1 : Sett treatment & soil drenching with *Trichoderma harzianum* @ 106 C.F.U/mL (30 days interval upto 240 DAP)
T_2 : Sett treatment with Autostin 50 WDG (Carbendazim) @1g/L for 30 minutes & spraying with Sunphanate 70 WP (Thiophanate methyl) @ 2g/L (30 days interval upto 240 DAP)
T_3 : Sett treatment with Autostin 50 WDG (Carbendazim) @1g/L for 30 minutes & soil drenching with Sunphanate 70 WP (Thiophanate methyl) @ 2g/L (30 days interval upto 240 DAP)
T_4 : Sett treatment with Autostin 50 WDG (Carbendazim) @1g/L for 30 minutes & spraying with Amistar Top 325 SC (Azoxystrobin + Difenoconazole) @ 2mL/L (30 days interval upto 240 DAP)
T_5 : Sett treatment with Autostin 50 WDG (Carbendazim) @1g/L for 30 minutes & soil drenching with Amistar Top 325 SC (Azoxystrobin + Difenoconazole) @ 2mL/L (30 days interval upto 240 DAP)
T_6 : Sett treatment & soil drenching with Tricost 1% WP (*Trichoderma* spp.) @ 5g/L (30 days interval upto 240 DAP)
T_7 : Sett treatment with Autostin 50 WDG (Carbendazim) @1g/L for 30 minutes & spraying with Wtontight 83 WP (Tricyclazole 63% + Bismerthiazole 20%) @ 350g/ha (30 days interval upto 240 DAP)
T_8 : Sett treatment with Autostin 50 WDG (Carbendazim) @1g/L for 30 minutes & soil drenching Wtontight 83 WP (Tricyclazole 63% + Bismerthiazole 20%) @ 350g/ha (30 days interval upto 240 DAP)
T_9 : Sett treatment with Autostin 50 WDG (Carbendazim) @1g/L for 30 minutes & spraying with Wtontight 83 WP (Tricyclazole 63% + Bismerthiazole 20%) @ 350g/ha (15days interval upto 240 DAP)
T_{10} : Sett treatment with Autostin 50 WDG (Carbendazim) @1g/L for 30 minutes & soil drenching Wtontight 83 WP (Tricyclazole 63% + Bismerthiazole 20%) @ 350g/ha (15 days interval upto 240 DAP)

6.4 WORK ELEMENTS:

1. Land preparation.
2. Inoculation of soil filled pots with red rot pathogen.
3. Plantation of sugarcane setts.
4. Application of chemicals and bio-control agents as per treatment.
5. Observation of experimental plot and data collection on parameters such as plant height, chewable cane, dyed cane, weight, Brix %, % Protection and disease reaction.
6. Data analysis and reporting.

6.5 TIME SCHEDULE:

Ac.	2025			2026											
No.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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6.6 ECONOMIC IMPACT:

By using biological and chemical methods, sugarcane production losses might be reduced by managing red rot disease. As a consequence, sugarcane production will increase, and eventually sugarcane growers will experience maximum financial gain.

6.7 EFFECTS ON ENVIRONMENT:

Several methods of controlling red rot diseases through biological and chemical means will be tested. Only the effective and eco-friendly measures will be selected for recommendation. Therefore, there will be no risk of any adverse effect on the environment.

6.8 UTILIZATION OF RESEARCH RESULTS:

With the completion of the experiment, the most effective control measure will be selected and finally recommended for the farmers. As a result, disease problem associated with *Colletotrichum falcatum* Went. will be minimized by the recommended management practice and yield will increase undoubtedly. Control of red rot disease through different bio-agents will be tested. Bio-agents are environment friendly and therefore, there will be no risk or adverse effect on the environment.

7.0 TITLE : EFFICACY OF FUNGICIDES AND BIOAGENTS IN CONTROLLING SEED-BORNE DISEASE IN RATOON CANE
LOCATION : BSRI, Ishwardi
INVESTIGATORS : M I Hossain, M A Rahman, S Sultana, R Islam and S Islam
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk): 60,000/-

7.1 DEFINITION OF THE PROBLEM:

Sugarcane grown from the stubble of the previous crop rather than from seed pieces is called ratoon. Sugarcane production through ratoon management is a common practice in sugarcane-growing areas of the world. This practice significantly reduces the cost of land preparation, planting, and seed material. But ratoon cane is susceptible to several fungal (red rot, wilt, smut, pokkah boeng) and bacterial (leaf scald) diseases, which can reduce yield and quality of cane. The use of fungicides and bio-control agents can significantly influence the control of seed-borne diseases in ratoon cane. Fungicides provide quick and effective disease suppression during the early stages of ratoon cane development, particularly in high-pressure areas. On the other hand, biocontrol agents offer long-term, eco-friendly disease management with added benefits to plant health. However, information regarding this aspect is not available in Bangladesh. Considering this fact, the present study has been undertaken with the following objective.

7.2 OBJECTIVES:

1. To find out the suitable fungicides and bio agents in controlling seed- borne disease in ratoon cane.

7.3 METHODOLOGY:

Two budded setts of Isd 37 will be used as planting material.

TREATMENTS: 12

T_0 : Control

T_1 : Spraying of Tilt 250 EC (Propiconazole) @ 1 ml/L of water (After shaving and every 30 days interval until 150 days)

T_2 : Spraying of Amistar TOP 32.2 SC (Azoxystobin and Difenoconazole) @ water (After shaving and every 30 days interval until 150 days)

T_3 : Spraying of Score 250 EC (Difenoconazole) @ 1 ml/L of water (After shaving and every 30 days interval until 150 days)

T_4 : Spraying of Thiovit 80 WG (Sulfur) @ 6 g/L of water (After shaving and every 30 days interval untill 150 days)

T_5 : Spraying of Root grow (1-Napthalic Acitic Acid) @ 1 g/L of water (After shaving and every 30 days interval until 150 days)

T_6 : Spraying of Root grow (1-Napthalic Acitic Acid) @ 1 g/L of water + Nativo @ 2gm/L water (Tebuconazole 50% + Trifloxystrobin 25% WG (75 WG) (After shaving and every 30 days interval until 150 days)

T_7 : Spraying of Root grow (1-Napthalic Acitic Acid) @ 1 g/L + Thiovit 80WG (Sulfur) @ 6 g/l of water (After shaving and every 30 days interval until 150 days)

T_8 : Spraying of Sulphanate (Thiophanate-methyl) @ 1 g/L of water (After shaving and every 30 days interval until 150 days)

T_9 : Spraying Knowin 50 WP (Carbendazim) @ 1 gm/L of water (After shaving and every 30 days interval until 150 days)

T_{10} : Spraying Tricost 1% WP (*Tricoderma harzianum*) @ 2×106 CFU/L of water (After shaving and every 30 days interval until 150 days)

T_{11} : Spraying Shabab (Hexaconazole) @ 1g/L of water + Root grow (1-Napthalic Acitic Acid) @ 1 g/L of water (After shaving and every 30 days interval until 150 days)

Plot Size : 6 m × 6 m
Replication : 3
Design : RCB
Planting Method : Conventional (Two budded setts of Isd 37)

DATA TO BE RECORDED:

1. Germination (%) on clump basis
2. No. of Tillers
3. Disease Incidence (every 30 days interval to until Harvest)
4. Brix % and
5. Millable cane
6. Cane yield.

7.4 WORK ELEMENTS:

1. Field preparation
2. Basal fertilizer application
3. Intercultural operation
4. Irrigation
5. Germination count at 30 DAP & Tiller counts at 120,150 and 180 DAP
6. Fertilizer application (top dressing)
7. Disease Incidence (every 30 days interval to until Harvest)
8. Millable cane count
9. Harvesting of cane
10. Data collection (Brix %, height, girth, yield)

7.5 TIME OF SCHEDULE:

Ac	2025			2026												2027											
No.	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
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7.6 ECONOMIC IMPACT:

Yield of the ratoon cane increases and farmers get high economic return.

7.7 EFFECTS ON ENVIRONMENT:

This is environment friendly and there will not be any adverse effect on the surrounding environment for implementation of this trial.

7.8 UTILIZATION OF RESEARCH RESULTS:

The result of the study will help the farmers to choose suitable fungicides and bio-agent for ratoon management.

8.0 TITLE : IDENTIFICATION, DOCUMENTATION AND MANAGEMENT OF DATE PALM AND STEVIA DISEASES IN BANGLADESH
LOCATION : BSRI, Ishwardi
INVESTIGATORS : S Sultana, M A Rahman, M I Hossain and M R Islam
NATURE OF STUDY : Modified
DURATION : 2025-2026
ESTIMATED COST(Tk): 22,000.00

8.1 DEFINITION OF THE PROBLEM:

Date palm (*Phoenix dactylifera* L.) is a tropical or sub- tropical crop which is widely cultivated across the Middle East, South Asia and North Africa. In the world, the production of the dates has been increased over the years due to the fast growing demand. All parts of the date palm and final products have economic value. The sap is also used as a beverage, either fresh or fermented. Date fruit is good source of high nutritional value food. Indeed it is rich in carbohydrates, dietary fibers, proteins, minerals and vitamin B complex, such as thiamine (B1), riboflavin (B2), niacin (B3), pantothenic (B5), pyridoxine (B6), and folate (B9) (Eoin, 2016), phytochemicals etc. Date palms are susceptible to several diseases that reduce date and juice production. Diseases cause considerable losses in date palms groves. Diseases like bayound (Killian & Maire,1930), leaf spot (Uchida, J. Y. 2004), leaf blight, graphiola leaf spot (Abbas & Abdulla, 2004), inflorescence rot, black scorch (Suleman *et al.*, 2001) etc. have been recorded in almost all date palm growing countries.

Stevia, botanically known as *Stevia rebaudiana* Bertoni (Asteraceae) is a sweet perennial herb. In Bangladesh, stevia cultivation is very limited. Multiple diseases of stevia have been identified in all over the world. Most of the diseases are of fungal origin (Paul and Singh, 2002). Some major diseases like sclerotium stem rot, pythium root rot, septoria leaf spot, charcoal rot, anthracnose, crown gall, root knot etc are observed in different countries. Many disease symptoms regarding those crops are also observed in Bangladesh but very few research works exist related to the phenomenon. Therefore, the present study has been undertaken to identify, document and management of date palm and stevia diseases in Bangladesh.

8.2 OBJECTIVES:

1. To identify different diseases of date palm and stevia in Bangladesh;
2. To investigate and document the pathogens that are responsible for such diseases in those crops and
3. To find out the most suitable management practice (chemical and/or biological) of identified diseases.

8.3 METHODOLOGY:

Data will be recorded on different diseases from different locations. Diseased plant parts will be collected; suspected pathogen isolation, culturing the isolated pathogen in PDA (Potato Dextrose Agar) media and pathogenicity test will be performed at Pathology laboratory in BSRI, Ishwardi and finally morphological and molecular identification of disease causal organism will be done.

Stem and root rot of stevia has been identified in cropping season 2024-2025. The identified disease will go through the management part. The design of the experiment will be assigned in complete block design (CBD) having three replications. The experiment will consist of the following treatments:

TREATMENTS: 7

- T_0 : Control
- T_1 : Spraying of Autostin 50 WDG (Carbendazim) @1 g/L of water (At the time of transplanting, 30 DAT and 60 DAT)
- T_2 : Spraying of Score 250 EC (Difenoconazole) @ 2 ml/L of water (At the time of transplanting, 30 DAT and 60 DAT)
- T_3 : Spraying of Acibin 28 SC (Azoxystrobin + Ciproconazole) @ 2 ml/L of water (At the time of transplanting, 30 DAT and 60 DAT)
- T_4 : Spraying of Amistar TOP 32.2 SC (Azoxystobin and Difenoconazole) @ 1 ml/L of water (At the time of transplanting, 30 DAT and 60 DAT)
- T_5 : Spraying of *Trichoderma harzianum* @ 106 C.F.U/mL of water (At the time of transplanting, 30 DAT and 60 DAT)
- T_6 : Spraying of Shabab 32.2 SC (Hexaconazole) @ 1 ml/L of water (At the time of transplanting, 30 DAT and 60 DAT)

8.4 WORK ELEMENTS:

1. Survey to date palm and stevia growing areas
2. Collection of diseased plant parts
3. Isolation, culturing and pathogenicity test
4. Morphological and molecular identification of disease causal organisms
5. Spraying of treatments according to doses
6. Data recording on disease incidence and severity
7. Data analysis and reporting

8.5 TIME SCHEDULE:

Ac.	2025			202 6											
No.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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8.6 ECONOMIC IMPACT:

By identifying different diseases of date palm and stevia yield losses could be minimized. As a result, growers of those crops will be economically benefited through increased yield, juice and *gur* production.

8.7 EFFECT ON ENVIRONMENT:

The research work has no adverse effect on environment. Rather, it is eco-friendly and will be reduced the disease incidence in the field.

8.8 UTILIZATION OF RESEARCH RESULTS:

With the completion of the experiment, different diseases of date palm and stevia will be identified. As a result, proper management and control measures of identified diseases will be suggested to the farmers. Eventually, the farmers will be benefited by getting more yields and escaping losses due to diseases.

9.0 TITLE : **MONITORING OF SUGARCANE DISEASES IN THE MILL AND NON-MILL ZONES**

LOCATION : BSRI, Ishwardi, NBSM, JSM, RJSM, MKSM, Barisal, Chuadanga, Chapai nawabgang, Joypurhat, Jamalpur, Narail, Sirajgang, Habiganj and Chittagong Hill Tracts

INVESTIGATORS : M A Rahman, M I Hossain, S Sultana and M R Islam

NATURE OF STUDY : On- going

DURATION : Continuous

ESTIMATED COST(Tk): 100000.00

9.1 DEFINITION OF THE PROBLEM:

The major sugarcane disease like red rot, wilt, white leaf, smut, top rot and leaf scald may occur and cause substantial damage of the crop. The incidence of different diseases of sugarcane can give the idea of disease occurrence. If monitoring of the disease incidence is done properly in time, disease incidence of different varieties/clones could be ascertained and appropriate control measures could be given in time.

9.2 OBJECTIVES:

1. To maintain up to date knowledge for the incidence of existing and new diseases if any in mill and non-mill zones;
2. To suggest appropriate control measures in time for current and future outbreak of diseases and
3. To determine the distribution and severity of some more common disease in Bangladesh.

9.3 METHODOLOGY:

Survey and monitoring of the disease incidence will be done in different agro-ecological zones (15 locations) covering mill and gur zones. Scientists will visit each selected areas three times in a year and will inspect the field and collect data in a prescribed format.

9.4 WORK ELEMENTS:

1. Disease survey and monitoring quarterly/annually
2. Data collection and reporting of diseases incidence

9.5 TIME SCHEDULE:

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9.6 ECONOMIC IMPACT:

Through monitoring of sugarcane diseases, instant measures will be taken and thus the crops will be saved from yield losses. Besides, future plan on location-wise disease control measures can be taken.

9.7 EFFECT ON ENVIRONMENT:

Monitoring of sugarcane diseases throughout the mill and non-mill zone bring good effect on environment through disease control.

9.8 UTILIZATION OF RESEARCH RESULTS:

The researchers, extension workers and cane growers will be able to maintain upto date knowledge about the incidence of existing and new diseases, if any, in mill and non-mill zones and can take appropriate control measure in time for current and future outbreak of diseases.

PROGRAMME AREA : SEED TECHNOLOGY
10.0 TITLE : PRODUCTION, QUALITY CONTROL AND DISTRIBUTION OF DISEASE FREE CLEAN SEED OF SUGARCANE
LOCATION : BSRI, Ishwardi
INVESTIGATORS : M A Rahman, M I Hossain, S Sultana and M R Islam
NATURE OF STUDY : On-going
DURATION : 2025-2026
ESTIMATED COST(Tk): 5,00000.00

10.1 DEFINITION OF THE PROBLEM:

Major diseases of sugarcane like red rot, white leaf, wilt, smut, RSD and mosaic are seed piece transmissible. So to control these diseases it is prime need to supply disease free clean seed. To conduct experiments of different divisions of BSRI as well as to supply to the growers of different sugar mill zones and non mill zones, quality control for diseases and seed production of different varieties of sugarcane is a routine programme of the division. It should be mentioned that about 60% clean seeds are being used in mill zones. However use of clean seeds in the non-mill zones is almost absent.

10.2 OBJECTIVES:

1. To supply the disease free clean seeds for the requirement of different divisions of BSRI and out-station experiments.
2. To distribute the disease free clean seeds to the mills and non-mill zones for further multiplication.
3. To minimize the disease incidence of sugarcane throughout the country.

10.3 METHODOLOGY:

High lands with proper drainage facilities will be selected for Foundation/Certified seed production. Required quantity seeds of all promising clones under ZYT III and commercial varieties will be planted in the soil bed after treating by MHAT at 54°C for 4 hours (including initial heating time) followed by Autostin treatment. After planting following STP method, regular inspection (every two months interval) will be made to find out disease infected clumps/plants. Disease infected clumps will be rogued out and affected plant or plant parts will be removed as soon as it will be noticed. Mechanical as well as chemical control will be followed to control insects. Recommended doses of fertilizers and other cultural practices will be followed. Finally the seed plots will be kept 100% free from different major diseases. Seed plots will be surrounded with 2-4 guard rows with the same variety.

10.4 WORK ELEMENTS:

1. Land selection and preparation.
2. Seed Collection.
3. Seed treatment by MHAT at 54°C for 4 hrs (including initial heating time) to raise the temperature at 54°C) followed by Autostin treatment
4. Planting of treated setts in the seed bed.
5. Transplanting of settlings in the main field.
6. Inspection for disease(s) and pests and rouging out of diseased clumps or removal of affected plant or plant parts.
7. Mechanical pest control.
8. Application of fertilizer and biocides.

9. Tying of canes to protect from lodging.
10. Harvest of crop.
11. Reporting.

10.5 TIME SCHEDULE:

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10.6 ECONOMIC IMPACT:

By using disease free foundation seeds the yield of cane could be increased at least by 25-30%.

10.7 EFFECT ON ENVIRONMENT:

This project has good impact on environment by using of disease free healthy seed cane.

10.8 UTILIZATION OF RESEARCH RESULTS:

The produced disease free breeder and foundation seeds will be used by different divisions of BSRI to set up different experiments in the mills and non-mill zones. Simultaneously the foundation seeds will be distributed to BSRI farm division and different sugar mills for further multiplication as certified seed. Through distribution of disease free foundation and certified seed to different research divisions and sugar mills, experimental error could be minimized and disease incidence in the sugar mills could be reduced as well.

11.0 TITLE : PRODUCTION OF DISEASE FREE DATE PALM SEEDLINGS THROUGH TISSUE CULTURE TECHNIQUE
LOCATION : BSRI, Ishwardi
INVESTIGATORS : M A Rahman, M I Hossain, S Sultana and M R Islam
NATURE OF STUDY : New
DURATION : 2025-2026
ESTIMATED COST(Tk): 100000.00

11.1 DEFINITION OF THE PROBLEM:

Date palm (*Phoenix dactylifera* L.) is a dioecious tree that belongs to the family Arecaceae. It is widely cultivated across the world, and its economic importance for producing fruits, juice, and *gur* has increased over the years. Date fruit is a good source of high-nutritional-value food. Moreover, it is rich in carbohydrates, dietary fibers, proteins, minerals, and vitamin B complex, such as thiamine (B1), riboflavin (B2), niacin (B3), pantothenic (B5), pyridoxine (B6), and folate (B9) (Eoin, 2016), phytochemicals, etc. It contributes to environmental conservation, agricultural sustainability, and food security in drought-prone areas of the world with limited water resources. Seed propagation of date palm is not a viable method because it does not produce the desired plants and results in genetic variability (heterozygosity) among the offspring. Farmers want to maximize the number of female plants they have. This is to prevent using too much of the available resources on fruitless male plants. Additionally, seed propagation delivers plants that may not be true-to-type. These palms also take a long delay before fruiting. In addition to these problem it encountter some seedborne disease like graphiola leaf spot, alternaria leaf spot and fruit rot which also plays an important role for facing not only

the yield but also the quality of juice and fruit of the crop. To overcome these problem production of seedling through tissue culture can be a better option. Therefore, the cultivation of date palms requires true-to-type planting materials, which can only be produced through tissue culture techniques.

11.2 OBJECTIVES:

1. To identify suitable sources of explants for micro propagation of date palm;
2. To develop tissue culture protocols and
3. To produce date palm seedlings through tissue culture technique.

11.3 METHODOLOGY:

Shoot tip of offshoots and immature inflorescences will be used as explants for micro propagation of date palm. The explants will be cut into small pieces, dipped into fungicide solution (Topsin M 70) for 30 seconds and washed thoroughly with distilled water. Then the explants will be taken under laminar airflow cabinet. Surface sterilization will be done with 0.1% mercuric chloride solution and finally washed three times with distilled water. MS medium supplemented with different concentrations and combinations of auxins and cytokinins will be prepared. The sterilized explants will be inoculated and then incubated aseptically on MS media with different concentrations and combinations of growth regulators for shooting and rooting. Rooted plantlets will go through acclimatization and transplanted in the field.

11.4 WORK ELEMENTS:

1. Collection of suitable explants and sterilization.
2. Media preparation
3. Inoculation and incubation of collected explants
4. Sub-culture
5. Observation and data collection under *in vitro* conditions
6. Acclimatization of plantlets
7. Transplantation of plantlets in the field
8. Observation on disease incidence and data collection under field conditions

11.5 TIME SCHEDULE:

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11.6 ECONOMIC IMPACT:

By using disease free healthy seedlings of date palm, production cost will be reduced and yield of date palm will be increased. As a result, farmers will be economically benefitted.

11.7 EFFECT ON ENVIRONMENT:

The research work has no adverse effect on environment rather it is environment friendly.

11.8 UTILIZATION OF RESEARCH RESULTS:

After the completion of the experiment, disease free seedling production of date palm through tissue culture protocols will be developed. With this developed protocol mass production of disease free date palm seedling will be possible. As a result the crop can be expanded all over the country with in a short time.

TRAINING AND TECHNOLOGY TRANSFER DIVISION

Rationale

Sugarcane is one of the important cash cum industrial crops of Bangladesh. It plays an important role in national economy. In Bangladesh, it is used as raw materials in sugar industry, *gur* factory and juice production and also used for chewing purposes. The by-product of sugar industry such as molasses, bagasse etc. has multipurpose industrial use. But the sugar industry of Bangladesh has been suffering from the under-capacity production syndrome due to shortage of its raw material i.e. sugarcane. Again yield of sugarcane is very poor due to lack of modern technology adoption by the farmers.

Many sugarcane production technologies generated at the research premises can hardly find their way among the members of the farming community. The low-level adoption of modern sugarcane production technologies and yield indicate that there are some problems associated either with the technologies or with the mechanism of dissemination or with the both that should be investigated. The first study of this division is the identification of these problems so that BSRI, BSFIC and DAE can improve their technology development and dissemination mechanism.

The second study is the monitoring of technology-based subsidy program in sugarcane. A subsidy programme is continued on some selected sugarcane production technologies during last few years. Hence, a follow up study is essential for effectiveness of the subsidy program.

In addition to the above studies, this division will also organize and conduct technology transfer program through training of extension personnel of BSFIC and DAE and advanced farmers of mills as well as non-mill zones and setting up of demonstrations in cane growers' field, especially in non-mill zones.

LIST OF EXPERIMENTS

1.0 Title : Adoption of Modern BSRI Technologies in Selected Sugar Mills and Non-Mill Zones
2.0 Title : Effects of Subsidy Program on Sugarcane Production
3.0 Title : Regional analysis of youth participation in sugarcane cultivation
4.0 Title : Status of Nipa Palm Juice and *Gur* Production in the Southern part of Bangladesh

PROGRAMME IN DETAILS

1.0 TITLE : **ADOPTION OF MODERN BSRI TECHNOLOGIES IN SELECTED SUGAR MILLS AND NON-MILL ZONES**
LOCATION : Mill Zone (TSM, JSM & NBSM)
Non-Mill Zone (Chapainawabganj, Sirajganj & Gazipur)
INVESTIGATORS : M A Rasel, M S Islam, N J Upoma and M Kamruzzaman
NATURE OF STUDY : On-Going (Modified)
DURATION : 2010- 2030
ESTIMATED COST(Tk): 100,000/-

1.1 DEFINITION OF THE PROBLEM:

Very often, people at the policy level show their concern about the level of technology adoption in the field. Many technologies are generated in the research institutions of which very few get their entrance in the farmers' level. Adoption of technology ranged from 1-98% in sugar mills zones (BSFIC 2004-05). It appears from another study that technology adoption rate is as low as 2.4 - 56.4 % in case of different improved sugarcane production technologies (Kranti Associate 1996). Present low level technology adoption and sugarcane yield indicates that there must are some problem either with the technologies or with the dissemination mechanism or with the both which should be investigated and recorded for future improvement of the scenario.

1.2 OBJECTIVES

1. To determine the extent of adoption of BSRI developed modern sugarcane production technologies in the sugar mills and non-mill zones;
2. To assess sugarcane farmers' knowledge on BSRI recommended sugarcane production technologies;
3. To identify the bottlenecks that retard adoption of modern sugarcane production technologies and
4. To ascertain the differences in adoption of modern sugarcane production technologies between the growers of sugar mills and non-sugar mills zones.

1.3 METHODOLOGY

Thirty sugarcane farmers will be selected from each sub zone of the selected sugar mills area and concentrated sugarcane growing upazilas of the mill and non-mill zones following stratified random sampling techniques representing small, medium and large farmers. Farmers' knowledge and adoption of selected BSRI technologies as well as bottlenecks for adoption will be identified through using personal interview schedules. Technology adoption will be measured by using the following formula:

$$\text{Adoption quient} = \frac{(T_i/L)}{N} \times 100$$

Where,

i = 1, 2, 3 ...N
N = Total numbers of technologies
L = Total area under sugarcane in ha
T_1 = Area of sugarcane in hectare under early planting
T_2 = Area of sugarcane in hectare under high and medium highland
T_3 = Area in hectare under recommended sugarcane varieties
T_4 = Area of sugarcane in hectare under recommended row spacing
T_5 = Area of sugarcane in hectare under planting/transplanting in trenches
T_6 = Area of sugarcane in hectare under STP
T_7 = Area in hectare under methodological intercropping
T_8 = Area in hectare under paired - row cane for cultivation of more than one intercrop

T_9 = Area of sugarcane in hectare under application of recommended fertiliser dose
T_{10} = Area of sugarcane in hectare under control of insect pests by mechanically & chemically
T_{11} = Area of sugarcane in hectare planted/transplanted with treated seed cane with chemicals
T_{12} = Area of sugarcane in hectare under irrigation

1.4 WORK ELEMENTS:

1. Preparation of data gathering instruments
2. Selection of sample sugarcane farmers
3. Field data collection (questionnaire, FGD, KII)
4. Data entry, cleaning, and analysis
5. Drafting findings and validation
6. Final report preparation

1.5 TIME SCHEDULE:

Data related to the knowledge and adoption of modern sugarcane production technologies will be gathered from the sample sugarcane farmers during December to June every year. Compilation of data will be completed within June to October 2026 of each year.

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1.6 ECONOMIC IMPACT:

The study results will be helpful in determining the level of technology adoption and problems faced by the farmers in adopting sugarcane technologies. This feedback will benefit the scientists (for further refinement of the technology) and the extensionists (for undertaking appropriate extension methodology).

1.7 EFFECTS ON ENVIRONMENT:

There will be no impact on environment as it is a socio-economic survey-based study.

1.8 UTILIZATION OF RESEARCH RESULTS:

The research results are expected to be of much benefit to the BSRI, BSFIC and DAE as well as the sugar mills for improving the technologies and dissemination mechanism.

2.0 TITLE : EFFECTS OF SUBSIDY PROGRAM ON SUGARCANE PRODUCTION
LOCATION : NBSM and NTSM
INVESTIGATORS : N J Upoma, M A Rasel, M S Islam and M Kamruzzaman
NATURE OF STUDY : New
DURATION : 2025-2026
ESTIMATED COST(Tk): 40,000.00

2.1 DEFINITION OF THE PROBLEM:

The government of Bangladesh started subsidizing the farmers in the mill zone from the financial year 2003-2004 with an aim of encouraging the sugarcane growers to adopt more sugar producing varieties and improved sugarcane cultivation technologies developed by BSRI. This subsidy is given directly to the farmers for cultivation of specified varieties and certain technologies. BSRI has mediated this process from the government to the sugarcane grower via BSFIC. In this process BSRI has included the improved varieties and technologies as precondition to receive the benefit, with a view to enhancing the technology transfer activities. To execute this subsidy program successfully and to help the farmers to derive the best benefit from this program, it is necessary to know the effects of the program and its drawbacks and thus the program was formulated.

2.2 OBJECTIVES:

1. To describe the socio-economic characteristics of the respondent beneficiaries in the study area;
2. To examine the benefits derived by the respondent beneficiaries from the subsidy program in the study area;
3. To explore the relationship between socioeconomic characteristics and benefits derived from the subsidy program by the respondent beneficiaries in the study area and
4. To identify the challenges or problems faced by the respondent beneficiaries in subsidy program.

2.3 METHODOLOGY:

80 of respondents which are receiver of subsidy program will be selected and 80 of non-receiver respondents will be selected from two mills which are North Bengal Sugar Mills ltd. and Natore Sugar Mills Ltd. considering simple random sampling technique. Respondents' socio-economic characteristics, benefits derived and identify the challenges faced by the respondents will be identified through using personal interview schedules. Collected data will be sorted, compiled and tabulated. Analysis like frequency counts, percentages, ranged will be used. Chi-squares, Pearson product moment correlation and t-test will be employed through SPSS computer program.

2.4 WORK ELEMENTS:

Following specific works to be undertaken for the survey work.

1. Construction of data gathering instruments
2. Gathering information by using semi structured questionnaires/ interview schedules
3. Compilation and analysis of data
4. Report writing

2.5 TIME SCHEDULE:

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2.6 ECONOMIC IMPACT:

The study results will be helpful determining the effects and drawbacks of the subsidy program and thus will be helpful for the scientist and planners to execute it in a more economically feasible way.

2.7 EFFECTS ON ENVIRONMENT:

There will be positive impact on environment as it is a socio-economic survey based study.

2.8 UTILIZATION OF THE RESEARCH RESULTS:

The results or recommendation of the study may suggest the effects of subsidy program and problems faced by the farmers in this subsidy program which will be useful for the planner and decision makers to plan and execute subsidy program in a more fruitful way.

3.0 TITLE : REGIONAL ANALYSIS OF YOUTH PARTICIPATION IN SUGARCANE CULTIVATION
LOCATION : Natore, Rajshahi, Gazipur, Bandarban, Barishal and Sylhet
INVESTIGATORS : R M Saiem, M S Islam, M A Rasel and N J Upoma
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk): 1,00,000/-

3.1 DEFINITION OF THE PROBLEM:

Agricultural development in Bangladesh is undergoing a transformation with increased emphasis on inclusivity, sustainability, and regional equity. Among the key players in this transition are youth and women, whose active involvement in farming is essential for ensuring food security, rural employment, and innovation in agricultural practices. However, participation in sugar crop cultivation a vital agro-industrial sector remains uneven across regions and gender lines.

This research seeks to explore and analyze the extent, nature, and challenges of youth and women's participation in sugar crop cultivation across selected regions of Bangladesh. Understanding their roles, opportunities, and constraints will help formulate strategies to enhance inclusive growth in the sugarcrop sector, aligned with the national development goals and SDGs.

3.2 OBJECTIVES:

1. To assess the socio-demographic characteristics of sugarcane producers;
2. To evaluate the profitability of sugarcane cultivation;
3. To know the youth engagement in any stages of sugarcane cultivation;
4. To identify the factors influencing youth involvement in sugarcane cultivation and
5. To formulate strategic recommendations for enhancing sugarcane production based on the study findings.

3.3 METHODOLOGY:

This study will follow a mixed-method approach to collect and analyze both quantitative and qualitative data from selected sugar crop-growing regions in Bangladesh.

Study Area Selection

The research will be conducted in 6 major sugar-growing districts chosen for their regional diversity and significant sugar crop cultivation.

Sample Selection

A purposive random sampling technique will be used to ensure representation of youth (18–35 years) and women farmers involved in sugar crop farming. Around 400 respondents will be selected across all regions, with proportional inclusion of male, female, and youth participants.

Data Collection Tools

1. Structured Questionnaires for collecting household and farm-level data.
2. Focus Group Discussions (FGDs) and face to face survey with women and youth farmer groups to understand challenges and opportunities.
3. Key Informant Interviews (KIIs) with agricultural officers and extension workers to gather expert insights.

Data Analysis

The data will be analyzed using R studio or SPSS, with descriptive statistics (percentages, averages, frequencies) to interpret patterns.

3.4 WORK ELEMENTS:

1. Collection and design of research tools and inputs
2. Selection and mapping of stakeholder
3. Field data collection (questionnaire, FGD, KII)
4. Data entry, cleaning, and analysis
5. Drafting findings and validation
6. Final report preparation

3.5 TIME SCHEDULE:

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3.6 ECONOMIC IMPACT:

- Empowering youth sugarcane cultivation can increase agricultural productivity and household incomes.
- Encourages entrepreneurship, especially in processing, seedling production, and value chains which reduces rural unemployment and urban migration.
- Helps optimize the utilization of underused lands, increasing national sugar output and reducing import dependency.

3.7 EFFECT ON ENVIRONMENT:

This investigation is environment friendly and there would have no adverse impact on environment.

3.8 UTILIZATION OF RESEARCH RESULTES:

- Data can be Used by BSRI, DAE, NGOs, and policy planners to develop gender- and youth-sensitive extension programs.
- Provides baseline data for further research or development projects related to agro-entrepreneurship.
- Supports evidence-based policy recommendations for the Ministry of Agriculture and local government bodies

4.0 TITLE : STATUS OF NIPA PALM JUICE AND *GUR* PRODUCTION IN THE SOUTHERN PART OF BANGLADESH

LOCATION : Barguna, Bagerhat (Mongla) and Khulna (Dakop), Patuakhali (kolapara)

INVESTIGATORS : M S Islam, M A Rasel, N J Upoma, R M Saiem, M S Arefin, R K Ganapati and M Kamruzzaman

NATURE OF STUDY : New

DURATION : 2025-2028

ESTIMATED COST(Tk): 1,50,000/-

4.1 DEFINITION OF THE PROBLEM

Nipa palm (*Nypa fruticans*) is a mangrove palm species that grows abundantly in the tidal coastal regions of Bangladesh, particularly in the southern belt. It is well adapted to saline and waterlogged conditions, making it an important natural resource for communities living in coastal and estuarine ecosystems. Traditionally, nipa palm has been valued for its leaves, which are used in thatching and handicrafts, but its sweet sap also holds considerable potential for producing juice, jaggery (*gur*), and other value-added products.

In Bangladesh, the production of palm juice and *gur* from species such date palm (*Phoenix sylvestris*) has long been practiced. However, the contribution of nipa palm to sweetener production has received limited attention despite its availability and socio-economic importance. Local communities in southern coastal areas extract sap from nipa palm inflorescences, which is consumed fresh as juice or processed into *gur*. This activity not only supplements rural livelihoods but also represents an eco-friendly alternative to conventional sugar sources.

Understanding the current status, challenges, and opportunities of nipa palm juice and *gur* production is essential for promoting its sustainable utilization, enhancing rural income, and diversifying sweetener sources in Bangladesh.

4.2 OBJECTIVES:

- To document the traditional practices, processing techniques, and extent of juice and *gur* production from nipa palm in selected coastal areas;
- To analyze the socio-economic importance of nipa palm sap utilization in supporting rural livelihoods and
- To identify the challenges, limitations, and future opportunities for sustainable production and commercialization of nipa palm-based sweeteners.

4.3 METHODOLOGY:

The study will be conducted in selected coastal districts of southern Bangladesh (e.g., Khulna, Satkhira, Bagerha, Patuakhali (kolapara), where nipa palm (*Nypa fruticans*) naturally grows and is traditionally tapped for juice and *gur* production.

Study Design

A mixed-methods approach will be applied, combining both qualitative and quantitative data.

Sampling and Respondents

Stratified sampling will be used to select villages where nipa palm sap harvesting is practiced. Data will be collected from local sap collectors, processors, traders, and consumers. A sample size of approximately 150 respondents will be targeted, depending on the availability of practitioners.

Data Collection Methods

1. **Household Survey:** A structured questionnaire will be used to collect information on sap collection practices, production scale, processing methods, costs, and income.
2. **Key Informant Interviews (KIIs):** Interviews with local leaders, extension workers, and experienced sap harvesters will provide insights into traditional knowledge and current challenges.
3. **Focus Group Discussions (FGDs):** Community discussions will capture shared experiences, socio-economic importance, and perceptions of opportunities.
4. **Field Observation:** Direct observation of sap tapping, juice collection and *gur* preparation processes will be documented.

(i) Data Analysis

The data will be analyzed using R studio or SPSS, with descriptive statistics (percentages, averages, frequencies) to interpret patterns.

4.4 WORK ELEMENTS:

1. Literature review and design of research tools
2. Selection of study areas and stakeholder mapping
3. Field data collection (questionnaire, FGD, KII)
4. Data entry, cleaning, and analysis
5. Drafting findings and validation
6. Final report preparation

4.5 TIME SCHEDULE:

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4.6 ECONOMIC IMPACT:

Nipa palm (*Nypa fruticans*) juice and *gur* production provides low-cost, seasonal income for coastal households in southern Bangladesh. It supports rural livelihoods, offers an alternative sweetener, and holds potential for commercialization. By utilizing naturally growing resources in saline areas, nipa palm contributes to household earnings and food security. Its juice and *gur* production can enhance rural economies if processing and marketing are improved.

4.7 EFFECT ON ENVIRONMENT:

This investigation is environment friendly and there would have no adverse impact on environment.

4.8 UTILIZATION OF RESEARCH RESULTES:

Data can be Used by BSRI, DAE, NGOs, and policy planners to develop sensitive extension programs.

- Provides baseline data for further research or development projects related to agro-entrepreneurship.
- Supports evidence-based policy recommendations for the Ministry of Agriculture and local government bodies.

AGRICULTURAL ECONOMICS DIVISION

Rationale

As an agriculture-dependent nation, Bangladesh sees many resource-poor farmers engaged in beekeeping as a vital livelihood option. Traditional beekeeping methods, limited technological adoption, and insufficient support hinder productivity and income growth. Although the Bangladesh Sugarcrop Research Institute (BSRI) has introduced improved beehives, adoption remains low. This study aims to assess the impact of BSRI-modified beehives on honey yield and beekeepers' income to guide policy interventions for sustainable apiculture development, poverty reduction, and ecosystem conservation.

Sugarcane farming plays a vital role in sustaining livelihoods and supporting Bangladesh's sugar industry. However, sugarcane is increasingly challenged by declining areas, yields, and inequitable market practices. This study examines trends in cultivation areas, productivity, and pricing to identify key issues and propose data-driven solutions. The insights aim to guide policy interventions that promote sustainability, boost farmer incomes, and enhance the sector's resilience to climate change and market volatility.

LIST OF EXPERIMENTS

1.0 Title : Impact of BSRI-modified bee hive technology on honey productivity and income of beekeepers of Sirajganj and Pabna districts

2.0 Title : Study on of sugarcane farmers in Bangladesh: Assessing area, Production, yields and price

PROGRAMME IN DETAILS

PROGRAMME AREA : **SOCIO-ECONOMIC AND TOT**
1.0 TITLE : **IMPACT OF BSRI-MODIFIED BEE HIVE TECHNOLOGY ON HONEY PRODUCTIVITY AND INCOME OF BEEKEEPERS OF SIRAJGANJ AND PABNA DISTRICTS**
LOCATION : Sirajganj and Pabna districts.
INVESTIGATORS : M Kamruzzaman, M E Reza and K Mahmud
NATURE OF STUDY : On-going
DURATION : 1 years
PROJECT COMPLETION : 2025-2026
ESTIMATED COST(Tk) : 1,50,000/-

1.1 DEFINITION OF THE PROBLEM:

As a nation primarily reliant on agriculture, the majority of Bangladesh's population is directly or indirectly involved in a diverse array of agricultural pursuits. Beekeeping is an essential alternative source of livelihood for many resource-poor farmers. The country has more than four (04) lakh beehives, and around twenty (20) thousand beekeepers are involved in honey production (DAE, 2023). The Beekeepers have the potential to produce 100,000 tons of honey, but current output is limited to 20,000 tons of honey in Bangladesh. Still, despite the favorable natural environment and the potential for establishing sustainable livelihoods in rural areas, it often lacks the necessary financial and technological support required to fully exploit its great potential in conserving forests and natural ecosystems and reducing poverty. As it is known, the traditional way of beekeeping is practiced throughout the country. Technological improvement is the foremost requirement for increasing agricultural productivity and poverty reduction in the long term. The low productivity of honey calls for measures to provide improved technologies to beekeepers to boost honey production. Recognizing the potential of the apiculture subsector and the challenges posed by traditional beehives, the Bangladesh Sugarcrop Research Institute (BSRI) has intensified its efforts through apicultural research. This initiative aims to support beekeepers by introducing and promoting improved beehives, thereby enhancing productivity and honey production. However, it is observed that the number of BSRI-modified beehive technologies used by beekeepers was minimal. Therefore, this study has been designed to support policymakers in formulating strategic policies for the impact of BSRI-modified bee hive technology on honey productivity and income of beekeepers in Sirajganj and Pabna districts.

1.2 OBJECTIVES:

i) To find out the factors affecting BSRI-modified bee hives of beekeepers;
ii) To estimate the effects of BSRI-modified beehive on honey productivity and income;
iii) To identify the constraints of honey production; and
iv) To suggest some policy recommendations based on research findings.

1.3 METHODOLOGY:

Nature of data:

A total of 120 beekeepers will be interviewed for primary data collection. These beekeepers were classified as adopters (45) and non-adopters (75) of the BSRI-modified bee hive. Beekeepers who exclusively utilized BSRI-modified bee hives were classified as adopting beekeepers. Non-adopting beekeepers were included who utilized traditional bee hives.

Analytical technique:

The endogenous switching regression model (ESRM) and propensity score matching (PSM) method will be employed to obtain unbiased and consistent results considering endogeneity, heterogeneity and self-selection bias. An econometric issue involving sample selection bias and heterogeneity is the driving force behind the use of the endogenous switching regression model. The adoption of BSRI modified bee hive and its impact on honey productivity and household income will be evaluated using the endogenous switching regression model (ESRM) and the propensity score matching (PSM) method. The PSM method will be used to supplement the endogenous switching regression in comparing the honey productivity outcome of adopters of the BSRI modified bee hive and their counterparts. The probit model will be used to create the propensity score for those who initially adopt the BSRI modified beehive. The propensity score is expressed as in the equation:

$$p(x) = P_r\{Z = 1|X|\} = E\{Z|X|\}$$

Where p(x) is the propensity score, Z {1, 0} is the treatment variable or the dummy adoption variable, and X is a vector of beekeepers' characteristics.

1.4 WORK ELEMENTS:

Sl. No.	Activity		Duration (Month)
1.	Study area selection	:	02
2.	Questionnaire preparation	:	01
3.	Pre-test questionnaire	:	02
4.	Finalize questionnaire	:	01
5.	Data collection	:	06
6.	Data entry	:	03
7.	Data management	:	02
8.	Data analysis	:	02
9.	Report writing	:	02

1.5 TIME SCHEDULE:

Activities No.	Year (2025)						Year (2026)					
	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
1	→	→										
2		→	→									
3		→	→									
4				→								
5				→	→	→	→	→	→	→		
6							→	→	→			
7								→	→			
8										→	→	
9											→	→

1.6 ECONOMIC IMPACT:

BSRI-modified bee hive technology aims to enhance honey productivity and improve beekeepers' livelihoods. It may reduce production costs by improving the management of bee colonies and reducing losses due to inefficient hive design and colony health. By optimizing hive design and colony health, beekeepers can minimize costs associated with traditional practices, such as purchasing additional hives or replacing bee colonies.

1.7 EFFECT ON ENVIRONMENT: The study has no adverse effect on the environment.

1.8 UTILIZATION OF RESULTS:

The results from studies can guide policymakers to provide targeted subsidies, training programs, and investment in rural beekeeping infrastructure. Government support in the form of technical assistance and financial incentives can help scale up the use of improved hives and boost honey production nationwide.

PROGRAMME AREA : SOCIO-ECONOMIC AND TOT

2.0 TITLE : STUDY ON SUGARCANE FARMERS IN BANGLADESH: ASSESSING AREA, PRODUCTION, YIELDS AND PRICE

LOCATION : Fourteen agro-ecological zones of Bangladesh

INVESTIGATORS : M Kamruzzaman and K Mahmud

NATURE OF STUDY : New

DURATION : 2 years

PROJECT COMPLETION : 2025-2027

ESTIMATED COST(Tk) : 3,00,000/-

2.1 DEFINITION OF THE PROBLEM:

The production of sugarcane is of great importance in the economy of Bangladesh. It employs millions of people, and it is the primary raw material for the sugar industry. The sector is economically vital, but it faces continuous production and marketing challenges that endanger its viability. This study examines three key aspects of sugarcane farming: area under cultivation, yield, and price across major sugarcane-producing regions. In recent years, farmers have been alternating between two cultivation patterns due to these competing crops. However, the yield levels being observed as a whole in Bangladesh are lower than their potential levels. This is primarily due to several reasons, including outdated production processes, inadequate access to high-quality inputs, climate vulnerabilities, and more. Farmers today face challenges with ever-changing prices, incompetent supply chains, and greedyintermediaries. By studying the sugarcane growers through a broad-based survey, this study intends to establish empirical evidence on land use patterns, productivity constraints and market inefficiency. The findings will be helpful for policymakers in developing targeted interventions on the issue of production and post-harvest. This research will help bolster evidence-based strategies to improve the competitiveness and sustainability of the sugarcane sector in light of shifting agricultural practices and market dynamics by bridging knowledge gaps.

2.2 OBJECTIVES:

i) Analyzing sugarcane cultivation area across different agro-ecological zones;
ii) Examining agronomic practices, input use patterns, and environmental constraints affecting sugarcane yield;
iii) Identifying factors influencing sugarcane farmers' land allocation decisions and
iv) Investigating price mechanisms and challenges faced by sugarcane farmers.

2.3 METHODOLOGY:

Selection of the study area:

The study will be conducted at fourteen (14) agro-ecological zones to collect the necessary field-level data. The names of agro-ecological zones and their respective districts are as follows:

AEZ No.	AEZ Name	Representative Districts (Sugarcane Areas)
AEZ 1	Old Himalayan Piedmont Plain	Panchagarh, Thakurgaon
AEZ 2	Active Tista Floodplain	Nilphamari, Rangpur
AEZ 3	Tista Meander Floodplain	Dinajpur, Kurigram
AEZ 4	Karatoya-Bangali Floodplain	Gaibandha, Bogura, Joypurhat
AEZ 5	Lower Atrai Basin	Naogaon, Rajshahi
AEZ 8	Young Brahmaputra-Jamuna Floodplain	Tangail, Jamalpur
AEZ 9	Old Brahmaputra Floodplain	Mymensingh, Netrokona
AEZ 10	Active Ganges Floodplain	Kushtia, Rajbari
AEZ 11	High Ganges River Floodplain	Pabna, Natore
AEZ 12	Lower Ganges River Floodplain	Faridpur, Magura
AEZ 13	Ganges Tidal Floodplain	Jessore, Khulna
AEZ 25	Level Barind Tract	Rajshahi, Chapainawabganj
AEZ 26	High Barind Tract	Naogaon, Bogura
AEZ 28	Madhupur Tract	Tangail, Mymensingh

Sampling technique:

Field survey method will be followed to collect primary data from the sample producers using a structured questionnaire. The questionnaire will be constructed and pre-tested for necessary modifications before starting the data collection. Besides, secondary information sources in the form of handouts, reports, publications, notifications, etc., having relevance and similarity with this study will also be considered.

Analytical technique:

After collecting necessary data and information from field surveys, interviews, communications, and interactions, they will be classified, edited, and coded. For analyzing the data, a combination of descriptive, mathematical, and statistical techniques will be used to achieve the objectives and obtain meaningful results.

2.4 WORK ELEMENTS:

Sl. No.	Activity		Duration (Month)
1.	Study area selection	:	02
2.	Questionnaire preparation	:	01
3.	Pre-test questionnaire	:	02
4.	Finalize questionnaire	:	01
5.	Data collection	:	06
6.	Data entry	:	03
7.	Data management	:	02
8.	Data analysis	:	02
9.	Report writing	:	02

2.5 TIME SCHEDULE:

Activities	Year (2025)						Year (2026)					
	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
1	→	→	→									
2		→	→									
3		→	→									
4				→								
5				→	→	→	→	→	→	→		
6							→	→	→			
7								→	→			
8										→	→	
9											→	→

2.6 ECONOMIC IMPACT:

Inform policies aimed at optimizing land use, increasing yields, and stabilizing prices, thereby directly benefiting farmers' incomes. Improved sector efficiency could attract investment, reduce sugar imports, and contribute to agricultural GDP, ultimately leading to sustainable economic development in sugarcane-dependent regions.

2.7 EFFECT ON ENVIRONMENT: The study has no adverse effect on the environment.

2.8 UTILIZATION OF RESULTS:

Study outcomes will support policy reforms, agricultural extension programs, and private sector investments to enhance productivity, stabilize prices and improve livelihoods.

REGIONAL SUGARCROP RESEARCH STATION, THAKURGAON

Rationale

Regional Sugarcrop Research Station (RSRS), Thakurgaon started functioning since 1985. This station mainly covers the districts of Panchagarh, Thakurgaon and Dinajpur Soil of this northern region falls under the Old Himalayan Piedmont Plain which is light textured with low organic matter. Sugarcane is the main cash crop of this region, but the average yield is low at farmers' level. The major objectives of this station are to select suitable, high yielding, high sugar content, tolerant to pests and diseases as well as drought and water logging sugarcane varieties for this region. Other responsibilities are to develop appropriate location specific technologies to control pests and diseases, to ascertain fertilizers requirement based on field trial, to develop remunerative sugarcane based farming with economic and high value intercrops and to popularize and expansion of date palm and palmyra palm plantation.

This station has so far developed the technology of double intercropping in paired- row cane over the coventional system, recommended gypsum @187 kg/ha which increased the cane yield to 6-7 t/ha, groundnut intercropping with sugarcane, double intercropping in single- row and paired- row cane with potato/onion as first intercrop and maize as second intercrop, relay intercropping of potato with sugarcane as first intercrop and sesame/mungbean as second intercrop etc. Through varietal trial Isd 20, Isd 21, Isd 32, Isd 34, Isd 35, Isd 36, Isd 37, Isd 38, Isd 39, Isd 40, BSRI Akh 43, BSRI Akh 44, BSRI Akh 45, BSRI Akh 46 and BSRI Akh 48 were found more suitable for this region. So far, more than 10,000 trainees were given short training on modern cane and intercrops, sugarbeet, date palm and palmyra palm production technologies.

In the current programme, one research programme on varietal improvement, two research programmes and one seed multiplication programme in the programme area of crop and soil management, eight training programmes and four demonstration plots under the programme area of training and technology transfer have been taken.

LIST OF THE EXPERIMENTS

PROGRAMME AREA: VARIETAL IMPROVEMENT

1.0 Title : Ratooning potentiality of BSRI bred promising sugarcane varieties in old Himalayan piedmont plain

PROGRAMME AREA: CROP AND SOIL MANAGEMENT

2.0 Title : Effects of pruning on vegetative traits and biomass production of stevia

3.0 Title : Influence of planting density and row spacing on the yield and quality attributes of sugarcane in old Himalayan piedmont plain

4.0 Title : Seed multiplication of the promising sugarcane varieties and seedling raising of date palm, palmyra palm and stevia

PROGRAMME AREA: SOCIO-ECONOMICS AND TECHNOLOGY TRANSFER

5.0 Title : Training/demonstration/field days at RSRS, Thakurgaon

PROGRAMME IN DETAILS

1.0 TITLE : **RATOONING POTENTIALITY OF BSRI BRED PROMISING SUGARCANE VARIETIES IN OLD HIMALAYAN PIEDMONT PLAIN**
LOCATION : RSRS, Thakurgaon
INVESTIGATORS : N Chowdhury, M M Rashid and M S Hossain
NATURE OF STUDY : On-going (modified)
DURATION : 2022-cond.
ESTIMATED COST(Tk) : 50,000/-

1.1 DEFINITION OF THE PROBLEM:

Sugarcane production through ratooning is a common practice in Bangladesh. This practice significantly reduces the cost of land preparation, planting and seed material. Benefits of ratooning is not well known to sugarcane growers. Good ratoon variety(s) is not available among the growers. There is ample scope to introduce ratooning practice if good ratoon variety is made available to farmers. Therefore, the experiment has been undertaken to select suitable variety(s) for ratooning for profitable cane production for this region.

1.2 OBJECTIVES:

1. To screen out the ratooning potential sugarcane variety(s) for AEZ I and
2. To popularize ratooning practice in AEZ I.

1.3 METHODOLOGY:

TREATMENTS:

T_1 : Isd 34
T_2 : Isd 37
T_3 : Isd 39
T_4 : BSRI Akh 43
T_5 : BSRI Akh 44
T_6 : BSRI Akh 45
T_7 : BSRI Akh 46
T_8 : BSRI Akh 48

Replications : 03
Design : RCB
Plot size : 8m x 6m

DATA TO BE RECORDED:

1. Tiller population at 60, 90, 120 and 150 days after stubble shaving
2. Stalk height (m), stalk diameter (cm), no. of internodes
3. Millable cane at harvest
4. Brix% at harvest
5. Cane yield at harvest

1.4 WORK ELEMENTS:

1. Stubble shaving
2. Irrigation
3. Inter row space mulching
4. Gap filling and basal fertilizer application
5. Weeding and mulching
6. Fertilizer top dressing
7. Pest control
8. Data collection (tiller, mllablecane, Brix% etc.)
9. Yield of ratoon cane at harvest

1.5 TIME SCHEDULE:

S.I. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→													
2				→					→							
3				→												
4				→												
5					→		→									
6						→					→					
7						→										→
8								→								→
9															→	→

1.6 ECONOMIC IMPACT:

Methodological ratoon management practice as well as selection of good variety(s) will help to increase sugarcane production and economic return.

1.7 EFFECT ON ENVIRONMENT: Friendly to soil and environment.

1.8 UTILIZATION OF RESEARCH RESULTS:

The result of the study will give a clear idea to the growers of TSM, PSM, STSM, SHSM region about ratoonning variety(s) and ratoon management practices.

2.0 TITLE : EFFECTS OF PRUNING ON VEGETATIVE TRAITS AND BIOMASS PRODUCTION OF STEVIA
LOCATION : RSRS, Thakurgaon
INVESTIGATORS : N Chowdhury, M S Hossain, M M Rashid and A K M R Islam
NATURE OF STUDY : On-going
DURATION : 2024-25/2027
ESTIMATED COST(Tk) : 50,000/-

2.1 DEFINITION OF THE PROBLEM:

Stevia rebaudiana (Bertoni) is a herbaceous perennial plant of the Asteraceae family, native to Paraguay (South America). It is commonly known as “sweet weed”, “sweet leaf”, “sweet herb” and “honey leaf”. It has achieved economic importance due to the different natural sweet compounds called steviol glycosides (SG) which are obtained from its leaves with taste sweet but with zero calories. The main sweet components in stevia dry leaves are steviosides (STV) which is about 200-300 times sweeter than sucrose. The stevia dried leaves powder is used in the tea cup as well as in other food items as calorie-free sweetener. It is completely natural, safe for human health and beneficial to diabetic patients. Apart from this it has some health benefits too. In recent time cultivation of stevia has made significant impact in countries like Japan, China, Brazil, Paraguay, Mexico, Russia, Indonesia, Korea, United States, India, Tanzania, Canada, and Argentina. This crop is highly potential in Bangladesh too. So, to cope up with the increasing demand of this herb among the diabetec patients and health concerned peoples, we are aiming at finding a way to increase the growth and yield of stevia.

2.2 OBJECTIVES:

1. To know pruning effect on stevia productivity;
2. To find appropriate pruning time and
3. To maximize leaf yield.

2.3 METHODOLOGY:

TREATMENTS:

T_1 : Field Condition

T_2 : Pruning at 30 DAP
T_3 : Pruning at 45 DAP
T_4 : Pruning at 60 DAP
T_5 : Pruning at 75 DAP
T_6 : Pruning at 30 and 60 DAP
T_7 : Pruning at 45 and 75 DAP
T_8 : Pruning at 60 and 90 DAP
T_9 : Pruning at 75 and 105 DAP
T_{10} : Pruning at 30, 60 and 90 DAP
T_{11} : Pruning at 45, 75 and 105 DAP
T_{12} : Pruning at 60, 90 and 120 DAP

Row to row distance : 30 cm
Plant to plant spacing : 40 cm
Stevia variety : BSRI Stevia 1
Plot size : 2m × 2m

Replication : 03
Design : RCB
Date of planting : March, 2024
Gross area : 0.05 ha

DATA TO BE RECORDED:

1. Plant height (cm)
2. Number of branch plant^{-1}
3. Number of leaves plant^{-1}
4. Fresh weight plant^{-1} (g)
5. Dry weight plant^{-1} (g)
6. Fresh leaf yield plant^{-1} (g)
7. Dry leaf yield plant^{-1} (g)
8. Initial and post harvest soil analysis

2.4 WORK ELEMENTS:

1. Land preparation
2. Plantation
3. Fertilization/Irrigation
4. Weeding
5. Data collection

2.5 TIME SCHEDULE:

Sl.No	2026									
	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov
1	→									
2		→								
3		→	→	→						
4			→	→						
5			→	→	→	→	→	→	→	

2.6 ECONOMIC IMPACT:

It is expected that stevia growers would get higher economic benefit from the results of this experiment.

2.7 EFFECT ON ENVIRONMENT:

This exp eriment is environment friendly and there would have no adverse effects on environment.

2.8 UTILIZATION OF RESEARCH RESULTS:

The results will be helpful for getting higher economic benefit from stevia cultivation by increasing yield.

3.0 TITLE : INFLUENCE OF PLANTING DENSITY AND ROW SPACING ON THE YIELD AND QUALITY ATTRIBUTES OF SUGARCANE IN OLD HIMALAYAN PIEDMONT PLAIN

LOCATION : RSRS, Thakurgaon

INVESTIGATORS : M S Hossain, M M Rashid and N Chowdhury

NATURE OF STUDY : New

DURATION : 2025-2026/2027

ESTIMATED COST(Tk) : 60,000/-

3.1 DEFINITION OF THE PROBLEM:

Sugarcane is a nutrient-sensitive, long-duration cash crop. Optimum plant population is important in best utilizing the inputs and get the highest return out of it. On the other hand, nutrient requirement of sugarcane varies from place to place according to soil and agro climatic condition over space and time. Yield potentiality of a crop would not reach maximum until proper fertilizer management is practiced. So, maximum yield and quality of sugarcane depend heavily on proper management of plant population density and fertilizer application. Both under and over population can reduce per area performance and profitability. Old Himalayan Piedmont Plain (AEZ-1) features sandy-loam soils with moderate to low fertility and distintcly seasonal moisture regimes. As plant population and fertilizer dose significantly influence cane yield, sugar content, and nutrient uptake efficiency, the experiment has been undertaken to select the most economically efficient combination for AEZ-1.

3.2 OBJECTIVES:

1. To optimize number of setts and spacing for planting sugarcane and
2. To increase income by getting higher yield.

3.3 METHODOLOGY:

TREATMENTS:

FACTOR A: NO. OF SETTS/HA

A_1 : 30,000 setts/ha (End to end)
A_2 : 50,000 setts/ha (End to end)
A_3 : 70,000 setts/ha (Overlapping)
A_4 : 90,000 setts/ha (Double line)

FACTOR B: ROW SPACING

B_1 : 70 cm
B_2 : 80 cm
B_3 : 90 cm
B_4 : 100 cm

Replications : 03
Design : RCB
Plot size : 8m x 6m
Variety : BSRI Akh 46

DATA TO BE RECORDED:

1. Germination counting at 45 DAP
2. Tiller counting at 120 and 150
3. Millable cane at harvest
4. Cane height and diameter at harvest
5. Brix% at harvest and
6. Yield at harvest

3.4 WORK ELEMENTS:

1. Layout of the field experiments
2. Basal fertilizer application and plantation of sett in the field
3. First top dressing of Urea and MoP at 120 DAP
4. Tiller counting at 120 DAP
5. Leaf tissues to be analyzed for different nutrient elements at 120 DAP
6. Second top dressing of Urea and MoP at 150 DAP
7. Tiller counting at 150 DAP and 180 DAP
8. Measurement of sucrose content before two days of harvesting
9. Counting Millable cane at harvest
10. Analyzing of leaf tissues for different nutrient elements at 300 DAP
11. Yield of cane at harvest
12. Post harvest soil sample collection
13. Soil and plant analyses for different nutrients

3.5 TIME SCHEDULE:

S.I. No.	2025				2026												2027		
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
1		→	→																
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11																→			
12																→			
13			→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	

3.6 ECONOMIC IMPACT:

Location specific fertilizer dose with optimum plant population will efficiently increase yield as well as total income by optimizing cost of production.

3.7 EFFECT ON ENVIRONMENT: Friendly to soil and environment.

3.8 UTILIZATION OF RESEARCH RESULTS:

The result of the study will give a clear idea to the sugarcane growers of TSM, PSM, STSM, SHSM region about specific fertilizer dose with optimum plant population of this area which will help them to improve productivity by optimizing cost of production.

4.0 TITLE : SEED MULTIPLICATION OF THE PROMISING SUGARCANE VARIETIES AND SEEDLING RAISING OF DATE PALM, PALMYRA PALM AND STEVIA
LOCATION : RSRS, Thakurgaon
INVESTIGATORS : M S Hossain, M M Rashid and N Chowdhury
NATURE OF STUDY : -
DURATION : 2025-2027
ESTIMATED COST(Tk) : 1,0,000/-

4.1 DEFINITION OF THE PROBLEM:

Quality seed is the most important for successful sugarcane production. Quality seed can increase

cane and sugar yield upto 15-30%. One study reported a 30% yield increase with high-quality seed over conventional material. Poor quality seed introduces seed-bourne disease, leading to varietal degeneration and yield losses. On the other hand, date palm, palmyra palm and stevia is three promising crops of BSRI cultivation of which is increasing day by day. To ensure sugarcane plantation with quality seeds in the research and demonstration plots as well to extend date palm, palmyra palm and stevia cultivation, this programme has been undertaken.

4.2 OBJECTIVES:

1. To disseminate quality setts of sugarcane and
2. To ensure quality sugarcane production.

4.3 METHODOLOGY:

VARIETY:

Sugarcane:

Isd 37
BSRI Akh 41
BSRI Akh 46
BSRI Akh 48
Black Ruby

Stevia:

BSRI Stevia 1

Date palm:

Palmyra palm

5.0 TRAINING/DEMONSTRATION/FIELD DAYS AT RSRS, THAKURGAON

5.1 TRAINING:

Name of the training course	Location	Course Co-ordinator	Duration	Trainee/ Batch	No. of Batches	Total No. of Trainees	Cost/ Batch (Tk.)	Total cost (Tk.)
A. Farmers training course	Thakurgaon	M S Hossain / N Chowdhury	01 day	30	4	120	29,900/-	1,19,600/-
	Panchagarh	M S Hossain / N Chowdhury	01 day	30	2	60	29,900/-	59,800/-
	Setabganj	M S Hossain / N Chowdhury	01 day	30	2	60	29,900/-	59,800/-
Total cost (A+B) = 2.39,200/-								

5.2 DEMONSTRATION:

Nature of demonstration	Investigator	Location	Number	Cost/demon (Tk.)	Total (Tk.)
A. Demonstration of BSRI bred latest sugarcane varieties	M S Hossain / N Chowdhury	Thakurgaon	01	18,000/-	18,000/-
	M S Hossain / N Chowdhury	Panchagarh	01	18,000/-	18,000/-
	N Chowdhury / M S Hossain	Setabganj, Dinajpur	01	18,000/-	18,000/
B. Single/Paired row sugarcane with intercropping	M S Hossain / M S Hossain	Thakurgaon	01	21,000/-	21,000/-
Total cost (A+B) = 75,000/-					

QUARANTINE STATION, GAZIPUR

Rationale

Sugarcane germplasm is one of the basic components for variety development especially through hybridization. The main objective of quarantine station is to remain vigilant about the entry and introduction of new pathogen or insect pests carried along with the imported varieties/clones from abroad. The Quarantine Station is located at BRRI campus, Gazipur was established in 1979-80 as an essential prerequisite for the purpose and to enrich the germplasm bank of BSRI. Since establishment, four hundred two germplasms have been imported and quarantined. Fourteen consignments such as 41st, 42nd, 43rd, 44th, 45th, 46th, 47th, 48th, 49th, 50th, 51st, 52nd, 53rd and 54th are under observation. By this time, three hundred and eight entries have been handed over to the Breeding Division, BSRI for further evaluation and one germplasm as first generation in the glass house. Besides, some exotic germplasms viz. China, Vietnam, VMC 86-550, HoCP 85 845, HoCP 91 555, HoCP 95 988, HoCP 96 540, CB 45-3, Phil 56-226 and Egypt are also maintained for seed multiplication.

At present fifteen locally collected chewing germplasms such as Q 69, Co 527, Misridana, Modhumala, Pwochadana, Misrimala, Pyashi, Kazla,Turpin, one unknown Sylhet, Blackruby, Dholbazary, Shinduri, Shung and one locally collected Malaysian germplasm have been maintained inside the campus of Quarantine Station for seed multiplication.

LIST OF EXPERIMENTS

PROGRAMME AREA : CROP PROTECTION

1.0 Title : Quarantine follow-up of imported germplasms

2.0 Title : Quarantine follow-up of local germplasms

PROGRAMME IN DETAILS

PROGRAMME AREA : CROP PROTECTION
1.0 TITLE : QUARANTINE FOLLOW-UP OF IMPORTED GERMPLASMS
LOCATION : Quarantine Station, Gazipur
INVESTIGATORS : N Islam and M A H Saddam
NATURE OF STUDY : On-going (From 1979-80)
DURATION : To be continued
ESTIMATED COST(Tk) : 20,000.00 (Depending germplasms availability)

1.1 DEFINITION OF THE PROBLEM:

There are some limitations/ restrictions for some diseases and places where the diseases are occurred i.e. diseases like SCMV, Fiji disease, Pineapple disease and Gummosis from countries namely Argentina, Java, Puerto Rico, Cuba, Louisiana (USA), Queensland, West Java and Australia respectively. But provisions are there that BSRI could import sugarcane germplasms/clones for research purpose from any country provided planting materials should be grown at a recognized post-entry quarantine station for an adequate period before release for large scale planting.

1.2 OBJECTIVES:

i) To remain vigilant about the entry and introduction of new pathogens and insect pests carried along with the germplasms brought from abroad and
ii) To conserve as important genetic material and enrich the hybridization program.

1.3 METHODOLOGY:

After introduction/arrival of new germplasm/clone, the seed materials will be treated by hot water at 50ºC for 3 hours or at 51ºC for 2 hours (if not previously treated) and will be planted in sterilized soils in pots inside glass house. Scientists in the quarantine station and head quarter will make observation for pests up to 8 to 9 month'sage crop. If major pests are not found in the germplasms/clones again will be planted in pots for second generation crop inside the same glasshouse. Both plant and ratoon crops will be inspected and observed for another 8 to 9 months.

If disease(s) or insect pests are not found during inspection in the second-generation plant and in first ratoon, the germplasm/clone will be planted outside the glasshouse but inside the quarantine premises. Before planting the materials will be treated by hot water treatment at 50ºC for 3 hours and by Bavistin 50 WP at 1:1000 solution. The germplasm/clone will be grown in natural condition for another year to observe for disease and insect pests. At the same time firstratoon of second-generation crop will be maintained and observed in the same manner.

Finally, the seed material will be handed over to BSRI Breeding Division for seed multiplication, inoculation test and zonal yield trial for release as variety or to preserve as genetic materials in the germplasm bank.

1.4 WORK ELEMENTS:

Depending on the arrival or availability of the germplasms from abroad the following works schedule will be followed for each and every consignment.

Act. No.	Name of Activities	Time of Activities
1.	Collection of the consignment from airport or any legal point of entry	Immediately after entry and introduction
2.	Inspection of the consignment for plant health and other documents.	Do
3.	Plant and soil treatment if required.	Do
4.	Plantation in pots inside glass house.	Do
5.	Observation for diseases and insect pests at monthly interval	1-9 months crop age
6.	Plantation of second-generation crop in pots inside glasshouse	9 months crop age
7.	Maintaining ratoon of first-generation crop in pots inside glasshouse	After harvesting of first generation plant crop
8.	Observation for disease and insect pests both in plant and ratoon cane at monthly interval	Up to 9 months crop age
9.	Harvesting of second-generation plant and first ratoon crop	At 9 months crop age
10.	Plantation of third generation plant in trenches inside QS Campus after HWT at 50°C for 3 hours and by Bavistin 50 WP 0.1% solution. Maintenance of first ratoon of second-generation crop inside glasshouse	Up to 10-12 months after importation of crop
11.	Observation for disease and insect pests both in plant and ratoon cane at monthly interval	Up to 30 months after importation of crop
12.	Final tiller and millable cane count during peak period	21-27 months crop, 5 months after planting (tiller count), 12 months after planting
13.	Brix (%) and other agronomic characters record	At 12 months crop
14.	Harvesting of plant cane and handing over to Breeding Division of BSRI	At 30 months crop after importation of crop
15.	Maintaining ratoon of third generation plant for further observation	At 30-42 months crop after importation of crop

1.5 TIME SCHEDULE:

Ac. No.	Months														
	1	3	6	9	12	15	18	21	24	27	30	33	36	39	42
1–4	→	→													
5	→	→	→												
6–7			→	→											
8-9			→	→											
10						→	→								
11	→	→	→	→	→	→	→	→	→	→					
12							→	→	→	→					
13					→	→									
14										→	→				
15											→	→	→	→	→

1.6 ECONOMIC IMPACT:

Plant quarantine is internationally accepted phenomenon to control seed borne pathogens by imposing some limitations/restrictions for some diseases against some places where the disease occurs. As per 'Destructive insects and pests rules 1966, amended in 1989 by the Government of the Peoples' Republic of Bangladesh there are restrictions for some diseases and places where the disease occurred. Hence, the imposed restrictions will be helpful to protect economic loss by entry of new pathogens.

1.7 EFFECT ON ENVIRONMENT:

Imposed quarantine restrictions for the movement of plant materials will be helpful to protect our environment against introduction of new pathogen.

1.8 UTILIZATION OF RESEARCH RESULTS:

This possibly could prevent establishment and spread of foreign pests in our country through legal restriction on the movement of plants and plant products. The germplasm/germplasms that will introduce and quarantined will go for further investigation/intervention at BSRI head quarter. If germplasm/germplasms could find suitable for commercial cultivation, that will be released as variety/varieties. Besides, these will be maintained in our germplasm bank to include and enrich the hybridization program.

2.0 TITLE : QUARANTINE FOLLOW- UP OF LOCAL GERMPLASMS
LOCATION : Quarantine Station, Gazipur
INVESTIGATORS : N Islam and M A H Saddam
NATURE OF STUDY : Ongoing (From 1979-80)
DURATION : To be continued
ESTIMATED COST(Tk) : 20,000.00 (Depending on germplasms availability)

2.1 DEFINITION OF THE PROBLEM:

Pathogenicity of a pathogen and strains of a pathogen react differently in different environment. For example-Red rot and SCMV may be cited whose strains are different and located in different corners of the country in different environment. Therefore, their movement should restrict by imposing quarantine regulations.

2.2 OBJECTIVE:

To remain vigilant about the entry and introduction of new pathogen or insect pests from one location to other carried along with the germplasms/clones during collection.

2.3 METHODOLOGY:

Seed materials of different germplasm/clone will be collected by the scientists of quarantine station and head quarter from different corners of the country. Then the seed materials will be treated with hot water at 50°C for 3 hrs and by Bavistin 50 WP at 1:1000 ratio for 30 minutes and planted in trenches inside quarantine station. The germplasms/clones will be observed closely for one plant and ratoon crop, if no new disease or insect pests observed during the period of investigation then these will be handed over to the Breeding Division for further investigation or to maintain as germplasm in the germplasm bank. Ratoon of the germplasms/clones will be maintained for another year observation.

Treatments: Germplasms: 15

Q 69	Misrimala	Kazla	Dholbazary	Unknown from Malaysia
Co 527	Pyashi	Turpin	Blackruby	Shinduri
Misridana	Madhumala	Pwochadana	Sylhet	Shung

Method of Planting: STP (Poly bag settling); Time of Planting: December, 2025

2.4 WORK ELEMENTS:

Depending on the arrival or introduction of local germplasms/clones at the quarantine station the following work schedule to be followed for each and every collection.

Act. No.	Name of Activities	Time of Activities
1	Collection, inspection and characterization	Immediately after collection/ introduction.
2	Hot water treatment at 50^0c for 3 hrs.	Do
3	Bavistin 50 WP treatment at 1:1000 ratio	Do
4	Plantation in trenches inside quarantine campus	Do
5	Germination count at 30 and 60 DAP	Up to 2 months crop age
6	Inspection for disease and insect pests at monthly interval	At 1-12 months crop age
7	Tiller count at 150 DAP	At 5 months crop age
8	Millable cane count in September	At 10 –11 months crop age
9	Brix percent and cane yield at harvest	At 12 –13 months crop age
10	Harvesting and handing over to Breeding division	At 13 months crop age
11	Maintaining ratoon of first gen. plant	Up to 13 – 14 months crop age
12	Inspection for disease and insect pests at monthly interval	Do
13	Harvesting of ratoon	At 13-14 months crop age

2.5 TIME SCHEDULE:

Ac. No.	Months					
	1	3	6	9	12	15
1- 4	→					
5	→					
6	→	→	→	→		
7		→				
8				→		
9					→	
10					→	
11	→	→	→	→	→	
12					→	→
13					→	→

2.6 ECONOMIC IMPACT:

Plant quarantine is internationally accepted phenomenon to control seed borne pathogens by imposing some limitations/restrictions. As per quarantine rules and regulations there are provisions to follow it for both exotic and local germplasm collection. Hence, the imposed restrictions will be helpful to protect economic loss from new pathogens.

2.7 EFFECT ON ENVIRONMENT:

Imposed restrictions on movement of seed cane or plant parts will be helpful to protect new environment against introduction of new pathogen from other regions.

2.8 UTILIZATION OF RESEARCH RESULTS:

This possibly could prevent establishment and spread of new pests at BSRI premises through legal restriction on the movement of plants and plant products.

REGIONAL SUGARCROP RESEARCH STATION, GAZIPUR

Rationale

The important objectives of this station are to develop need based appropriate technologies of sugarcane production and dissemination of recommended technologies among the farmers related to *gur* and chewing cane production in the non-mill zone especially in the eastern part of the country. Considering those facts, it is needed to conduct research on different aspects of crop improvement, crop production, crop protection and TOT & socio-economic studies.

Considering the above facts, three experiments under crop production aspects-Impact of natural waterlogged conditions on leaf element composition and cane yield in different sugarcane varieties, influence of boron and gibberellic acid on fruit setting and reducing fruit drop in Arabian date palmand effect ethephone application on growth and branching of stevia.

In crop and soil improvement area two experiment like-Impact of tillage system on soil physical, chemical, biological properties, root system and yield of sugarcane and development of gummy jelly using Palmyra palm (*Borassus flabellifer* L.) for value addition.

Under the TOT and Socio economics program area, regarding dissemination of BSRI matured technologies among farmers by conducting demonstration, training programs and field days. Seedlings production and maintenance programs on sugarcane, tal and stevia have been proposed.

LIST OF EXPERIMENTS

PROGRAMME AREA : CROP PRODUCTION

1.0 Title : Impact of natural waterlogged conditions on leaf element composition and cane yield in different sugarcane varieties

2.0 Title : Influence of boron and gibberellic acid on fruit setting and reducing fruit drop in Arabian date palm

3.0 Title : Effect ethephone application on growth and branching of Stevia

PROGRAMME AREA : CROP& SOIL IMPROVEMENT

4.0 Title : Effect of sugarcane bagasse biochar on soil health and sugarcane production

5.0 Title : Development of gummy jelly using Palmyra palm (*Borassus flabellifer* L.) for value addition

PROGRAMME AREA : TOT & SOCIO ECONOMICS

6.0 Title : DEMONSTRATION

a. Demonstration of chewing sugarcane with intercrops

b. Demonstration of BSRI released chewing sugarcane varieties

c. Varietal Demonstration of BSRI released sugarcane

7.0 Title : TRAINING

a. Farmer's Training

8.0 Title : OTHER ACTIVITIES

a. Seedlings preparation & maintenance of sugarcane, stevia & tal

b. Maintenance of tal khejur bagan

c. Maintenance of Museum plot

PROGRAMME IN DETAILS

PROGRAMME AREA : CROP PRODUCTION
1.0 TITLE : IMPACT OF NATURAL WATERLOGGED CONDITIONS ON LEAF ELEMENT COMPOSITION AND CANE YIELD IN DIFFERENT SUGARCANE VARIETIES
LOCATION : RSRS Farm, Gazipur
INVESTIGATORS : M A H Saddam, N Islam, A S Mitu and M S Islam
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk) : 40,000.00

1.1 DEFINITION OF THE PROBLEM:

Waterlogging is one of the most serious environmental constraints affecting sugarcane production, causing yield losses ranging from 18% to 64%, depending on the genotype, environmental conditions, developmental stage, and duration of stress (Gilbert *et al.*, 2008; Glaz and Lingle, 2012). In regions where sugarcane is widely cultivated, farmers frequently experience significant economic losses due to natural waterlogged conditions.The major impacts of waterlogging on sugarcane include increased stalk mortality, reduced relative growth rate, decreased cane yield, and deterioration in juice quality and sugar recovery (Viator *et al.*, 2012; Gomathi *et al.*, 2015). These negative effects are primarily due to oxygen deficiency in the root zone, as the diffusion of oxygen through water is approximately 10,000 times slower than through air (Armstrong and Drew, 2002). Prolonged waterlogging leads to hypoxic or anoxic soil conditions, which cause the accumulation of phytotoxins (Armstrong and Armstrong, 2001), initiate a series of physico-chemical and microbial changes in the soil (Ponnamperuma, 1984), and ultimately result in severe energy deficiencies and plant death (Greenway and Gibbs, 2003).These physiological and biochemical disruptions not only hinder plant growth but also compromise nutrient uptake, leading to potential nutrient imbalances or deficiencies in the plant system. Consequently, sugarcane productivity declines, and farmers face substantial economic losses. Considering these challenges, this experiment has been undertaken to assess the impact of natural waterlogged conditions on leaf element composition and cane yield in different sugarcane varieties. Based on the above context, the following objectives have been formulated.

1.2 OBJECTIVES:

i. To evaluate the effect of natural waterlogged conditions on leaf nutrient /element concentration in different sugarcane varieties and
ii. To assess the impact of natural waterlogging on cane yield among the selected varieties.

1.3 METHODOLOGY:

TREATMENTS:

Factor A : Varieties

V_1 : Isd 34	T_1 : Normal land (control)
V_2 : BSRI Akh 41	T_2 : Short term waterlogged
V_3 : BSRI Akh 45	T_3 : Long term waterlogged

Plot size : 6.0m × 8.0m
Replications : 3
Design : RCB Factorial
Method of planting : soilbed settlings
Time of Planting : January, 2026

Data to be recorded:

1. Establishment (%) of settling
2. Tiller population at 120, 150 and 180 days after planting (DAP)
3. Millable cane at harvest
4. Brix (%) at harvest
5. Cane yield
6. Soil and leaf nutrient status

1.4 WORK ELEMENT:

1. Settlings preparation
2. Land preparation
3. Plantation
4. Intercultural operation
5. Sample collection
6. Leaf tissue to be analyzed for different nutrient elements
7. Data tabulation, analysis and reporting

1.5 TIME SCHEDULE:

Act. No.	2025			2026											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1	→														
2	→	→													
3		→	→												
4			→	→		→		→							
5					→		→		→		→			→	
6														→	
7														→	→

1.6 ECONOMIC IMPACT: Positive economic impact is expected.

1.7 EFFECT ON ENVIRONMENT: This experiment is environmentally friendly.

1.8 UTILIZATION OF RESEARCH RESULTES: The findings of this investigation may help to achieve nation's goals for sustainable agricultural development.

2.0 TITLE : INFLUENCE OF BORON AND GIBBERELLIC ACID ON FRUIT SETTING AND REDUCING FRUIT DROP IN ARABIAN DATE PALM
LOCATION : RSRS Farm, Gazipur
INVESTIGATORS : N Islam, M A H Saddam A S Mitu and M S Arefin
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk) : 30,000.00

2.1 DEFINITION OF THE PROBLEM:

Date palm (*Phoenix dactylifera* L.) is a monoctyledonous and dioecious species belonging to Arecaceae (Palmaceae) family. Date palm ecosystem is mostly of dry nature can grow from 12.7 to 27.5°C average temperature. Female trees start producing dates at 4 to 6 years of age and reach full production within 15 to 20 years (Nixon and Carpenter, 1978). After a certain age the date yields is decreasing. Cultivation of exotic Arabian date varieties is a relatively new endeavor In Bangladesh. High humidity of our country can pose challenges for commercial cultivation of Arabian dates. Boron is a multiuse and essential element for plants and plays an important role in pollination. Omar *et al.* (2014) obtained the highest percentage of fruit setting and the highest increase in fruit length and diameter by spraying 10-year-old palm trees cv. Mnifi with boron at 1500 ppm before pollination and 4 weeks after pollination. Zean EL-Dean *et al.* (2017) mentioned in a study during the 2016-2017 seasons on palm trees 10-year cv. Barhi, that spraying the trees with borax at the concentration 4 gm^{-1} with pollen caused a significant increase in the setting percentage and fruit's length, diameter and weight. Gibberellic is one of the most important plant hormones (Phytohormones) naturally produced within plant tissues.It also plays an important role in the physiological changes in plants, as it contributes to reducing the chlorophyll destruction and increasing the size, weight and delaying the ripening of the fruits and stimulates the production of enzymes (Peter and stephen, 2012). Al-Qurash *et al.* (2012) found that the application of gibberellic acid on palm trees in the concentration 150 ppm has significantly decreased the fruit dropping in both seasons, while the concentration 100 ppm has increased the fruit weight, length and diameter for both seasons. The research aimed to study the effect of spraying with gibberellic acid and boron on physio-chemical properties of the fruits. Also reduce the fruit dropping by using gibberellic acid. Considering the above facts, the following objectives have been chosen.

2.2 OBJECTIVES:

i. Assessing the effect of boron and GA_3 on fruit setting, yield and quality of date palm and
ii. Determination of optimum dose of boron and GA_3 to improve the fruit quality and its composition.

2.3 METHODOLOGY:

TREATMENTS:

The experiment comprises five treatments

T_0 : Control (without Boron and GA_3)
T_1 : Boron @ 50 mg/L + GA_3@ 50 mg/L
T_2 : Boron @ 50 mg/L + GA_3@ 75 mg/L
T_3 : Boron @ 75 mg/L + GA_3@ 75 mg/L
T_4 : Boron @ 100 mg/L + GA_3@ 100 mg/L

Design: RCB (Each date palm plant will be treated as one treatment and a spray will be done before pollination and 4 weeks after pollination)

Data to be recorded:

1. Fruit set (%)
2. Fruit retention (%)
3. Fruit length (cm)
4. Fruit diameter (cm)
5. yield (kg)
6. Fruit acidity (%) and
7. TSS (%)

2.4 WORK ELEMENT

1. Pollination by the same source of pollen grains just after 2-4 days of open spath (February 26)
2. Fertilization(4 times)
3. Intercultural operation(around the year)
4. Data on fruiting characters (April-July, 26)
5. Data analysis and reporting

2.5 TIME SCHEDULE:

Act. No.	2026											
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1		→										
2		→		→	→			→				
3	→	→	→	→	→	→	→	→	→	→	→	→
4				→	→	→	→					
5								→				

2.6 ECONOMIC IMPACT: Positive economic impact is expected.

2.7 EFFECT ON ENVIRONMENT:

PGRs, called bio-stimulants or bio-inhibitors, act inside plant cells to stimulate or inhibit specific enzymes or enzyme systems and help regulate plant metabolism. So, it is expected that there is no adverse effect on environment.

2.8 UTILIZATION OF RESEARCH RESULTES:

It is expected that the application of boron and gibberellic acid will enhance fruit setting, improve pollen germination and fertilization efficiency, strengthen fruit retention, and thereby reduce premature fruit drop in Arabian date palm. By expanding this technology, the yield of Arabian dates will increase and farmers will be benefited.

3.0 TITLE : **EFFECT ETHEPHONE APPLICATION ON GROWTH AND BRANCHING OF STEVIA**
LOCATION : RSRS Farm, Gazipur
INVESTIGATORS : M A H Saddam, N Islam, A S Mitu and M S Islam
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk) : 25,000.00

3.1 DEFINITION OF THE PROBLEM:

Stevia (*Stevia rebaudiana*) is an herb. It is grown commercially for the extraction of intensely sweet-tasting, non-caloric, stevioside and used as a sugar substitute. More recently, steviahas become a popular herb with home gardeners. As with many herbs grown for commercial sales in pots, it is desirable to produce a full, well-branched plant that is sold during the vegetative stage of development. Maintaining vegetative development is desirable for stevia, as flowering reduces plant growth and steviol glycoside concentrations (Bondarev *et al.*, 2003), and because the senesced inflorescences do not abscise, reducing visual appeal. More branching shows vigorous growth. Ethephone application increase both lateral branch and leaf area. As a result production becomes increased. Therefore, the experiment has been undertaken to know the following objectives.

3.2 OBJECTIVES:

I. To evaluate the effect of different concentrations of ethephone on plant height, leaf number, and biomass production in stevia and
II. To study the influence of ethephone application on branching behavior and flowering of stevia.

3.3 METHODOLOGY:

Thirty days after transplanting, foliar spray will be applied on plant following the treatments

TREATMENTS:

T_0 : Control
T_1 : 100 mg/l
T_2 : 250 mg/l
T_3 : 500 mg/l
T_4 : 750 mg/l
T_5 : 1000 mg/l

Plot size : 2.0m × 2.5m
Replications : 4
Design : RCB
Method of planting : Polybag seedlings
Time of Planting : January, 2026

Data to be recorded

1. Survival (%)
2. Plant height (cm)
3. Number of branch and leaves
4. Fresh and dry weight of plants (gm)
5. Time of flowering
6. Chemical properties of leaves.

3.4 WORK ELEMENTS:

1. Land selection and preparation
2. Lay out of the experiment
3. Plantation
4. Intercultural operations
5. Data collection
6. Harvesting
7. Leaf tissue to be analyzed for different nutrient elements
8. Data tabulation, analysis and reporting

3.5 TIME SCHEDULE:

Act. No.	2025				2026											
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1	→	→	→													
2			→	→												
3				→	→											
4						→	→		→							
5								→	→	→	→					
6									→	→	→					
7										→	→	→				
8													→	→	→	→

3.6 ECONOMIC IMPACT:

It is expected that stevia growers would get higher economic benefit out of the result of this experiment.

3.7 EFFECT ON ENVIRONMENT:

There would not be any adverse effects on environment due to implementation of this experiment.

3.8 UTILIZATION OF RESEARCH RESULTS

The findings of the study will be useful for stevia growers and also be helpful for getting higher economic benefit to the growers.

4.0 TITLE : **EFFECT OF SUGARCANE BAGASSE BIOCHAR ON SOIL HEALTH AND SUGARCANE PRODUCTION**
LOCATION : RSRS farm, Gazipur
INVESTIGATORS : M A H Saddam, A S Mitu, N Islam and S Akhter
NATURE OF STUDY : Ongoing
DURATION : 2023- 2026
ESTIMATED COST(Tk) : 35,000.00

4.1 DEFINITION OF THE PROBLEM

Sugarcane (*Saccharum officinarum*) is an important agro-industrial crop which plays a vital role in the national economy. It takes about 12 months from planting to harvesting. Due to the long duration, a huge amount of fertilizer has to be used, as a result, soil health is deteriorating day by day and production has been reduced. To recover this soil health organic amendment is essential. Biochar is one of the important organic amendments which improves soil health and is an organic carbon byproduct that is generated during pyrolysis in the absence of oxygen. Because biochar is highly resistant to microbial decomposition of soils (Baldock and Sumernik, 2002), its storage in the soil is a promising approach to carbon sequestration (Glaser *et al*., 2009, Lehmann 2007). In current years, biochar has been shown as one promising means of reducing the atmospheric CO_2 concentration because biochar slows the rate at which photo synthetically fixed carbon (C) is returned to the atmosphere (Lehmann, 2007 and Sohi *et al.*, 2010). Biochar is a carbonized material produced from the waste biomass, includes sugarcane bagasse, sawdust, rice husk, rice straw, wheat straw, animal litters and so on. Sugarcane bagasse is a solid waste of the sugar industry. It has the advantages of abundant availability, high yield, simple collection procedures, relatively stable ingredients and uniform properties (Westerhoff *et al.*, 2001). Like most agricultural residues, bagasse is a carbon-rich biomass, highly abundant and suitable for biofuel or biochar production. Therefore, the experiment has undertaken to achieve the following objectives.

4.2 OBJECTIVES:

i. To find out the effect of sugarcane bagasse biochar on sugarcane production and
ii. Improving soil health as well as soil fertility.

4.3 METHODOLOGY:

Biochar will be made at RSRS Farm, Gazipur on anaerobic condition and applied at row with fertilizer according to treatment.

Treatments:

T_1 : RFD
T_2 : RFD + Biochar @ 0.25 t/ha
T_3 : RFD + Biochar @ 0.50 t/ha
T_4 : RFD + Biochar @ 0.75 t/ha
T_5 : RFD + Biochar @ 1.0 t/ha

Plot size : 7m × 6m
Replications : 3
Design : RCBD
Variety : BSRI Akh 41
Method of sugarcane planting : STP (soil bed settling)
Time of Planting : January, 2026

Data to be recorded:

1. Establishment (%) of settling
2. Tiller population at 120, 150 and 180 days after planting (DAP)
3. Millable cane at harvest
4. Unit stalk weight, height, girth and internode
5. Brix (%) at harvest
6. Cane yield
7. Pre and post soil nutrient analysis
8. BCR

4.4 WORK ELEMENTS:

1. Raising of settlings
2. Land selection and preparation
3. Biochar preparation and application Basal fertilizer application
4. Planting of sugarcane settlings and irrigation
5. Intercultural operations
6. Earthing up and tying
7. Insect and pest control
8. Data collection, tabulation, analysis and reporting

4.5 TIME SCHEDULE

Act. No.	2025			2026											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1	→	→	→												
2	→	→													
3	→		→												
4				→											
5						→		→		→					
6									→						
7						→		→			→				
8							→	→					→	→	

4.6 ECONOMIC IMPACT: Positive economic impact is expected.

4.7 EFFECT OF ENVIRONMENT: There is no adverse effect on environment. It is eco-friendly.

4.8 UTILIZATION OF RESEARCH RESULTES: The findings will help farmers make proper decisions about the application of sugarcane bagasse biochar.

5.0 TITLE : **DEVELOPMENT OF GUMMY JELLY USING PALMYRA PALM (*Borassus flabellifer* L.) FOR VALUE ADDITION**
LOCATION : RSRS Farm, Gazipur
INVESTIGATORS : M A H Saddam and N Islam
NATURE OF STUDY : New
DURATION : 2025-2026
ESTIMATED COST(Tk) : 50,000.00

5.1 DEFINITION OF THE PROBLEM:

The palmyra palm (*Borassus flabellifer* L.) is a sugar palm that is commonly grown in Africa, South Asian (India, Bangladesh and Sri Lanka), and Southeast Asia (Thailand, Myanmar, Vietnam, Cambodia, Indonesia and Malaysia) (Golly *et al.*, 2017). This plant is generally known as 'Tal' in Bangladesh. Palmyra trees have nearly 800 applications, including beverages, food, medicine, fiber, and timber (Arulraj and Augustine 2008). Generally all parts of the palmyra tree provide several useful products. The most valuable part of the palmyra palm is the fruit. The unripe fruit of the palmyra palm is extremely difficult to consume since the hard rind and fibrous portion must be removed before consumption (Mani *et al.*, 2018). When the fruit is ripe, the fibrous outer layer of the fruit can also be eaten raw, roasted, or boiled (Shirisha *et al.*, 2018). The edible pulp of the ripe palmyra palm is a soft orange-yellow mesocarp that accounts for approximately 51.07% of the total fruit. This sugary part is slightly bitter and rich in vitamin C and β-carotenoids and also a good source of pectin, iron, phosphorus, calcium, magnesium and antioxidants.The pulp can be extracted manually or with a fruit pulp extractor. It can be processed into soft beverages, toffee, cakes, jam, jelly, ice cream, sweets, cordials and other delicious food products (Rao *et al.*, 2008). Unfortunately, over 60% of the annual fruit yield of the palmyra palm is lost within 10 days after harvesting due to its high moisture content, resulting in a short shelf-life (Chaurasiya *et al.*, 2014) and limited commercial use of ripe palm fruit. It is estimated that approximately 10,000 tons of fruit pulp are wasted each year. Gummy jelly is one of the confectionery products, often containing high sugar (especially sucrose and glucose syrup) as well as one or more gelling components, flavorings, coloring and food acid (Marfil *et al.*, 2012). Palmyra fruits are seasonal and highly perishable, often leading to post-harvest losses (Sundaram *et al.*, 2014). Developing shelf-stable value-added products like gummy jelly can reduce waste, improve food security, and enhance livelihoods. The nutritional richness of palmyra-makes it ideal for functional food development. Consumer preference is shifting toward natural, plant-based, and healthy snacks, increasing market potential for such products (Singh *et al.*, 2021). To fulfil the following purpose this study has been under taken.

5.2 OBJECTIVES:

I. To develop a palmyra fruit-based gummy jelly using natural ingredients;
II. To investigate the physical properties, proximate composition, and energy contentand and
III. To promote rural entrepreneurship through sustainable agro-processing.

5.3 METHODOLOGY:

Preparation of palmyra palm fruit juice

Ripe palmyra palm fruits will be washed under running tap water and the exocarp must be peeled. The seeds will be removed, and the fruit pulp will then manually extract into water (pulp:water ratio = 1:1) (Chaurasiya *et al.*, 2014). After that, the extract will sieve to remove the insoluble pulp and obtain palmyra palm fruit juice. The juice will be pasteurized at 65ºC for 5 min (Artnarong *et al*., 2016) and stored at -18ºC until used.

Sample preparation

The ingredients used in sample preparation would glucose syrup, sucrose, high methoxyl pectin, sodium citrate, fructose, and 50% (w/v) citric acid. According to the preliminary experiments, the formulation of gummy jelly products and the preparation processes will independently repeated on 3 separate days as replications.

Determination of pH and aw

In order to determine pH, 5±1 g of samples will be cut into thin slices and mixed with distilled water (sample:water = 1:3, w/w). The mixture will heat at 60±2°C and constantly stirred until completely dissolved. It will be cooled at 25°C before being measured with a pH meter (pH510, Eutech Instruments, Klang Selangor D.E., Malaysia), which would previously been calibrated with buffer solutions of pH = 7 and 4 (Herbstreith *et al.*, 2004).

Texture profile analysis

Texture profile analysis (TPA) of gummy jelly will be measured using a texture analyzer TA. XT 2i (Stable Micro Systems Ltd., UK) as described by Amjadi *et al*. 2018. Food samples should be compressed twice without being penetrated. Three replicates of the analysis will be performed at 25±2°C. The following texture parameters of the samples will be reported: hardness, adhesiveness, springiness, cohesiveness and chewiness (Delgado and Bañón 2015).

Color analysis

Color values of samples will be measured at room temperature using a Hunter colorimeter (Color Quest 45/0, Hunter Associates Laboratory, Inc., Reston, VA) as described by Charoen *et al*. 2018. The instrument will be calibrated prior to measurement using standard white and black reflector plates. Four readings per sample will be conducted by changing the position of the sample. Three samples of each formulation will be measured in each replicate. CIE L*a*b* color parameters (L*: lightness, a*: a positive a* represents redness and a negative a* represents greenness, and b*: a positive b* represents yellowness and a negative b* represents blueness) for 10° vision angle and D65 illuminant would be measured.

Data to be recorded:

1. Time of sieving, pasteurization and storing
2. Time of sample preparation
3. Maintain pH and temperature
4. Texture profile analysis and
5. Color analysis

5.4 WORK ELEMENT

1. Fruit collection
2. Preparation of palmyra palm fruit juice
3. Sample preparation
4. Determination of pH and aw
5. Texture profile analysis
6. Color analysis
7. Data collection
8. Statistical analysis and Reporting

5.5 TIME SCHEDULE:

AC No	2025		2026									
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
1	→											
2		→										
3		→	→									
4			→	→								
5					→	→						
6						→	→					
7		→	→			→	→	→	→			
8									→	→	→	→

5.6 ECONOMIC IMPACT: Value-added processing can benefit rural communities and small-scale industries.

5.7 EFFECT ON ENVIRONMENT: This study is eco-friendly.

5.8 UTILIZATION OF RESEARCH RESULTES:

This study promotes sustainable value addition to an underutilized fruit crop. It supports rural economic development through local processing and small-scale industry. Additionally, it aligns with SDG-12 (Responsible Consumption and Production) and SDG-2 (Zero Hunger) by reducing food waste and improving nutritional intake.

PROGRAMME AREA: TOT & SOCIO ECONOMICS

6. DEMONSTRATION:

Nature of Demonstration	Investigator	Locations	Number	Cost/ Plot (Tk)	Total (Tk)
1. Demonstration of BSRI released chewing sugarcane with Intercrop	N Islam / M A H Saddam	Gazipur farm VawalMirzapur Kapasia	05	23,750/-	1,18,750/-
2. Demonstration of BSRI released sugarcanewith intercrop	N Islam / M A H Saddam	Kaoltia, Kapasia VawalMirzapur, Narsindhi	05	21,500/-	1,07,500/-
3. Varietal Demonstration of BSRI released sugarcane	N Islam / M A H Saddam	VawalMirzapur Kapasia,Valuka, Narsindhi	05	18,500/-	92,500/-
Total cost (Three lakh eighteen thousands seven hundred fifty taka only):					3,18,750/-

7. TRAINING/ FIELD DAYS:

Name of Training Course	Location	Course Co-ordinator	Duration	Trainee/ Batch	No. of Batch	Cost/ Batch (Tk)	Total cost (Tk)
A. Farmer's Training	RSRS, Gazipur-03	N Islam/ M A H Saddam	02 days	30	07	30,000/-	4,20,000/-
	Shreepur, Gazipur -02						
	Belabo,Narsingdi-01						
	Valuka, Mymensingh-01						
A. Field days	RSRS, Gazipur-01	N Islam/ M A H Saddam	01day	80	03	75,000/-	2,25,000/-
	Kaligonj, Gazipur -01						
	Valuka, Mymensingh-01						
	Total (Six lakh forty five thousands taka only)=				10 Batch	-	6,45,000/-

8. OTHER ACTIVITIES:

Nature of activities	Investigator	Locations	Cost (Tk)
a. Seedligs preparation of sugarcane, tal and stevia	N Islam	RSRS,Gazipur	25,000/-
b. Maintenance of date palm and palmyra palm garden	M A H Saddam	RSRS,Gazipur	25,000/-
c. Museum plot	N Islam	RSRS,Gazipur	25,000/-
Total cost (Seventy five thousands taka only):			75,000/-

REGIONAL SUGARCROP RESEARCH STATION SUBARNACHAR, NOAKHALI

Rationale

The most important objectives of this station are to develop need based appropriate technologies of sugarcane production and dissemination of recommended technologies among the farmers related to chewing cane and *gur* variety production in the non-mill zone, especially in the salinity and coastal eastern part of the country. This region mainly covers the districts of Noakhali, Feni, Lakshmipur, Chandpur and Chattogram. Considering those facts, it is needed to research different aspects of crop improvement, crop production, crop protection, and TOT & socio-economic studies.

Considering the above facts, total five experiments under crop and soil management aspects-Nutrient requirement for sustainable chewinig cane production with intercrops in AEZ 18; Performance of winter vegetable as intercrops with sugarcane in single row system in AEZ 18; Performance of chewing sugarcane varieties under Young Meghna Estuarine Floodplain (AEZ 18); Selection of sugarcane varieties suitable for *gur* production under Subarnachar area; Efficacy of spacing with organic and inorganic fertilizer on growth and yield of stevia in AEZ 18 are included as priority research.

Under TOT and Socio-economics program area regarding dissemination of BSRI matured technologies among the farmer's, several demonstration and training programs of SAAO and farmers have been proposed.

LIST OF EXPERIMENTS

PROGRAMME AREA : CROP PRODUCTION

1.0 Title : Performance of winter vegetable as intercrops with sugarcane in single row system in AEZ 18

2.0 Title : Potentiality of chewing varieties With Intercrops under Young Meghna Estuarine Floodplain (AEZ 18)

3.0 Title : Selection of sugarcane varieties suitable for *gur* production under Noakhali regions (AEZ 18)

4.0 Title : Efficacy of spacing with organic and inorganic fertilizer on growth and yield of stevia in AEZ 18

5.0 Title : Integrated Nutrient Management Practices for Chewing Sugarcane Cultivation at Noakhali Region (AEZ 18)

PROGRAMME IN DETAILS

PROGRAMME AREA : CROP PRODUCTION
1.0 TITLE : PERFORMANCE OF WINTER VEGETABLE AS INTERCROPS WITH CHEWING CANE IN SINGLE ROW SYSTEM IN AEZ 18
LOCATION : Subarnachar and Hatia, Noakhali
INVESTIGATORS : R C Kabiraj, S Islam, M A Rasel and A K M R Islam
NATURE OF STUDY : On - going
DURATION : 2024-26
ESTIMATED COST(Tk) : 75,000/-

1.1 DEFINITION OF THE PROBLEM:

World population is increasing exponentially and it is necessary to feed up this huge population. An important strategy for increasing labour utilization per unit area of available land and productivity is to intensify land use. Intercropping is the cultivation of two or more crops simultaneously on the same field which aims to produce a greater yield on a given piece of land by making use of resources or ecological processes that would otherwise not be utilized by a single crop. Sugarcane is location specific and long duration crop and takes about 90-120 days for canopy development, which allows for growing intercrops during the early stage. Taking advantages of this, sugarcane cultivators grow various short duration crops like pulses, vegetables etc as intercrops to get interim return since small sugarcane growers cannot wait for a long time to get financial return from sole sugarcane crop. The yield of inter crops is quiet low at farmers level due to lack of use appropriate intercropping systems as well as poor management practices. Some inter crops shows adverse effect on cane yield, quality and also decrease the soil fertility. Therefore, an experiment has been undertaken to select suitable intercrops with single row sugarcane at Subarnachar region.

1.2 OBJECTIVE(S):

1. To test the suitable intercrops for sequential intercropping in single row sugarcane at Subarnachar area and
2. To identify the effect of sequential intercropping on growth yield and quality of sugarcane.

1.3 METHODOLOGY:

Treatments:

T_1 : Single Row Cane only
T_2 : SRC - Radish + Soybean
T_3 : SRC - Red Amaranth + Soybean
T_4 : SRC - Coriander + Soybean
T_5 : SRC - Spinach + Soybean

Replications : 3
Design : RCBD
Planting method : End to end 2 budded setts
Date of planting : October, 2025

1.4 DATA TO BE RECORDED:

For Sugarcane

1. Germination count (%)
2. No. of tillers/ha
3. No. of millable cane/ha
4. Cane height (m) and diameter (cm)
5. Field brix (%)
6. Flowering record
7. Estimated cane yield (t/ha)

For Intercrop

1. Intercrops population
2. Yield of 1st and 2nd intercrops
3. Biomass (t ha^{-1})

1.5 WORK ELEMENTS:

1. Land preparation
2. Basal fertilization and planting of sugarcane
3. Planting of intercrop
4. Irrigation, weeding and mulching for both crops as and when required
5. Insect pest management
6. Harvest (intercrop)
7. Harvest (sugarcane)

1.6 TIME SHEDULE:

Act. No.	Months														
	2025			2026											
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1.	→	→	→												
2.		→	→												
3.		→	→												
4.			→	→	→	→	→	→	→	→	→				
5.						→	→	→	→	→	→				
6.					→	→									
7.														→	→

1.7 ECONOMIC IMPACT: Positive economic impact is expected.

1.8 EFFECT OF ENVIRONMENT: Friendly to environment.

1.9 UTILIZATION OF RESEARCH RESULTS:

The result obtained from this study may help growers to know suitable intercrops with sugarcane in this location. On the basis of results will be able to take correct decision about the high yielding intercropping cultivation with sugarcane.

PROGRAMME AREA : CROP PRODUCTION
2.0 TITLE : POTENTIALITY OF CHEWING VARIETIES WITH INTERCROPS UNDER YOUNG MEGHNA ESTUARINE FLOODPLAIN (AEZ 18)
LOCATION : Chauddagram, Comilla, Mirsharai, Chottogram & Chandpur
INVESTIGATORS : R C Kabiraj, S Islam, M A Rasel and A K M R Islam
NATURE OF STUDY : On-going
DURATION : 2024-26
ESTIMATED COST(Tk) : 90,000/-

2.1 DEFINITION OF THE PROBLEM:

Now-a-days chewing cane is high value crop in Bangladesh. It is more popular in our country. Long time it is cultivated in most of the districts. The management practices for chewing sugarcane varying from place to place and farmers to farmers. Natural disaster occurs in Bangladesh especially in coastal areas. Subarnachar is one of them. Farmers of this region practices local varieties which is not economically profited due to lower yield and economic return. So high yielding varieties are needed for this region. The present study has been taken to select suitable location specific cane varieties for chewing purpose. Chewing cane is a long duration and exhaustive crop which consumes high amount of plant nutrients. Nutrient requirement of sugarcane differs from place to place according to soil and agro-climatic conditions over space and time. Yield potentiality of a crop would not reach a maximum unless proper fertilizer management is practiced. It is spectacular that the poor sugarcane yield is largely attributed to improper use of fertilizer. The inherent capacity of soil to supply nutrients is gradually declining over time for its nutrient mining due to intensive crop cultivation and some other manipulations. With the advancement of technology there would be a continuous need for updating the nutrient requirement of sugarcane at different Agro-Ecological Zones. In view of this, the

experiment has been undertaken to determine the present nutrient requirement for Chewing cane cultivation in different AEZs that will be helpful for updating the next Fertilizer Recommendation Guide.

2.2 OBJECTIVE(S):

1. To select suitable chewing varieties in subarnachar area and
2. To select location specific chewing varieties for costal area.

2.3 METHODOLOGY:

Treatments: (4)

T_1 : BSRI Akh 41-potato + Summer Mungbean
T_2 : BSRI Akh 42-potato + Summer Mungbean
T_3 : BSRI Akh 47-potato + Summer Mungbean
T_4 : Black Ruby-potato + Summer Mungbean

Design : RCB;
Replication : 3;
Plot size : 8m x 6m;
No. of lines/plot : 8 (8m long)
Gross area : 0.33 acre;
Planting material : 2- budded sett

2.4 DATA TO BE RECORDED:

For Sugarcane

1) Germination %
2) Tiller counting at 120, 150 and180 days after plantation (DAP)
3) Millable cane, cane diameter, cane height, yield and Brix at harvest

For Intercrop

1. Intercrops population
2. Yield of 1st and 2nd intercrops
3. Biomass (tha^{-1})

2.5 WORK ELEMENT:

1. Plantation of chewing cane
2. Germination count
3. Tiller count
4. Measurement of stalk height, girth and internode length
5. No. of millable cane/ha
6. Determination of field brix (%) and chewing qualities
7. Observation on flowering habit and stalk color
8. Observation on reaction to pests and diseases

2.6 TIME SHEDULE:

Act. No.	Months														
	2025			2026											
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1.	→	→	→												
2.		→	→	→											
3.			→	→	→										
4.			→	→	→	→	→	→	→	→	→	→			
5.						→	→	→	→	→	→				
6.					→	→	→								
7.														→	→

2.7 ECONOMIC IMPACT: Positive economic impact is expected.

2.8 EFFECT OF ENVIRONMENT: Friendly to environment.

2.9 UTILIZATION OF RESEARCH RESULTS:

The result will help the farmers to grow suitable chewing cane variety for higher yield and economic benefit for commercial production.

PROGRAMME AREA : CROP PRODUCTION
3.0 TITLE : SELECTION OF SUGARCANE VARIETIES SUITABLE FOR *GUR* PRODUCTION UNDER NOAKHALI REGIONS
LOCATION : RSRS, Subarnachar, Noakhali & Hatia
INVESTIGATORS : R C Kabiraj, S Islam, M A Rasel and M S Arefin
NATURE OF STUDY : On -going
DURATION : 2024-26
ESTIMATED COST(Tk) : 70,000/-

3.1 DEFINITION OF THE PROBLEM:

Sugarcane is location specific crop. The performance of particular sugarcane variety differs from place to place and farmers to farmers, which deserves adaptability trail. Without adaptability test, it cannot recommend a particular variety for particular location. Farmers of this region grow local varieties resulting economic return is very low. High yielding and good quality sugarcane varieties are needed for this region. Therefore, this study is needed to find out the comparative performance *gur* varieties such as Isd 16, Isd 40, BSRI Akh 43, BSRI Akh 44, BSRI Akh 45 and BSRI Akh 46. The present study is undertaken to evaluate the performance of the BSRI released *gur* varieties at Subarnachar region.

3.2 OBJECTIVE(S):

1. To test the adaptability of BSRI released sugarcane *gur* varieties at Noakhali region and
2. To identify location specific suitable variety for commercial cultivation.

3.3 METHODOLOGY:

The selected BSRI released commercial varieties such as Isd 16, Isd 37, Isd 39, BSRI Akh 43, BSRI Akh 44, BSRI Akh 45 and BSRI Akh 46 will be planted in RCB design with 3 replications. Row to row distance 1m and plant to plant distance 100 cm. Intercultural operations will be done as and when required. Recommended dose of fertilizers will be applied as required

Treatments: (7)

T_1 : Isd 16
T_2 : Isd 37
T_3 : Isd 39
T_4 : BSRI Akh 43
T_5 : BSRI Akh 44
T_6 : BSRI Akh 45
T_7 : BSRI Akh 46

Replications : 3
Design : RCBD
Planting method : 2 budded setts

3.4 DATA TO BE RECORDED:

1) Germination count (%)
2) No. of tillers/ha (at 120 DAT, 150 DAT and 80 DAT)
3) No. of millable cane/ha
4) Cane height (m) and diameter (cm)
5) Brix (%) of cane at harvest
6) Estimated cane yield (t/ha)
7) *Gur* recovery after *gur* preparation
8) Physical and chemical properties of *gur*

3.5 WORK ELEMENT:

1. Plantation of *gur* variety
2. Germination count
3. Tiller count
4. Measurement of stalk height, girth and internode length
5. Observation on reaction to pests and diseases
6. Cane yield at harvest
7. *Gur* preparation and *gur* yield data collection

3.6 TIME SCHEDULE:

Sl.	2025				2026											
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1				→												
2					→											
3							→		→							
4													→	→	→	
5						→	→	→	→	→	→	→	→	→	→	→
6															→	
7																→

3.7 ECONOMIC IMPACT: Positive economic impact is expected.

3.8 EFFECT OF ENVIRONMENT: Friendly to environment.

3.9 UTILIZATION OF RESEARCH RESULTS:

The result obtained from this study may help growers to know suitability of *gur* variety in this location. On the basis of results will be able to take correct decision about the high yielding, pest and disease tolerant *gur* varieties.

4.0 TITLE : EFFICACY OF SPACING WITH ORGANIC AND INORGANIC FERTILIZER ON GROWTH AND YIELD OF STEVIA IN AEZ 18
LOCATION : RSRS, Subarnachar, Noakhali
INVESTIGATORS : R C Kabiraj, S Islam, M A Haque, M H Rahman, N Islam, M A Rasel and M A Sayeed
NATURE OF STUDY : New
DURATION : 2024-26
ESTIMATED COST(Tk) : 25,000/-

4.1 DEFINITION OF THE PROBLEM:

Stevia (*Stevia rebaudiana* Bertoni) is an emerging alternative sugar crop and is becoming more popular in various parts of the world. The stevia leaves mostly contain stevioside, which tastes 300 times sweeter than sucrose (Geuns *et al.*, 2003). It is a natural sweetener that belongs to the sunflower family, Asteraceae, and is native to Paraguay (South America); hence called Paraguay's sweet herb (Megeji *et al.*, 2005). Stevia cultivation covers 32,000 hectares worldwide, with China accounting for 75 per cent of the total area. Currently, stevia is widely used in Japan. Due to the huge demand for diabetic products in the market, Indian farmers have also started growing stevia. Stevia is now being grown by farmers in several areas of Rajasthan, Punjab, Uttar Pradesh, West Bengal, Madhya Pradesh, Andhra Pradesh, Karnataka, Chhattisgarh, and other Indian states. Besides its sweetening properties, *Stevia rebaudiana* also contains anti-hyperglycemic, anti-cancer, hepatoprotective, anti-hypertensive, anti-caries, antioxidant, and anti-bacterial properties (Chughtai *et al.*, 2020). It has several common names, like sweet leaf, honey yerba, honey leaf, meetitulsi, sweet chrysanthemum, and candy leaf (Singh *et al.*, 2019).

Plant spacing is an important non-monetary agronomical practice that determines the spatial arrangements of plants that influence canopy structure, light interception and radiation use efficiency and ultimately, biomass production of crops. Pinching, also known as shoot tip removal or decapitation, is an agronomic practice that encourages the production of lateral branches in plants by disrupting apical dominance.

Since the leaf is the economically important component, producing greater leaf biomass is the primary criterion of crop performance. Proper plant spacing is essential for increasing crop yield potential since it influences crop growth and development by altering canopy light interception and interplant competition.

4.2 OBJECTIVE(S):

1. To find out suitable row and plant spacing of stevia;
2. To assess the productivity of stevia and
3. To find out yield potential of stevia under different fertilizer combination.

4.3 METHODOLOGY:

The experiment will be conducted at RSRS Subarnachar Farm. The experiment will be planted in RCB design with 3 replications. Intercultural operations will be done as and when required. The following treatments will be considered

Treatments Combinations: (9)

Factor – A : Spacing

T_1 : 50cm × 50cm
T_2 : 50cm × 40cm
T_3 : 50cm × 30cm

Factor – B : – Fertilizer dose

F_1 : 75 % of STV (Soil test value) + FYM @ 5 t/ha
F_2 : 100 % of STV (Soil test value) + FYM @ 5 t/ha
F_3 : 125 % of STV (Soil test value) + FYM @ 5 t/ha

Replications : 3
Design : RCB factorial
Plot size : 2m × 2m

4.4 DATA TO BE RECORDED:

1. Physical and chemical properties of initial and post-harvest soil
2. Plant height
3. Number of branch plant^{-1}
4. Number of leaves plant^{-1}
5. Fresh leaf weight plant^{-1}
6. Dry leaf weight plant^{-1}
7. Fresh leaf yield plant^{-1}

4.5 WORK ELEMENT

1. Lay out of the experiment
2. Seedling planting
3. First top dressing of urea
4. Second top dressing of urea
5. Intercultural operations
6. Data collection
7. Leaf tissue to be analyzed for different nutrient elements
8. Yield of stevia
9. Data tabulation, analysis and reporting

4.6 TIME SCHEDULE:

Act. No.	2026											
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1		→	→									
2				→	→							
3				→	→							
4			→	→								
5			→	→	→	→						
6				→	→	→	→	→				
7								→	→			
8						→	→	→	→	→		
9											→	→

4.7 ECONOMIC IMPACT: Positive economic impact is expected.

4.8 EFFECT OF ENVIRONMENT: Friendly to environment.

4.9 UTILIZATION OF RESEARCH RESULTS:

The result will help the farmers to grow stevia for higher yield and economic benefit for commercial production.

5.0 TITLE : INTEGRATED NUTRIENT MANAGEMENT PRACTICES FOR CHEWING SUGARCANE CULTIVATION AT NOAKHALI REGION (AEZ 18)
LOCATION : Subarnachar, Noakhali (AEZ 18)
INVESTIGATORS : R C Kabiraj, S Islam, M A Sayeed and M A Haque
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk) : 75,000.00

5.1 DEFINITION OF THE PROBLEM:

Sugarcane is an important cash crop of Bangladesh. In Bangladesh sugarcane is used for producing white sugar, *gur* making, drinking of juice and chewing purpose. Recently Sugar mills of this country and *gur* makers faces scarcity of sugarcane due to low production and poor yield. Now average yield of sugarcane in Bangladesh is only 42 t/ha whereas the world average yield is 72 t/ha. Causes of low yield depends on various factor viz. fertility deterioration of soil due to intensive cropping, imbalanced use of fertilizer, low organic matter content in soil, less use or no use of organic manure, lack of knowledge of farmers on integrated nutrient management practice etc. Among the different management practices being undertaken for enhancing the productivity of sugarcane of which, soil fertility is an important one. Imbalance fertilization in sugarcane crop is mainly responsible for decline in its productivity and ultimately the profitability. Dawe *et al*. (2003) have reported that deterioration in soil health and crop productivity is associated with decline in soil-organic carbon under such farming systems. As soil organic carbon influences the physical, chemical and biological properties of the soil, thus it is necessary to device such nutrient-management practices that help to improve or maintain the organic C content of the soil. Inorganic fertilization alone cannot maintain the organic carbon status of soil. Thus integrating organic manures with inorganic fertilizer can adequately meet the nutritional requirements of sugarcane crop (Nagaraju *et al.*, 2000). A balanced application of nutrients through an integrated use of organics and chemical fertilizers showed a promise in sustaining the cane productivity of soils (Kumar *et al.*, 2013 Ramesh *et al.*, 2004 Gopala sundaram *et al.*, 2012). Therefore the experiment was undertaken at Regional Sugarcrop Research Station, Subarnachar, Noakhali to study the effect of various combinations of organic manure and inorganic fertilizers for maximization of sugarcane yield.

5.2 OBJECTIVE:

1. Finding out the effect of integrated nutrient management on Chewing sugarcane productivity and
2. Determining soil health status due to integrated nutrient management practices.

5.3 METHODOLOGY:

The experiment will be conducted at Subarnachar, Noakhali (AEZ 18) area.

Treatments:

T_1 : Control
T_2 : Soil Test Value (STV)
T_3 : 75% of T_2
T_4 : T_3 + Cowdung @ 10 tha^{-1}
T_5 : T_3 + Poultry Manure @ 5 tha^{-1}
T_6 : T_3 + Mustard Oilcake @ 500 $Kgtha^{-1}$

Design	: RCB;
Replication	: 3;
Plot size	: 8m × 6m;
Method of planting	: 2- budded sett;
Variety	: BSRI Akh 42

5.4 DATA TO BE COLLECTED:

1. Physical and chemical properties of initial and post harvest soils
2. Germination counting at 60 and 90 days after plantation (DAP)
3. Tiller counting at 120, 150 and180 days after plantation (DAP)
4. Sheath and leaf blades to be analyzed for different nutrient elements at 120 DAP and at 300 DAP
5. Millable cane, cane diameter, cane height, yield and Brix at harvest

5.5 WORK ELEMENT:

Activity No.	Name of activity
1	Layout of the field experiments and initial soil sample collection
2	Basal fertilizer application and plantation of sett in the field
3	First top dressing of urea and MoP at 120 DAP
4	Tiller counting at 120 days after plantation (DAP)
5	Leaf tissues to be analyzed for different nutrient elements at 120 DAP
6	Second top dressing of urea and MoP at 150 DAP
7	Tiller counting at 150 DAP and 180 DAP
8	Sucrose content before two days of harvest
9	Millable cane counting at harvest
10	Leaf tissues to be analyzed for different nutrient elements at 300 DAP
11	Yield of cane at harvest
12	Post harvest soil sample collection
13	Soil and plant analyses for different nutrients

5.6 TIME SCHEDULE:

AC No.	Year	2025				2026											
	Month	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→	→														
2		→	→	→													
3							→	→									
4,5							→	→	→								
6								→	→	→							
7								→	→	→							
8																→	
9-12																	→
13		→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→

5.7 ECONOMIC IMPACT:

Integrated nutrient management practice for growing sugarcane will reduce cost of production as well as ensure higher sugarcane yield. Therefore sugarcane growing farmers will be economically benefited.

5.8 EFFECT ON ENVIRONMENT:

The uses of integrated nutrient management practice have no harmful effect on the soil, the crop and the consumer.

5.9 UTILIZATION OF RESEARCH RESULTS:

The findings of the study will be useful to the sugarcane farmers and extension workers to improve sugarcane productivity and ensure soil health.

BSRI SUB-STATION, JOYPURHAT

LIST OF EXPERIMENTS

1.0 Title : Effect of three sequential intercropping on growth, yield and profitability of sugarcane
2.0 Title : Performance of some BSRI released varieties as plant crop in Tista Meander Floodplain
3.0 Title : Performance of some chewing cane varieties with intercrop in Tista Meander Floodplain
4.0 Title : Demonstration on cultivation of chewing sugarcane
5.0 Title : Ratooning potentiality of some popular BSRI sugarcane varieties in JSM zone

PROGRAMME IN DETAILS

1.0 TITLE : **EFFECT OF THREE SEQUENTIAL INTERCROPPING ON GROWTH, YIELD AND PROFITABILITY OF SUGARCANE**
LOCATION : Aymarasulpur, Panchbibi, Joypurhat
INVESTIGATORS : M M Hasan, M S Islam, T A Apon and A K M R Islam
NATURE OF STUDY : Ongoing
DURATION : 2024-2026
ESTIMATED COST(Tk) : 35,000.00

1.1 DEFINITION OF THE PROBLEM:

Sugarcane is a crucial cash crop in Bangladesh, contributing significantly to the agricultural economy and providing livelihoods for many farmers. However, traditional farming practices often result in underutilization of land, particularly the vacant spaces between sugarcane rows. Sequential intercropping can enhance the productivity of sugarcane cultivation by introducing additional crops that can be harvested throughout the year, thus optimizing land use and increasing farmers' income.

While sugarcane growers in Bangladesh typically cultivate one or two intercrops alongside sugarcane, the introduction of a third intercrop is less common and remains unexplored. This research proposes to investigate the growth, yield and profitability of sugarcane when intercropped with three sequential intercrops, thereby providing an opportunity for farmers to gain additional income and improve soil health.

1.2 OBJECTIVES:

1. To evaluate the growth of sugarcane when intercropped with different sequential intercrops;
2. To assess the yield and economic viability of sugarcane with three sequential intercropping system and
3. To determine the land equivalent ratio (LER) and overall land utilization efficiency.

1.3 METHODOLOGY:

The experiment will be conducted in Joypurhat district under Tista Meander Floodplain soil (AEZ-3). The experiments will be set up at the farmers' field following randomized complete block design with three replications. Intercultural operations, fertilizer application and irrigation will be done as per recommendation.

Treatments:

T_1 : Sole sugarcane
T_2 : Sugarcane + Onion
T_3 : Sugarcane + Lettuce
T_4 : Sugarcane + Onion - Chili
T_5 : Sugarcane + Lettuce - Chili
T_6 : Sugarcane + Onion - Chili - Black gram
T_7 : Sugarcane + Lettuce - Chili - Black gram
T_8 : Sugarcane + Onion - Chili - Turmeric
T_9 : Sugarcane + Lettuce - Chili - Turmeric
T_{10} : Sugarcane + Onion - Chili - Ginger
T_{11} : Sugarcane + Lettuce - Chili - Ginger

Variety : Isd 39;
Planting materials : two budded sett
Plot size : 8m × 6m;
Gross area : 0.33 acre

DATA TO BE COLLECTED:

For sugarcane:

1. Germination percentage
2. Tiller population at 120, 150 and 180 days after plantation
3. Number of millable cane, cane yield, brix percent and plant height at harvest

For Intercrop:

1. Yield of 1st, 2nd and 3rd intercrops.
2. Economic analysis: BCR, LER

1.4 WORK ELEMENT:

1. Sett preparation
2. Layout preparation and initial soil sample collection
3. Basal fertilizer application and planting sugarcane and 1st intercrop
4. Relay planting of 2nd intercrop and harvesting of 1st intercrop
5. Tiller count at 120 days after planting (DAP)
6. First top dressing of urea and MoP
7. Harvesting of 2nd intercrop & planting 3rd intercrop turmeric and ginger
8. Tiller count at 150 DAP
9. Second top dressing of urea and MoP
10 Tiller count at 180 DAP
11. Planting 3rd intercrop black gram
12. Harvesting of 3rd intercrop
13. Brix%, millable cane and yield at harvest
14. Post harvest soil sample collection

1.5 TIME SCHEDULE

Sl. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1		→	→													
2		→	→													
3		→	→													
4					→											
5							→									
6							→									
7								→								
8								→								
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11										→						
12																→
13																→
14																→

1.6 ECONOMIC IMPACT:

The research program offers a promising economic impact by enhancing land use efficiency, boosting net returns and ensuring sustainable soil health, all while reducing production costs and creating year-round employment. These benefits make this model a potentially transformative approach to sugarcane farming with implications for improved livelihoods, food security and resilience in Bangladeshi farming communities.

1.7 EFFECT ON ENVIRONMENT:

The effect of the research program promotes environmental benefits by enhancing soil health, improving water efficiency, reducing greenhouse gas emissions and supporting biodiversity. The reduced need for chemical inputs, coupled with the long-term sustainability of the soil and agro-ecosystem, aligns this approach with environmental conservation goals. These outcomes make triple sequential intercropping a valuable, eco-friendly model for future sustainable agriculture practices in Bangladesh.

1.8 UTILIZATION OF THE RESEARCH RESULTS:

The research program has significant implications for agricultural productivity, rural income, environmental sustainability and economic resilience. Through the effective utilization of its findings, this research can drive improvements in land use efficiency, resource conservation, farmer profitability and sustainable agricultural practices in Bangladesh benefiting farmers, policymakers and the environment.

2.0 TITLE : **PERFORMANCE OF SOME BSRI RELEASED VARIETIES AS PLANT CROP IN TISTA MEANDER FLOODPLAIN**
LOCATION : Vadsa, Joypurhat
INVESTIGATORS : M M Hasan, M O Sheikh, M M Alam and A K M R Islam
NATURE OF STUDY : Ongoing
DURATION : 2024-2026
ESTIMATED COST(Tk) : 24,000.00

2.1 DEFINITION OF THE PROBLEM:

Bangladesh Sugarcrop Research Institute (BSRI) has released forty eight (48) sugarcane varieties till present. Releasing new varieties is very necessary and a continuous process to substitute old varieties for higher yields of sugarcane. Before recommendation of the latest sugarcane varieties for Tista Meander Flood Plain Soil it is needed to study their performance regarding insect and disease resistance, suitability to local climatic and soil conditions and ability to produce higher yield. In mill zones of Bangladesh sugarcane growers generally use old varieties and yield is not encouraging. So, new sugarcane varieties are crying need to the growers for profitable production. Therefore, the experiment will be undertaken to select suitable sugarcane varieties for profitable production.

2.2 OBJECTIVES:

1. To select suitable sugarcane varieties in Tista Meander Floodplain Soil and
2. To study the comparative performance of different sugarcane varieties.

2.3 METHODOLOGY:

The experiment will be conducted in the farmers' field of Joypurhat district under AEZ 3 (Tista Mender Floodplain Soil). The experiments will be set up in randomized complete block design following three replications.Intercultural operations, fertilizer application and irrigation will be done as per recommendation.

Treatments:

T_1 : Isd 16
T_2 : Isd 26
T_3 : Isd 33
T_4 : Isd 34
T_5 : Isd 37
T_6 : Isd 39
T_7 : Isd 40
T_8 : BSRI Akh 43
T_9 : BSRI Akh 45
T_{10} : BSRI Akh 46
T_{11} : BSRI Akh 48

Plot size : 8m × 6m,
Gross area : 0.33 acre

DATA TO BE COLLECTED:

1. Germination percentage
2. Tiller population at 120, 150 and 180 days after plantation
3. Lodging percentage count
4. Percentage of insect and disease infested canes
5. Number of millable cane, cane yield, brix percent and plant height at harvest

2.4 WORK ELEMENTS:

1. Land selection and preparation
2. Basal fertilizer application and planting
3. Irrigation
4. Intercultural operations
5. Top dressing of fertilizers
6. Insect and pest control
7. Sugarcane harvesting
8. Data collection on number of tiller, millable cane, yield and brix percent etc

2.5 TIME SCHEDULE:

Sl. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	→	→	→													
2			→	→												
3				→	→	→	→	→	→							
4					→	→	→	→	→	→						
5							→	→	→	→						
6						→	→	→	→	→	→	→	→			
7																→
8							→	→	→	→	→	→	→	→	→	→

2.6 ECONOMIC IMPACT:

This research could lead to a substantial economic uplift for farmers and rural communities by increasing yields, reducing costs, stabilizing income and enhancing the sugarcane supply chain. Such impacts contribute to both the microeconomics of individual farming households and the macroeconomic health of the region's agricultural industry.

2.7 EFFECT ON ENVIRONMENT:

Careful management practices and monitoring are essential to mitigate the negative effects associated with monoculture, soil nutrient depletion and local ecosystem disruption. Implementing sustainable agricultural practices will be key to ensuring that the benefits of cultivating BSRI-recommended sugarcane varieties outweigh any potential environmental risks.

2.8 UTILIZATION OF THE RESEARCH RESULT:

The effective utilization of the research results on BSRI-recommended sugarcane varieties in Tista Meander Floodplain soil can significantly improve agricultural practices, enhance farmers' livelihoods and contribute to sustainable development in the region. By integrating research findings into practical applications, stakeholders can work together to create a thriving sugarcane sector that benefits the local economy and environment.

3.0 TITLE : PERFORMANCE OF SOME CHEWING CANE VARIETIES WITH INTERCROP IN TISTA MEANDER FLOODPLAIN
LOCATION : Panchgram, Kalai, Joypurhat
INVESTIGATORS : M M Hasan, M O Sheikh, S Rasul and A K M R Islam
NATURE OF STUDY : New
DURATION : 2025-2026
ESTIMATED COST(Tk) : 35,000.00

3.1 DEFINITION OF THE PROBLEM:

Sugarcane is a long duration crop (12-14 months) in Bangladesh. Due to its long duration farmers are not interested to grow sugarcane but they are interested to grow quick growing and profitable crops like winter crops in Tista Meander Floodplain soils. As a result sugarcane growing fields are replaced by winter crops. Winter crops have a rapid growth rate and smother the sugarcane crop which has slow growth rate for 120-150 days after planting. Under this circumstance, intercropping winter crops with sugarcane is necessary in that area. Chewing cane is in high demand in fresh markets for direct consumption due to its sweetness, softness and chewability. It brings a better price compared to other types of sugarcane or crops, making it more profitable.

Therefore, this study aims to examine chewing cane's growth, yield and profitability when combined with intercrops giving farmers the chance to earn extra money.

3.2 OBJECTIVES:

1. To find out the best variety for chewing purposes in Tista Meander Floodplain soil and
2. To identify suitable intercrop of chewing cane-intercropping system in Tista Meander Floodplain soil.

3.3 METHODOLOGY:

The experiment will be conducted in Joypurhat district under Tista Meander Floodplain soil (AEZ-3). The experiments will be set up at the farmers' field following randomized complete block design with three replications. Intercultural operations, fertilizer application and irrigation will be done as per recommendation.

Treatments:

T_1 : BSRI Akh 41+ Onion - Okra
T_2 : BSRI Akh 42+ Onion - Okra
T_3 : Black Rubby + Onion - Okra
T_4 : BSRI Akh 41+ Chili - Okra
T_5 : BSRI Akh 42+ Chili - Okra
T_6 : Black Rubby + Chili - Okra
T_7 : BSRI Akh 41+ Potato - Okra
T_8 : BSRI Akh 42+ Potato - Okra
T_9 : Black Rubby + Potato - Okra

Planting materials : two budded sett
Plot size : 8m × 6m;
Gross area : 0.33 acre

DATA TO BE COLLECTED:

For chewing cane:

1. Germination percentage
2. Tiller population at 120, 150 and 180 days after plantation
3. Number of chewing cane, cane yield, brix percent and plant height at harvest

For Intercrop:

1. Yield of intercrops.
2. Economic analysis: BCR

3.4 WORK ELEMENT:

1. Layout preparation
2. Sett preparation
3. Basal fertilizer application and planting sugarcane intercrop
4. Harvesting of intercrop
5. Tiller count at 120 days after planting (DAP)
6. First top dressing of urea and MoP
7. Tiller count at 150 DAP
8. Second top dressing of urea and MoP
9. Tiller count at 180 DAP
10. Brix%, millable cane and yield at harvest

3.5 TIME SCHEDULE

Sl. No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→	→												
2			→	→												
3			→	→												
4						→	→	→								
5							→	→								
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9										→	→					
10														→	→	

3.6 ECONOMIC IMPACT:

The research program offers a promising economic impact by introducing short-duration crops, farmers can gain additional income without significantly increasing input costs. The intercrops mature and are harvested before the chewing cane reaches its peak growth stage, allowing dual income streams from the same field.

3.7 EFFECT ON ENVIRONMENT:

By strengthening soil health, increasing water efficiency, lowering greenhouse gas emissions and promoting biodiversity, the research program's effects enhance environmental benefits. The long-term viability of the soil and agro-ecosystem along with the decreased requirement for chemical inputs, makes this strategy consistent with environmental conservation objectives. Because of these results, intercropping is a useful and environmentally beneficial paradigm for Bangladesh's future sustainable agricultural methods.

3.8 UTILIZATION OF THE RESEARCH RESULTS:

Economic resilience, environmental sustainability, rural income and agricultural output are all significantly impacted by the study program. Farmers and policymakers can all gain from this research's successful application, which can promote advances in land use efficiency, resource conservation, farmer profitability and sustainable farming practices in Bangladesh.

PROGRAM AREA: TRANSFER OF TECHNOLOGY AND SOCIO ECONOMICS

Sl. No.	Nature of program	Number	Unit Cost	Total (Tk)
1	Demonstration on cultivation of chewing sugarcane	04	18,000/-	72,000/-
2	Ratooning potentiality of some popular BSRI sugarcane varieties in JSM zone	04	10,000/-	40,000/-

BSRI SUB-STATION, RAJSHAHI

LIST OF EXPERIMENTS

1.0 Title : Field performance of some newly released sugarcane varieties and their ratooning potentiality in mill zones
2.0 Title : Selection of suitable genotypes for *gur* production in low land of Chapai Nawabganj district
3.0 Title : Performance of different carrot varieties as intercrop with chewing cane
4.0 Title : Study on quality characters of date palm juice based on age and cutting interval
5.0 Title : Effect of late and excess application of nitrogenous fertilizer on maturity behavior of sugarcane

PROGRAMME IN DETAILS

1.0 TITLE : **FIELD PERFORMANCE OF SOME NEWLY RELEASED SUGARCANE VARIETIES AND THEIR RATOONING POTENTIALITY IN MILL ZONES**
LOCATION : Rajshahi
INVESTIGATORS : H M Al-Amin, M K Begum and A K M R Islam
NATURE OF STUDY : On-going
DURATION : 2023-2026
ESTIMATED COST(Tk) : 50,000.00

1.1 DEFINITION OF THE PROBLEM :

Sugarcane is being cultivated in mills and non-mill zone areas mainly for sugar, *gur* and chewing purpose. At present only few varieties are being cultivated which do not actually fulfill the farmers requirement, because the yield of cane of the existing varieties are very poor. Before recommendation of latest sugarcane varieties under Rajshahi sugar mill areas are required to be studied their ability to produce higher yield, quality and their ratooning potentiality. The experiment is aimed to help the farmers of mill areas to select the high yielding and high sugar content varieties and their rationing potentialities for commercial cultivation of this region.

1.2 OBJECTIVES :

1. To observe the suitability of BSRI recommended varieties in RJSM areas;
2. To select the good ratooner varieties for this area and
3. To study the comparative performance of different latest varieties.

1.3 METHODOLOGY :

Treatments :

T_1 = BSRI Akh 46
T_2 = BSRI Akh 45
T_3 = BSRI Akh 43
T_4 = Isd 33
T_5 = Isd 34 (Check)

Design : RCBD
Replication : 3
Plot size : 8m × 8m
Method of planting : Conventional (2 budded setts),
Gross areas : 0.15 ha.

Data to be collected:

1. Germination percent
2. Tiller population at 120, 150 and 180 days
3. Millable cane count
4. Cane yield at harvest
5. Brix percent (%)

Those data will be collected from plant cane as well as 1st and 2nd ratoon cane.

1.4 WORK ELEMENTS :

1. Land selection and preparation
2. Basal fertilizer application and planting
3. Germination count
4. Intercultural operation
5. Irrigation
6. Tiller counting at 120, 150 and 180 days
7. Fertilizer application (top dressing)
8. Insect and pest control
9. Millable cane count
10. Harvesting of cane
11. Brix %, recovery and yield data collection

1.5 TIME SCHEDULE:

AC	Year	2025					2026										
No.	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
i.	I																	
ii.																		
iii.																		
iv.																		
v.																		
vi.																		
vii.																		
viii.																		
ix.																		
x.																		
xi.																		

1.6 ECONOMIC IMPACT: Positive economic impact is expected.

1.7 IMPACT ON ENVIRONMENT:

This is environment friendly and there will not be any adverse effect on the surrounding environment for implementation.

1.8 UTILIZATION OF RESEARCH RESULT :

The result of the study will help to decide farmers to select good ratooner varieties of sugarcane. Thus this study has a great value for the localization.

2.0 TITLE : SELECTION OF SUITABLE GENOTYPES FOR *GUR* PRODUCTION IN LOW LAND OF CHAPAI NAWABGANJ DISTRICT
LOCATION : Sibganj, Chapai Nawabganj
INVESTIGATORS : M K Begum, H M Al-Amin, M S Arefin and M S Islam
NATURE OF STUDY : On-going
DURATION : 2024-2027
ESTIMATED COST(Tk) : 90,000/-

2.1 DEFINITION OF THE PROBLEM:

BSRI bred sugarcane varieties are usually done in mill zones and do not cover all agro-ecological zones. As such BSRI released commercial varieties do not perform equally in all locations. Therefore, it is important to evaluate the performance of those varieties in non- mill zones. The sugarcane yield of a particular variety depends upon the heredity of the genotype and the environment where it is exposed during the course of its life cycle. Variety of a crop plays an important role as regards to the yield and quality, sugarcane is no exception (Anon. 1978). Non-mill zone farmers of Bangladesh continuously need high yielding and high sugar varieties. After a considerable period of cultivation sugarcane varieties show a tendency to decline in yield and vigor (Barnes, 1954 and Humbert, 1959). It is an obscure and puzzling problem to scientists, growers and processors. To maintain high yielding character, it is necessary to replace varieties every few years with newly released varieties. All sugarcane varieties do not perform well specially in low land. Therefore, the present study was undertaken to evaluate the performance of some varieties in low land of non-mill zones for *gur* production.

2.2 OBJECTIVES:

i) Evaluating the performance of sugarcane genotypes in low lands and
ii) Selecting the location specific sugarcane varieties for *gur* production.

2.3 METHODOLOGY:

Five BSRI released commercial varieties will be grown along with one clone which is cultivated long time in that area.

Treatments:

T_1 = Isd 33
T_2 = Isd 34
T_3 = BSRI Akh 45
T_4 = BSRI Akh 46
T_5 = I 291-87 (Red rot susceptable)

Design: RCB, **Replication:** 3, Plot size: 8m X 8m; Number of plots: 15; Method of planting: Conventional; Time of planting: October/November 2025, Intercultural operation: As and when required: Fertilizer dose: As per recommended dose to be estimated for each location.

Data to be recorded:

i. Mortality of settlings/germination/gap filling records
ii. Tiller (March and May)
iii. Number of millable cane at harvest
iv. Plant height at harvest
v. Major insect and diseases
vi. Yield of cane
vii. Sucrose/Brix %
viii. *Gur* recovery %

2.4 WORK ELEMENTS & TIME SCHEDULE:

Activity No	Name of Activities
i.	Land & farmer selection
ii.	Land preparation supervision
iii.	Planting (sugarcane)
iv.	Germination count.
v.	Fertilizer application (Top dressing)
vi.	Tillering count (March and May)
vii.	Intercultural operation
viii.	Pest control
ix.	Millable cane count
x.	Harvesting and yield record.
xi.	Sucrose/Brix %.

2.5 TIME SCHEDULE:

AC	Year	2025					2026										
No.	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
i.																		
ii.																		
iii.																		
iv.																		
v.																		
vi.																		
vii.																		
viii.																		
ix.																		
x.																		
xi.																		

2.6 ECONOMIC IMPACT: Positive economic impact is expected.

2.7 EFFECT ON ENVIRONMENT: Positive effect on environment.

2.8 UTILIZATION OF RESEARCH RESULT:

The result of the study will help to decide farmers to select suitable *gur* varieties of sugarcane in low land of that area.

3.0 TITLE : PERFORMANCE OF DIFFERENT CARROT VARIETIES AS INTERCROP WITH CHEWING CANE
LOCATION : Naogaon
INVESTIGATORS : H M Al-Amin, M K Begum and A K M R Islam
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk) : 60,000.00

3.1 DEFINITION OF THE PROBLEM:

Currently, the sustainability of sugarcane cultivation is under pressure due to competition from various short-duration crops. As a long-duration crop, sugarcane occupies the land for 10 to 12 months, making it difficult for resource-poor farmers to wait that long for economic returns from a sole crop. In this context, intercropping offers a practical solution by allowing farmers to grow short-duration crops like carrot alongside sugarcane, providing an interim source of income. In the Manda upazila of Naogaon, farmers have been cultivating different carrot varieties, but they lack clear guidance on which variety is best suited for intercropping with chewing cane. Considering these factors, the present study was undertaken to address this gap.

3.2 OBJECTIVE(S):

1. To assess the yield potential of various carrot varieties under intercropping conditions with chewing cane and
2. To compare the economic returns of different carrot–chewing cane intercropping combinations through cost-benefit analysis.

3.3 METHODOLOGY:

Treatments:

T_1 : Chewing Cane (Only)
T_2 : T_1 + New Koruda (Lal Teer Seed Ltd)
T_3 : T_1 + Japan King (Ispahani Agro Ltd)
T_4 : T_1 + Improved shin Koruda (Clause Vegetable Seed Ltd)
T_5 : T_1 + Carrot king (Supreme Seed Company Ltd)
T_6 : T_1 + Thema (East West Seeds Pvt Ltd)

Carrot varieties will be grown in 1 line between single rows of chewing cane.

Design	: RCBD
Replication	: 3
Plot size	: 8m × 6m
Method of planting	: Conventional (2 budded setts),
Gross areas	: 0.13 ha.
Chewing Cane Variety	: BSRI Akh 42

Data to be collected:

1. Germination percent at 60 days of planting
2. Tiller population at 120, 150 and 180 days of planting
3. Intercrop yield
4. Brix percent (%)
5. Chewable cane count at harvest
6. Cane yield at harvest

3.4 WORK ELEMENTS:

1. Land selection and preparation
2. Basal fertilizer application and planting of cane
3. Planting of first intercrop
4. Intercultural operation
5. Irrigation
6. Harvesting of intercrop
7. Fertilizer application (top dressing)
8. Insect and pest control
9. Harvesting of cane
10. Data collection (Tiller, Chewable cane, brix% and yield)

3.5 TIME SCHEDULE:

Ac. No.	2025				2026									
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
1	→	→												
2			→	→										
3			→	→										
4				→	→	→	→	→	→	→				
5			→	→	→	→	→	→						
6						→	→							
7						→	→	→	→					
8				→	→	→	→	→	→	→	→	→		
9												→	→	→
10			→	→	→	→	→	→	→	→	→	→	→	→

3.6 ECONOMIC IMPACT: Positive economic impact is expected.

3.7 IMPACT ON ENVIRONMENT:

This is environment friendly and there will not be an adverse effect on the surrounding environment for implementation of these results.

3.8 UTILIZATION OF RESEARCH RESULT:

The experimental results will help the farmers to choose suitable carrot varieties under intercropping conditions with chewing cane and farmers will be benefited by getting interim income.

4.0 TITLE : STUDY ON QUALITY CHARACTERS OF DATE PALM JUICE BASED ON AGE AND CUTTING INTERVAL
LOCATION : Rajshahi
INVESTIGATORS : M K Begum , H M Al-Amin, M S Arefin and M S Islam
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk) : 1,00,000.00

4.1 DEFINITION OF THE PROBLEM:

The date palm is very popular and allowed to grow in Bangladesh mainly for its sweet juice and *gur* although nothing of these trees is useless. Fresh juice is sold early in the morning in the both villages and urban areas. Besides, *gur* is prepared from the juice. *Gur* prepared from date palm is sweeter than sugarcane *gur* due to its higher reducing sugars content, and is very popular for its special taste and aroma. It contains more protein, fat, mineral specially phosphorus and calcium than sugarcane *gur*. According to FAO recommendation per capita 13 kg sugar is required for human diet, and as such present requirement of sugar for 140 million populations in Bangladesh is about 1.80 million tons. Present production of sugar and *gur* in the country is about 0.10 million tons and 0.50 million tons respectively, and as such shortfall of sugar/*gur* is about 1.20 million tons. According to BBS report date palm and palmyra palm is grown in around 10755 to 10767 hectares of land and total estimated juice production is 3.34 to 3.48 million tons and 14% *gur* recovery 0.034 to 0.038

million tons of *gur* is produced per year in Bangladesh. With population increase as well as urbanization, demands of sugar is being increased, while acreage of sugarcane cultivation is being gradually decreased due to higher demand for food, vegetables etc and utilization of crop lands for houses, roads, industries etc. Therefore, there is no scope to increase sugarcane acreage to meet the higher demand of ever increasing population in Bangladesh. Date palm, palmyra palm and golpata are grown in homestead, embankment, ponds, road sides, and in marginal lands. These trees can survive in severe drought, flood and water logging condition. No systematic cultivation practices of date palm are done to get quality juice. Considering these factors, the present study was undertaken.

4.2 OBJECTIVE(S):

1. To determine the optimal tree age for harvesting in order to obtain high-quality juice and
2. To determine the proper interval time after 3rd cut.

4.3 METHODOLOGY:

Treatments:

Factor A: Age of the tree

T_1 : 5 -8 years old age tree
T_2 : 9-12 years old age tree
T_3 : Above 12 years old age tree

Factor B: Cutting interval

T_1 : 3 days interval
T_2 : 4 days interval
T_3 : 5 days interval

Design : Factorial
Replication : 3
No. of tree : 27
Variety : Wild date palm (*Phoenix sylvestris*)

Data to be collected:

1. Amount of juice daily from each date palm tree during November to February under different treatment.
2. Brix percent (%)
3. pH

4.4 WORK ELEMENTS:

1. Selection of different ages of date palm trees
2. Prepare them for sap collection
3. Data collection (Amount of sap, brix% and pH).

4.5 TIME SCHEDULE:

Ac. No.	2025				2026									
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
1	→	→												
2	→	→												
3			→	→	→	→								

4.6 ECONOMIC IMPACT: Positive economic impact is expected.

4.7 IMPACT ON ENVIRONMENT:

This is environment friendly and there will not be an adverse effect on the surrounding environment for implementation of these results.

4.8 UTILIZATION OF RESEARCH RESULT:

The experimental results will help the farmers to choose suitable age and interval times after 3rd cut of date palm trees.

5.0 TITLE : **EFFECT OF LATE AND EXCESS APPLICATION OF NITROGENOUS FERTILIZER ON MATURITY BEHAVIOR OF SUGARCANE**
LOCATION : Rajshahi
INVESTIGATORS : H M Al-Amin, M K Begum, M A Haque, K M Alam, M S Arefin and M S Islam
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk) : 60,000.00

5.1 DEFINITION OF THE PROBLEM:

Sugarcane (*Saccharum officinarum*) is an important commercial crop that plays a vital role in sugar and bioethanol production, as well as providing raw materials for several agro-based industries. Achieving high cane yield with optimum sugar recovery largely depends on proper crop nutrition, particularly nitrogen (N), which is the most yield-limiting nutrient. Nitrogen plays a crucial role in enhancing tillering, leaf area development, and photosynthetic activity of sugarcane. However, the timing and quantity of nitrogen application are critical factors influencing not only the vegetative growth but also the maturity behavior and sucrose accumulation of the crop.

Excessive and late application of nitrogen fertilizer, especially near the harvesting period, often promotes vegetative growth at the expense of sucrose storage in the stalk. This results in delayed maturity, poor juice quality, and reduced sugar recovery, ultimately affecting the efficiency of sugar mills. Farmers, in many cases, apply additional nitrogen fertilizer before harvesting in the hope of increase cane and tertiary tiller weight without considering its negative impact on juice quality and maturity. This inappropriate practice leads to higher production costs, delayed harvests, and reduced profitability.

Therefore, a scientific investigation into the effect of late and excess nitrogen application on sugarcane maturity is necessary to provide evidence-based recommendations. Such research will help optimize nitrogen management practices, ensure timely cane maturity, and improve sugar recovery. The findings will contribute to sustainable sugarcane cultivation by balancing yield and quality, benefiting both farmers and sugar industries.

5.2 OBJECTIVE(S):

1. To study the influence of delayed and excessive nitrogen fertilizer application on the growth and maturity patterns of sugarcane and
2. To develop fertilizer management recommendations for farmers that balance both high yield and desirable cane maturity for better industrial processing.

5.3 METHODOLOGY:

Treatments:

T_1 : Recommended dose of nitrogen (RDN) based on soil test, applied in three equal splits at basal, March, and May.
T_2 : Farmer's practice 1 — application of 150 kg urea ha^{-1} at four stages: basal, March, May, and July.
T_3 : Farmer's practice 2 — application of 150 kg urea ha^{-1} at five stages: basal, March, May, July and August.
T_4 : Farmer's practice 3 — application of 150 kg urea ha^{-1} at six stages: basal, March, May, July, August, and September.
T_5 : Farmer's practice 4 — application of 150 kg urea ha^{-1} at seven stages: basal, March, May, July, August, September, and October.
T_6 : Farmer's practice 5 — application of 150 kg urea ha^{-1} at eight stages: basal, March, May, July, August, September, October, and November.

Design : RCBD
Replication : 3
Plot size : 8m × 6m
Method of planting : Conventional (2 budded setts),
Gross areas : 0.13 ha.
Chewing Cane Variety : Isd 33

Data to be collected:

1. Germination percent at 60 days of planting
2. Tiller population at 120, 150 and 180 days of planting
3. Number of millable cane at harvest.
4. Major insect and diseases
5. Yield of cane and
6. Pol% and Brix % data will be collected from October to January.

5.4 WORK ELEMENTS:

1. Land selection and preparation
2. Basal fertilizer application and planting of cane
3. Planting of first intercrop
4. Intercultural operation
5. Irrigation
6. Harvesting of intercrop
7. Fertilizer application (top dressing)
8. Insect and pest control
9. Harvesting of cane
10. Data collection (Tiller, Millable cane, brix % and yield)

5.5 TIME SCHEDULE:

Ac.	2025				2026									
No.	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
1.	→	→												
2.			→	→										
3.			→	→										
4.				→	→	→	→	→	→	→				
5.			→	→	→	→	→	→						
6.						→	→							
7.						→	→	→	→					
8.				→	→	→	→	→	→	→	→	→		
9.												→	→	→
10.			→	→	→	→	→	→	→	→	→	→	→	→

5.6 ECONOMIC IMPACT: Positive economic impact is expected.

5.7 IMPACT ON ENVIRONMENT:

This is environment friendly and there will not be an adverse effect on the surrounding environment for implementation of these results.

5.8 UTILIZATION OF RESEARCH RESULT:

The results of this research can be utilized to formulate site-specific nitrogen management strategies that ensure timely sugarcane maturity, improved sucrose accumulation, and enhanced sugar recovery in mills.

BSRI SUB-STATION, CHUADANGA

LIST OF EXPERIMENTS

1.0 Title : Comparative efficacy of different insecticides against sugarcane rootstock borer (*Emmalocera depressella*) in Carew & Company (Bangladesh) Ltd. sugar mill area

2.0 Title : Management of sugarcane borer complex through different insecticides combination

PROGRAMME IN DETAILS

PROGRAMME AREA : PEST MANAGEMENT
1.0 TITLE : COMPARATIVE EFFICACY OF DIFFERENT INSECTICIDES AGAINST SUGARCANE ROOTSTOCK BORER (*Emmalocera Depressella*) IN CAREW & COMPANY (BANGLADESH) LTD. SUGAR MILL AREA
LOCATION : Chuadanga (2 locations)
INVESTIGATORS : T Ahmed, M O Sheikh, and M N Alam
NATURE OF STUDY : Ongoing
DURATION : 2024-2026
ESTIMATED COST(Tk) : 50,000.00

1.1 DEFINITION OF THE PROBLEM:

Rootstock borer, *Emmalocera depressella* Swinhoe (Lepidoptera: Pyralidae) is one of the major insect pests of sugarcane causing significant losses of 8.55% (Miah *et al.*, 1986). Rootstock borer is a serious pest causing damage to the underground portions of cane stalks. Infestation by rootstock borer in the early stages of cane was observed in reducing cane yield upto 68% (Miah *et al.*, 1986). The larvae bore into the underground basal portion of the plant and feed there showing the dead heart symptom. The dead heart cannot be easily pulled out and it does not give any offensive smell. The pest is active at high temperatures and low humidity. Drying up 3rd/4th leaf is sometimes observed with the yellowing of the whole plants attack. In mature cane, the stock portion is badly damaged, tissues are macerated and food material cannot be translocated. Leaf becomes pale yellow resulting the death of the cane. Miah *et al.* (1986) found 68.0% infestation and 8.6% reduction in yield. Infestation may reach upto 100.0% in some canes in prone areas. Rootstock borer in its first brood affects cane by 51% of which produce no tiller, 30% produce only one tiller and 18% two tillers (Cheema,1953). During harvest, up to 10% yield decrease and reduction in sucrose in juice by about 0.3 unit have been observed by Gupta and Avasthy (1951).

1.2 OBJECTIVE(S):

i) To determine the efficacy of the different insecticides against sugarcane rootstock borer.

1.3 METHODOLOGY:

The experiment will be conducted at Carew & Co. (Bangladesh) Limited, Sugar Mill area under Chuadanga district. The sugarcane variety Isd 40 will be conventionally planted with two budded setts. The proposed insecticides are granular and have EC formation. The granular will be applied at the root zone in the trenches on both sides of cane rows while EC formulation will be applied by sprayer. The chemicals will be applied in July+ August+ September. Thereafter, insecticides were covered with soils using spades. Field soils were made moist through irrigation before insecticide application. For the collection of data (level of infestation), five clumps per plot were uprooted randomly and were compared with the control plot.

Treatments: 7

T_0 : Control (Untreated)
T_1 : Applying Dispel 48EC (Chlorpyrifos) @ 8ml/L (July+ August+ September)
T_2 : Applying Actara 15WG (Thiamethoxam) @ 0.6gm/L (July+ August+ September)
T_3 : Applying Regent 3GR (Fipronil) @ 16.6 kg ha^{-1} ((July+ August+ September)
T_4 : Spraying Shobicron 415 EC (Profenofos (40%) + Cypermethrin (1.5%)) @ 1ml/L of water (July+ August+ September)
T_5 : Spraying Nitro 505EC (Chlorpyrifos (50%) + Cypermethrin (5%)) @ 1ml/L of water(July+ August+ September)
T_6 : Spraying Marshal 10EC (Carbosulfan) @ 3ml/L of water (July+ August+ September)

Plot Size : 8m × 6m
Replication : 3
Design : RCB
Planting Method : Conventional (Two bud setts of Isd 40)

Data to be recorded:

1. Germination (%)
2. No. of Tillers
3. (%) RSB infestation and efficiency
4. Brix % and Millable cane
5. Cane yield

1.4 WORK ELEMENTS:

1. Field preparation
2. Basal fertilizer application
3. Intercultural operation
4. Irrigation
5. Fertilizer application (top dressing)
6. Germination count at 60 DAP & Tiller counts at 110,150 and 180 DAP
7. Spraying insecticides (July+ August+ September)
8. (%) RSB infestation and efficiency
9. Millable cane count
10. Harvesting of cane
11. Data collection (brix (%), yield)

1.5 TIME SCHEDULE:

Ac No.	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1				→	→											
2					→	→										
3						→	→	→	→	→	→					
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8											→	→	→			
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10															→	→
11															→	→

1.6 ECONOMIC IMPACT: A positive economic impact is expected.

1.7 EFFECT ON ENVIRONMENT:

This is environmentally friendly, and the implementation of this experiment will not adversely affect the surrounding environment.

1.8 UTILIZATION OF RESEARCH RESULTS:

The result of the study will help the farmers of Carew & Co. (Bangladesh) Ltd. to choose suitable insecticides against sugarcane rootstock borer.

PROGRAMME AREA : PEST MANAGEMENT
2.0 TITLE : MANAGEMENT OF SUGARCANE BORER COMPLEX THROUGH DIFFERENT INSECTICIDES COMBINATION
LOCATION : Chuadanga (2 locations)
INVESTIGATORS : T Ahmed, M O Sheikh, and S Akhter
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk) : 60,000.00

2.1 DEFINITION OF THE PROBLEM:

Sugarcane (*Saccharum officinarum* L.) is one of the most important commercial crops contributing significantly to the national economy. It is a tall, perennial grass belonging to the genus *Saccharum*, native to tropical and warm temperate regions of South Asia and Melanesia, and widely cultivated for sugar production (Nripesh and Gaikwad, 2017). In Bangladesh, sugarcane is attacked by nearly seventy species of insect pests (Ara *et al.*, 2014). Among them, ten species are regarded as major pests of economic importance (Rahman and Satter, 1991). In India, yield losses due to insect pest infestations have been estimated at around 20%, along with a 15% reduction in sugar recovery (Avasthy, 1983). Among the numerous insect pests infesting sugarcane, the borer complex causes the most severe and persistent damage. This complex mainly includes the early shoot borer (*Chilo infuscatellus*), top shoot borer (*Scirpophaga excerptalis*), rootstock borer (*Emmalocera depressella*), and sugarcane stem borer (*Chilo tumidicostalis*). These borers attack different parts and stages of the sugarcane crop, resulting in dead hearts, tunneling, reduced plant vigor, and ultimately lower cane yield and sugar recovery. In Bangladesh, the damage caused by the borer complex poses a serious constraint to sugarcane productivity and quality. The overlapping activity of multiple borer species throughout the crop growth period makes their management highly challenging. Therefore, evaluating the efficacy of different insecticides is essential for developing effective control strategies to minimize losses caused by the borer complex and to ensure sustainable sugarcane production.

2.2 OBJECTIVE(S):

i) To evaluate the efficacy of different insecticides against the borer complex of sugarcane and
ii) To determine the most effective and economical insecticide combination for the management of sugarcane borer complex.

2.3 METHODOLOGY:

The experiment will be conducted at Carew & Co. (Bangladesh) Limited, Sugar Mill area under Chuadanga district. The sugarcane variety Isd 37 will be conventionally planted with two budded setts. The proposed insecticides are granular and have EC formation. The granular will be applied at the root zone in the trenches on both sides of cane rows and in the cane, while EC formulation will be applied by sprayer. The chemicals will be applied in March+ May+ July. Thereafter, insecticides were covered with soil using spades. Field soils were made moist through irrigation before insecticide application.

Treatments:

T_0 : Control (Untreated)
T_1 : Spraying Azadirachtin 0.03 EC @ 2500 ml a.i./ha of water
T_2 : Applying *Metarhizium anisopliae* + *Trichoderma harzianum* + *Beauveria bassiana* @ 4 ml + 2 ml a.i./ha of water
T_3 : Applying *Metarhizium anisopliae* + *Trichoderma harzianum* + *Bacillus thuringiensis* @ 4 ml + 2 ml a.i./ha of water
T_4 : Applying *Celastrus angulatus* 1% E.W. @ 100gm a.i./ ha of water
T_5 : Applying Fipronil 40% + Imidacloprid 40% @ 0.44 ml + 0.44 ml a.i./ha of water
T_6 : Spraying Thimrthoxam 20% + Chlorantraniliprole 10% @ 300gm a.i./ha of water
T_7 : Spraying Chlorpyriphos 20% EC @ 1.5 ml a.i./ha of water

Plot Size : 8m × 6m
Replication : 3
Design : RCB
Planting Method : Conventional (Two bud setts of Isd 37)

Data to be recorded:

1. Germination (%)
2. No. of Tillers
3. (%) Borer infestation and efficiency
4. Brix % and Millable cane
5. Cane yield

2.4 WORK ELEMENTS

1. Field preparation
2. Basal fertilizer application
3. Intercultural operation
4. Irrigation
5. Fertilizer application (top dressing)
6. Germination count at 60 DAP & Tiller counts at 110,150 and 180 DAP
7. Spraying insecticides (March+ May+ July)
8. (%) Borer infestation and efficiency
9. Millable cane count
10. Harvesting of cane
11. Data collection (brix (%), yield)

2.5 TIME SCHEDULE

Ac	2025				2026											
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1				→												
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8							→			→						
9											→					
10														→		
11															→	

2.6 ECONOMIC IMPACT: A positive economic impact is expected.

2.7 EFFECT ON ENVIRONMENT:

This is environmentally friendly, and the implementation of this experiment will not adversely affect the surrounding environment.

2.8 UTILIZATION OF RESEARCH RESULTS :

The result of the study will help the farmers of the Chuadanga mill zone area to choose suitable insecticides against sugarcane borers.

BSRI SUB-STATION, JAMALPUR

LIST OF THE EXPERIMENTS

PROGRAMME AREA: VARIETAL IMPROVEMENT

1.0 Title : Evaluating the Growth and Yield of Latest Sugarcane Vatieties and their Ratooning Performance in the Mill Zone

2.0 Title : Assessing the Suitability of Chewing Cane and their Ratooning Potentiality for Hilly Areas

PROGRAMME AREA: CROP AND SOIL MANAGEMENT

3.0 Title : Effect of Intercropping to Enhance Sugarcane Productivity

PROGRAMME IN DETAILS

1.0 TITLE : **EVALUATION OF THE GROWTH AND YIELD OF LATEST SUGARCANE VATIETIES AS MAIN AND RATOON CROP PERFORMANCE IN THE MILL ZONE**
LOCATION : Melandaha and Jamalpur Sadar
INVESTIGATORS : T Alam , K M Alam and A M S Rahman
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk) : 60,000.00

1.1 DEFINITION OF THE PROBLEM/JUSTIFICATION:

The Bangladesh Sugarcrop Research Institute has released promising sugarcane varieties for both plant and ratoon cane cultivation. Since variety performance varies across the regions, it is essential to evaluate these varieties in specific location. Therefore, this study aims to identify the most suitable sugarcane varieties for plant and ratoon cane in the mill zone of Agro-Ecological Zone 8 (AEZ 8).

1.2 OBJECTIVES:

1. To identify the most promising sugarcane varieties for both plant and ratoon cane in the mill zone of AEZ 8 and
2. To evaluate the yield potentiality of these varieties across both plant and ratoon cane.

1.3 METHODOLOGY:

Treatments:

T_1 : BSRI Akh 43
T_2 : BSRI Akh 44
T_3 : BSRI Akh 45
T_4 : BSRI Akh 46
T_5 : BSRI Akh 48

Plot size : 8m × 6m
Replications : 3
Design : RCBD
Method of sugarcane planting : Conventional (2 eyed set)
Time of Planting : October/November,2025
Harvesting : October/November,2026
Gross Area : 0.33 Ac.

Data to be recorded:

1. Establishment % of settlings
2. Tiller population at 120.150 and 180 day after Planting (DAP)
3. Millable cane at harvest
4. Unit stalk weight, hight, grith, internode.
5. Cane Yield.
6. Brix % cane at harvest.
7. Cost and return analysis

1.4 WORK ELEMENTS:

1. Basal fertilization and planting of cane
2. Weeding and Mulching.
3. Irrigation
4. Fertilizer top dressing
5. Insect and pest management
6. Harvesting of cane
7. Data collection
8. Data tabulation, analysis and reporting

1.5 TIME SCHEDULE:

Ac. No.	2025				2026											
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			→	→	→											
2						→	→	→	→	→	→					
3							→	→	→	→	→	→				
4				→	→			→	→	→						
5				→	→		→		→	→						
6															→	→
7					→	→	→	→	→	→	→	→	→	→	→	
8					→	→	→	→	→	→	→	→	→	→	→	→

1.6 ECONOMIC IMPACT:

A positive economic impact is anticipated from wide adoption of the evaluated sugarcane varieties in AEZ 8.

1.7 EFFECT ON ENVIRONMENT:

There is no adverse effect on environment. It is eco-friendly

1.8 UTILIZATION OF RESEARCH RESULTES:

- The findings will help farmers to choose suitable sugarcane varieties for cultivation in their area.
- Farmers will be economically benefited through cultivation of high yielding sugarcane varieties.

2.0 TITLE : ASSESSING THE SUITABILITY OF CHEWING CANE AND THEIR RATOONING POTENTIALITY FOR HILLY AREAS

LOCATION : Jhenaigati, Sherpur

INVESTIGATORS : T Alam , K M Alam and A M S Rahman

NATURE OF STUDY : New

DURATION : 2025-2027

ESTIMATED COST(Tk) : 30,000.00

2.1 DEFINITION OF THE PROBLEM/JUSTIFICATION:

Chewing cane holds significant popularity in Bangladesh. However, its cultivation remains largely stagnant, constrained by traditional, low-efficiency practices predominantly employed by marginal farmers lacking access to modern inputs and innovations. As a result, both yield and quality are significantly compromised. Although ratoon cropping is a widely adopted, cost-efficient strategy in commercial cane farming, its application in chewing cane remains limited due to irregular harvesting practices and the unavailability of ratoon-compatible varieties. This gap not only limits productivity but also increases production costs for smallholder growers, especially in non-mill, hilly zones like AEZ 9, where modern inputs and infrastructure are limited. There is a critical need to identify chewing cane varieties that perform well under ratoon conditions in such environments, enabling more sustainable and profitable cultivation practices.

2.2 OBJECTIVES

- To identify suitable chewing cane varieties and evaluate their comparative ratoon performance in the hilly areas of AEZ 9 and
- To enhance farmers' income through improved chewing cane cultivation using efficient ratoon cropping practices.

2.3 METHODOLOGY:

Treatments:

T_1 : BSRI Akh 41
T_2 : BSRI Akh 42
T_3 : BSRI Akh 47
T_4 : Black Rubi
T_5 : Co 208

Plot size : 8m × 6m
Replications : 3
Design : RCBD
Method of sugarcane planting : Conventional (2 eyed set)
Time of Planting : October/November,2025
Harvesting : October/November,2026
Gross Area : 0.33 Ac.

Data to be recorded:

1. Establishment % of settlings
2. Tiller population at 120.150 and 180 day after Planting (DAP)
3. Millable cane at harvest
4. Unit stalk weight, hight, grith, internode
5. Cane Yield
6. Brix % cane at harvest

2.4 WORK ELEMENTS:

1. Basal fertilization and planting of cane
2. Weeding and Mulching
3. Irrigation
4. Fertilizer top dressing
5. Insect and pest management
6. Harvesting of cane
7. Data collection
8. Data tabulation, analysis and reporting

2.5 TIME SCHEDULE:

Ac.	2025				2026											
No.	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.	→	→	→													
2.				→	→	→	→	→	→	→						
3.				→	→	→	→	→	→							
4				→	→			→	→	→						
5.				→	→		→		→	→						
6.															→	→
7.					→	→	→	→	→	→	→	→	→	→	→	→
8.					→	→	→	→	→	→	→	→	→	→	→	→

2.6 ECONOMIC IMPACT:

The adoption of superior chewing cane varieties in AEZ 9 will drive sustainable yield improvements and boost farmer income.

2.7 EFFECT OF ENVIRONMENT: There is no adverse effect on environment. It is eco-friendly

2.8 UTILIZATION OF RESEARCH RESULTS:

- The findings will guide farmers in selecting suitable chewing cane varieties and their ratoon cultivation in the hilly areas of AEZ 9.
- Adoption of high-yielding, ratoon-suitable varieties will help improve productivity and increase farmers' income.

3.0 TITLE : EFFECT OF INTERCROPPING TO ENHANCE SUGARCANE PRODUCTIVITY
LOCATION : Jamalpur Sadar
INVESTIGATORS : T Alam, K M Alam and A M S Rahman
NATURE OF STUDY : On-going
DURATION : 2025-2026
ESTIMATED COST(Tk) : 35,000/-

3.1 DEFINITION OF THE PROBLEM :

Sugarcane intercropping is a profitable practice. Yield and nutrient acquisition advantages are frequently found in intercropping system. Sugarcane intercropping has been practiced in worldwide to create income generating and to acquire more production. Vegetables, pulses, cereals and spices crops are cultivated as intercrops with sugarcane covering about 30-35% sugarcane area. Due to lack of knowledge, farmers are not more interested to cultivate intercrops with sugarcane in Bangladesh. The yield of intercrops is quiet low at farmer's level due to lack of appropriate intercropping systems as well as poor fertilizer and soil management. A few reports have been published on soil fertility in intercropping with sugarcane relative to sole cropping. Therefore, an experiment has been undertaken to studying the effect of intercropping on sugarcane and to maintain soil fertility level.

3.2 OBJECTIVES:

i) To studying the effect of sequential intercropping on growth, yield and quality of sugarcane and
i) To investigate soil chemical properties for maintaining soil fertility level.

3.3 METHODOLOGY:

Treatments:

T_1 : Single row cane only
T_2 : SRC + Potato (Cardinal)
T_3 : SRC + Spinach (BARI Spinach 1)
T_4 : SRC + Red amaranth (BARI Lalshak 1)
T_5 : SRC + Onion (BINA Onion 2)
T_6 : SRC + Garlic (BARI Roson 2)
T_7 : SRC + Tomato (BARI Tomato 6) 2nd intercrop mungbean (BINA Mungbean 8)

Plot size	: 8m×6m
Replications	: 3
Design	: RCBD
Method of sugarcane planting	: 2-eyed setts
Cane Variety	: BSRI Akh 42
Gross Area	: 0.33 ac.

DATA TO BE RECORDED:

1. Establishment % of setts
2. Tiller population at 120, 150 and 180 days after planting (DAP)
3. Millable cane at harvest
4. Unit stalk weight, height, girth, internode
5. Cane yield
6. Brix % of cane at harvest.
7. Pre and post soil analysis as pH, organic C, total N, available P, S, Zn Exchangeable K, Mg and B
8. Yield of intercrops

3.4 WORK ELEMENTS:

1. Basal fertilization, transplanting of cane and sowing of 1st intercrops
2. Weeding and Mulching
3. Harvesting of 1st intercrops
4. Sowing of 2nd intercrop
5. Irrigation
6. Fertilizer top dressing
7. Insect and pest management
8. Harvesting of 2nd intercrop
9. Harvesting of cane
10. Initial and post harvest soil analyses as pH, organic C, total N, available P, S, Zn, Exchangeable K, Mg and B
11. Soil analysis after 1st and 2nd intercrops harvesting
12. Data collection
13. Data tabulation, analysis and reporting

3.5 TIME SCHEDULE:

AC	Year	2025				2026											
No.	Month	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1		→															
2				→													
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9															→		
10		→													→		
11				→					→								
12					→												
13																→	

3.6 ECONOMIC IMPACT:

Positive economic impact is expected.

3.7 EFFECT ON ENVIRONMENT:

There will be no adverse effect on the environment.

3.8 UTILIZATION OF RESEARCH RESULTES:

The findings of the study will be helpful for sugarcane farmers to improve soil fertility and productivity of sugarcane.

BSRI SUB-STATION, RAHMATPUR, BARISHAL

LIST OF EXPERIMENTS

1.0 Title : Collection, characterization and management of Nipa palm germplasm
2.0 Title : Sugarcane based integrated farming in SORJAN system under southern region

PROGRAMME IN DETAILS

PROGRAMME AREA : GERMPLASM MANAGEMENT
1.0 TITLE : COLLECTION, CHARACTERIZATION AND MANAGEMENT OF NIPA PALM GERMPLASM
LOCATION : Nobipur, Kalapara, Patuakhali
INVESTIGATORS : R K Ganapati, M N Morshed and M S Islam
NATURE OF STUDY : New
DURATION : 3 years
ESTIMATED COST(Tk) : 50,000/-

1.1 DEFINITION OF THE PROBLEM:

Genetic variability is very important in breeding as well as adaptation to a changing environment by environmental stressors like rising salinity, climate change, and coastal erosion which also a big challenge for coastal ecosystem. Nipa palm as a mangrove flora inhabitant to Sundarban from ancient time and dispersed across the coast of Bengal delta. On time being and varying salinity and environmental interreference variability developed and adapted to particular environments. And utilizing this variability in breeding is crucial. Therefore, collecting genotypes from different region of the country and conserve them is prerequisite to develop new varieties through breeding.

Depending upon the garden phenotype and geographic distribution the genotypes of Nipa palm will be collected and planted in tidal flash able river side near coast to establish garden in future use as genetic resources.

1.2 OBJECTIVE(s):

1. To collect Nipa palm genotypes from different areas of the country and
2. To Characterize the collected materials.

1.3 METHODOLOGY:

Treatments:

NP_1 = Genotype collected from Satkhira (Shyamnagar) district
NP_2 = Genotype collected from Khulna district
NP_3 = Genotype collected from Bagerhat district
NP_4 = Genotype collected from Barguna district
NP_5 = Genotype collected from Patuakhali district
NP_6 = Genotype collected from Bhola district
NP_7 = Genotype collected from Noakhali district
NP_8 = Genotype collected from Cox-bazar district

Locations : Nabipur, Kalapara, Patuakhali
Plot Size : 10m x 10m
Replication : 3

1.4 DATA TO BE RECORDED:

i. Seed morphology: Seed shape, Seed size and Seed color
ii. Germination trait:
Germination rate [GR=(Ga/Gn)x100];
Survival rate [SR=(Ns/Ga)x100]
iii. Fruit traits: Fruiting rate and Seed setting rate

GR-germination percent, Ga-number of seeds that have germinated, Gn-number of seeds supply for testing, SR-emergence rates, Ns-final number of seedlings that will survive

1.5 WORK ELEMENTS:

i. Collecting seeds from various region
ii. Raising seedlings
iii. Transplanting to establishing garden
iv. Characterization of Collected materials

1.6 TIME SCHEDULE:

AC No.	2026											
	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												

1.7 ECONOMIC IMPACT:

Nipa palm is an environmentally friendly plant protect land from river erosion, use as wind break in cyclone, réclame saline affected soil and support in rural livelihood in coastal area.

1.8 EFFECTS ON ENVIRONMENT:

No adverse effect on environment.

1.9 UTILIZATION OF RESEARCH RESULTS:

Collected germplasm will be used in future for breeding.

PROGRAMME AREA : TECHNOLOGY INNOVATION

2.0 TITLE : SUGARCANE BASED INTEGRATED FARMING IN SORJON SYSTEM UNDER SOUTHERN REGION

LOCATION : Rahmatpur Sub-station, Barishal

INVESTIGATORS : R K Ganapati, M N Morshed and M Kamruzzaman

NATURE OF STUDY : On going (Modified)

DURATION : 3 years

ESTIMATED COST(Tk) : 1, 20,000/-

2.1 DEFINITION OF THE PROBLEM:

Bangladesh is recognized worldwide as the most climate vulnerable country. The southern region once deemed as “granary of Bengal” has now turned to a low productive agricultural region in the country. The integrated farming system consists of resource saving practices that aim to achieve acceptable profit and high sustain production levels. Therefore, this program should be focused on Sorjan based integrated farming system for improving the food and nutritional security of the vulnerable people of the tidal flooding eco-system in the southern region of Bangladesh.

2.2 OBJECTIVE(s):

1. Increasing sugarcane productivity through Sorjan system and
2. To popularize sugarcane based Sorjan farming under southern region.

2.3 METHODOLOGY:

Treatments:

T_1 = BSRI Akh 42 + Vine crops + Fish*
T_2 = BSRI Akh 42 + Tomato + Vine crops + Fish*
T_3 = BSRI Akh 42 + Cauliflower+ Vine crops + Fish*
T_4 = BSRI Akh 42 + Onion + Vine crops + Fish*

*Multi layered fishes

Plot Size : Sorjan bed : 21m ×6m×1m
Canal : 21m ×6m×2.5 m ,
Design : RCBD,
Replication : 3,
Gross Area : 0.18 ha (each)

Planting system/spacing: Seeds and/or seedlings will be sown in the line maintaining recommended spacing. Sugarcane, vegetables both will be planted on sorjan bed. Vine crops will be planted in rows on the edge of the bed. Fertilizer dose and method of application will be used as per recommendation of the specific crop species.

2.4 DATA TO BE RECORDED:

1. Tiller count will be taken after 120, 150 and 180 days of planting
2. Brix % of cane juice will be taken at harvest
3. Data on chewable cane and yield will be taken at harvest
4. Yield of cultivated crops and fishes

2.5 WORK ELEMENTS:

1. Land selection
2. Monitoring of land preparation and planting date fixation. Raising of settlings
3. Supervision of irrigation, mulching, weeding and insect management
4. Evaluation of growth performance
5. Tiller count (March, April, May and June)
6. Millable cane count at harvest
7. Yield of Cane and Brix at harvest
8. Yield of cultivated crops and fishes

2.6 TIME SCHEDULE:

AC No.	2025				2026											
	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1		→														
2			→													
3			→													
4				→	→	→	→									
5							→	→								
6									→	→						
7										→	→	→	→			
8												→	→	→	→	→

2.7 ECONOMIC IMPACT:

Year-round production of vegetables, sugarcane and fish in sorjan system will increase farmer's income that uplift the living standard. This study will provide a guide line about economic combination of crops cultivate in a dynamic pattern in low land experiment will be helpful to select a standardization of sorjan bed and suitable cropping system for the economic improvement of the farmers as well as of the country.

2.8 EFFECTS ON ENVIRONMENT:

No adverse effect on environment.

2.9 UTILIZATION OF RESEARCH RESULTS:

The research results will be communicated to the DAE for extension. The growers may be communicated through class room training. Finally, the farmers will adopt the technology upon satisfaction. The result will be published in annual reports, national and international journals through which end users will be benefited.

3.0 PROGRAMME AREA: SOCIO-ECONOMIC AND TECHNOLOGY TRANSFER

Demonstration	Location	Number	Unite Cost (Tk.)	Total (Tk.)
Demonstration of profitability of sugarcane intercropping	southern area	10	12,000/-	1,20,000/-
Demonstration of latest BSRI bread sugarcane (Chewing) varieties	Seven Districts	5	12,000/-	60,000/-
Seedlings Production				
Palmyra palm	On station	10,000	-	30,000/-
Nipa Palm (Golpata)	Sea shore	10,000	7.5/-	75,000/-
Arabian Date Palm	On station	2000	5/-	10,000/-
Local Date palm	On station	5000	5/-	25000/-
Stevia	On station	500	5/-	2500/-
Gur Preparation Technique Demonstration/Field Day				
Field day on Golpata *Gur* Preparation and preservation		1	30,000/-	30,000/-
Field day on Sugarcane *Gur* preparation and preservation		1	30,000/-	30,000/-
Training				
Entrepreneur training on Application and utilization of modern Technology in Sugarcrop Production		6 batch	15,000/-	90,000/-
			Total	**4,72,500/-**

BSRI SUB-STATION, SIRAJGANJ

LIST OF EXPERIMENTS

1.0 Title : Compatibility of winter crops as intercrop with sugarcane in Karatoya-Bangali floodplain

2.0 Title : Selection of sugarcane varieties suitable for *gur* production in AEZ 4

PROGRAMME IN DETAILS

1.0 TITLE : **COMPATIBILITY OF WINTER CROPS AS INTERCROP WITH SUGARCANE IN KARATOYA-BANGALI FLOODPLAIN**
LOCATION : Kamarkhando & Sirajganj Sadar
INVESTIGATORS : M A R Doel, T A Apon, M A Rasel, M O Sheikh and A K M R Islam
NATURE OF STUDY : Ongoing Modified
DURATION : 2024-2027
ESTIMATED COST(Tk) : 96,000/-

1.1 DEFINITION OF THE PROBLEM:

World population is increasing exponentially and it is necessary to feed up this huge population. An important strategy for increasing labor utilization per unit area of available land and productivity is to intensify land use. Intercropping is the cultivation of two or more crops simultaneously on the same field which aims to produce a greater yield on a given piece of land by making use of resources or ecological processes that would otherwise not be utilized by a single crop. Sugarcane is location specific and long duration crop and takes about 90-120 days for canopy development, which allows for growing intercrops during the early stage. Taking advantages of this, sugarcane cultivators grow various short duration crops like pulses, vegetables etc. as intercrops to get interim return since small sugarcane growers cannot wait for a long time to get financial return from sole sugarcane crop. The yield of inter crops is quiet low at farmer's level due to lack of use appropriate intercropping systems as well as poor management practices. Some inter crops shows adverse effect on cane yield, quality and also decrease the soil fertility. Therefore, an experiment has been undertaken to select suitable intercrops with single row sugarcane at AEZ 4.

1.2 OBJECTIVE (S):

i. Selecting the suitable winter crop with sugarcane in AEZ 4 and
ii. To Increase farmer's income by sugarcane cultivation.

1.3 METHODOLOGY:

Treatments:

Factor A (Variety)

V_1 : BSRI Akh 41
V_2 : Isd 37

Factor B (Sequential Intercrop)

S_1 : Radish-Onion
S_2 : Potato-Onion
S_3 : Carrot-Onion
S_4 : Cabbage-Onion
S_5 : Cauliflower-Onion

Method of Planting : Two budded Setts
Plot size : 8m × 6m
Design : RCBD
Replication : 3 (Three)
Cane variety : BSRI Akh 41 & Isd 37
Locations : Two
Fertilizer : As per recommendation
Irrigation and cultural practices : As and when required

DATA TO BE COLLECTED:

i. Field establishment %
ii. No. of tiller at 90, 120, 150 & 180 DAP
iii. No. of millable cane
iv. Cane height (m) and stalk diameter (cm)

v. Intercrop yield (tha^{-1})
vi. Cane yield (tha^{-1})
vii. Brix (%)

1.4 WORK ELEMENTS:

i. Land preparation
ii. Basal fertilization and planting of sugarcane
iii. Planting of intercrop
iv. Irrigation, weeding and mulching for both crops as and when required
v. Insect pest management
vi. Harvest (intercrop)
vii. Harvest (sugarcane)

1.5 TIME SCHEDULE:

Act. No.	Months														
	2025			2026											
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
i.		→	→	→											
ii.			→	→											
iii.				→	→										
iv.				→	→	→	→	→	→	→	→				
v.						→	→	→	→	→					
vi.				→	→	→	→	→							
vii.											→	→	→		

1.6 ECONOMIC IMPACT: Positive economic impact is expected.

1.7 EFFECT ON ENVIRONMENT: No adverse effect on the environment.

1.8 UTILIZATION OF RESEARCH RESULTS: The result will help the farmers to select suitable intercrops with chewing cane for increasing the net income.

2.0 TITLE : SELECTION OF SUGARCANE VARIETIES SUITABLE FOR *GUR* PRODUCTION IN AEZ 4
LOCATION : Two locations in Sirajganj
INVESTIGATORS : M A R Doel, M S Islam and M S Arefin
NATURE OF STUDY : Ongoing
DURATION : 2024-
ESTIMATED COST(Tk) : 70,000/-

2.1 DEFINITION OF THE PROBLEM:

Sugarcane is location specific crop. The performance of particular sugarcane variety differs from place to place and farmers to farmers, which deserves adaptability trail. Without performance test, we cannot recommend a particular variety for particular location. Farmers of this region grow local varieties resulting economic return is very low. High yielding and good quality sugarcane varieties are needed for this region. Therefore, this study is needed to find out the comparative performance *gur* varieties such as Isd 34, Isd 37, BSRI Akh 44, BSRI Akh 45 and BSRI Akh 46. The present study is undertaken to evaluate the performance of the BSRI released *gur* varieties in AEZ 4.

2.2 OBJECTIVE(S):

i. To test the performance of BSRI released sugarcane *gur* varieties at AEZ 4 and
ii. To identify location specific suitable variety for commercial cultivation.

2.3 METHODOLOGY:

Treatments: (5)

T_1 : Isd 34
T_2 : Isd 37 (Check)
T_3 : BSRI Akh 44
T_4 : BSRI Akh 45
T_5 : BSRI Akh 46

Method of Planting	: Two budded setts
Plot size	: 8m × 6m
Design	: RCBD
Replication	: 3 (Three)
Cane variety	: Isd 34, Isd 37, BSRI Akh 44, BSRI Akh 45 and BSRI Akh 46
Locations	: Two
Fertilizer	: As per recommendation
Irrigation and cultural practices	: As and when required

DATA TO BE RECORDED:

i. Germination count (%)
ii. No. of tillers/ha (at 90 DAT, 120 DAT, 150 DAT and 180 DAT)
iii. No. of millable cane/ha
iv. Cane height (m) and diameter (cm)
v. Brix (%) of cane at harvest
vi. Estimated cane yield (t/ha)
vii. *Gur* yield

2.4 WORK ELEMENT:

i. Plantation
ii. Germination count
iii. Tiller count
iv. Measurement of stalk height, girth and internode length
v. Determination of field brix (%)
vi. Observation on flowering habit
vii. Observation on reaction to pests and diseases
viii. Harvesting of cane
ix. *Gur* preparation and *gur* yield data collection

2.5 TIME SCHEDULE:

Sl.	2025				2026											
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
i.				→												
ii.						→	→									
iii.							→	→	→	→						
iv.													→	→	→	
v.															→	→
vi.															→	→
vii.						→	→	→	→	→	→	→	→	→	→	→
viii.																→
ix.																→

2.6 ECONOMIC IMPACT: Positive economic impact is expected.

2.7 EFFECT OF ENVIRONMENT: Environment friendly.

2.8 UTILIZATION OF RESEARCH RESULTS: The result obtained from this study may help to identify suitable sugarcane varieties for *gur* production. On the basis of results will be able to take correct decision about the high yielding sugarcane varieties for *gur* production in AEZ 4.

BSRI SUB-STATION, CHUNARUGHAT

LIST OF EXPERIMENTS

1.0 Title : Performance of winter crop as intercrops on sugarcane cultivation in wider row system

2.0 Title : Performance of released sugarcane varieties suitable for *gur* production in Akhaura Terrace soil

PROGRAMME IN DETAILS

PROGRAMME AREA : VARIETAL IMPROVEMENT
1.0 TITLE : PERFORMANCE OF WINTER CROP AS INTERCROPS ON SUGARCANE CULTIVATION IN WIDER ROW SYSTEM
LOCATION : Two Locations (Chunarughat)
i) Cotabari Bongaon, Ahmmedabad, Chunarughat
ii) Gorgaon, Chunarughat
INVESTIGATORS : A Chakraborty, M M Rahman, M S Islam, M N A Siddiquee, M N Alam, M M Hossain and A K M R Islam
NATURE OF STUDY : Ongoing
DURATION : 2022-2026
ESTIMATED COST(Tk) : 70,000

1.1 DEFINITION OF THE PROBLEM:

Sugarcane, (*Saccharum officinarum*) occupies an area of 20.42 million hectares worldwide. Sugarcane varieties become the earliest production industries, which have high sucrose content (Bakker 1999). Their production is about 1.333 million tons and suporting more than 50% demand of sugar over the world (Monique Hunziker *et al.*, 2009). In Bangladesh, sugarcane has been growing for a long time throughout the country. However, there are many reasons such as cultivation techniques, varieties, planning, investment that make yield and income of the sugarcane are unstable in recent years. Not only the impact of supply and demand, but also limited techniques of the majority of farmers. High investment costs, productivity, inadequate quality make the cost of sugarcane production higher, therefore, it is hard to compete with other countries in the regional area and in the world. However, the traditional methods of producing, scattered acreage, yield and quality of sugarcane are not yet improved, therefore, economic efficiency is not really stable. During the World Trade Organization system, the competition of agricultural products increases fiercely. Therefore, application of scientific techniques is a requirement for the farmers to improve productivity, quality and to reduce production costs in order to achieve the highest economic efficiency. The aim of this experimental research is to make the increasing productivity and quality of sugarcane, as well as improve economic efficiency for producers and contribute to sustainable development of sugarcane production with intercropping. Therefore, it is important to introduce farmers with wider row system for higher yield of sugarcane as well as *gur* production and intercropping from plant cane in Akhaura Terrace.

1.2 OBJECTIVES:

i) To find out suitable intercrops for sequential intercropping in wider system in Akhaura Terrace area and
ii) To evaluate the potentiality of sequential intercropping.

1.3 METHODOLOGY:

Treatments:

T_1 : Wider Row Cane (WRC) only
T_2 : Wider Row Cane (WRC) + Tomato-Mugbean
T_3 : Wider Row Cane (WRC) + Chilli – Yardlong bean
T_4 : Wider Row Cane (WRC) + Tomato - Yardlong bean
T_5 : Wider Row Cane (WRC) + Chilli – Mungbean

Plot size	: 8m × 6m
Variety	: BSRI Akh 48
Replications	: 3
Design	: RCBD
Method of sugarcane planting	: Conventional (two eyed setts)
Time of Planting	: December, 2025
Harvesting	: November/December, 2026
Gross Area	: 0.33 Acre.

1.4 DATA TO BE RECORDED:

1. Germination % of setts
2. Tiller population at 120,150 and 180 days after Planting (DAP)
3. Millable cane at harvest
4. Unit stalk weight, hight, girth, and internode
5. Brix % cane at harvest
6. Cane Yield
7. Goor yield after *gur* preparation

1.5 WORK ELEMENTS:

1. Land selection
2. Land preparation
3. Basal fertilization
4. Cane plantation
5. Irrigation
6. Weeding and mulching
7. Fertilizer top dressing
8. Insect and pest Management
9. Earthing up and tying
10. Milliable cane count
11. Brix % of cane
12. Cane yield at harvest
13. *Gur* preparation & *gur* yield data collection

1.6 TIME SCHEDULE:

Ac.	2025			2026												2027
No.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	→															
2	→															
3	→															
4	→	→														
5		→	→	→	→	→	→									
6		→	→	→	→	→										
7					→	→		→	→							
8					→			→	→	→						
9								→	→	→						
10													→	→		
11														→		
12															→	
13															→	

1.7 ECONOMIC IMPACT: Positive economic impact is expected.

1.8 EFECT OF ENVIRONMENT: There is no adverse effect on environment. It is eco-friendly.

1.9 UTILIZATION OF RESEARCH RESULTES:

1. The findings will help farmers to choose suitable planting system of sugarcane production with intercropping in this area.
2. Farmers will be economically benefited through cultivation of high yielding and quality *gur* producing sugarcane with intercropping winter vegetables.

PROGRAMME AREA : VARIETAL IMPROVEMENT
2.0 TITLE : PERFORMANCE OF RELEASED SUGARCANE VARIETIES SUITABLE FOR *GUR* PRODUCTION IN AKHAURA TERRACE SOIL
LOCATION : Two Locations of Chunarughat (Habiganj)
i) Cotabari Bongaon, Ahmmedabad, Chunarughat
ii) Chaganagor, Gazipur, Chunarughat
INVESTIGATORS : A Chakraborty, M M Rahman, M N A Siddiquee, M N Alam, M M Hossain, A K M R Islam and M S Islam
NATURE OF STUDY : Ongoing
DURATION : 2025-2027
ESTIMATED COST(Tk) : 80,000/-

2.1 DEFINITION OF THE PROBLEM :

In Akhaura Terrace soil, sugarcane cultivation is generally practiced for *gur* production and chewing purposes. Farmers of this region grow local varieties. So their yield and economic return from sugarcane cultivation is very low. High yielding and good quality sugarcane varieties are needed for this region. BSRI bred sugarcane varieties viz. Isd 37, Isd 40, BSRI Akh 41, BSRI Akh 46 and BSRI Akh 48 are recommended for good/better quality of *gur* production. But this varieties are not known to farmers of this region. Therefore, the present study has been under taken to select suitable BSRI bred sugarcane varieties for *gur* production in Akhaura Terrace soil/Sylhet region.

2.2 OBJECTIVE :

(I). To select suitable cane variety (s) with high yield and recovery for *gur* production

2.3 METHODOLOGY :

(i) Treatments :

T_1 : Isd 37
T_2 : Isd 40
T_3 : BSRI Akh 41
T_4 : BSRI Akh 46
T_5 : BSRI Akh 48
T_6 : Local variety (Standard)

Design	: RCBD.
Replication	: 3
Planting Method	: 2 budded setts.
Time of Planting	: November, 2024.
Plot sige	: 8m × 6m.
Gross area	: 0.195 ha.
Net area	: 0.1152 ha.

Conventional planting method (Two budded sett) will be followed for raising good crop. Intercultural operation will be done as per recommendation. Tiller count will be taken after 120, 150 and 180 days of planting. Brix percentage of cane juice will be taken before harvest. Data on millable cane and yield will be taken at harvest. *Gur* will be prepared in the month of January and variety wise data on *gur* production will be taken.

2.4 WORK ELEMENTS:

1. Land preparation
2. Plantation and fertilizer application
3. Irrigation
4. Tiller count at 120, 150 & 180 days after transplanting (DAT)
5. Top dressing (1^{st})
6. Weeding, mulching, Irrigation
7. Top dressing (2^{nd})

8. Earthing up
9. Sucrose content before harvest
10. Millable cane count at harvest
11. *Gur* preparation
12. Yield of cane at harvest

2.5 TIME SCHEDULE:

Activity no.	Months																
	2025					2026										2027	
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
1	→	→	→														
2			→	→	→	→											
3			→	→	→												
4					→	→	→	→									
5					→	→	→										
6					→	→	→	→	→								
7						→	→	→									
8									→	→	→	→					
9														→	→	→	
10														→	→	→	
11															→	→	
12																→	→

2.6 ECONOMIC IMPACT:

The experiment will be helpful to select suitable location specific high yielding sugarcane varieties for *gur* production in Akhaura Terrace soil.

2.7 EFFECT ON ENVIRONMENT: No adverse effect on the environment.

2.8 UTILIZATION OF RESEARCH RESULTS :

Selected *gur* producing sugarcane varieties will be distributed to local farmers for commercial production of *gur*.

BSRI SUB-STATION, GAIBANDHA

LIST OF EXPERIMENTS

1.0 Title : Evaluation of Sugarcane Varieties with sequential intercropping at Active Tista Floodplain Soils in Bangladesh

2.0 Title : Evaluation of BSRI Bred Sugarcane Varieties Under Water-Logging Condition at Active Tista Floodplain Soils in Bangladesh

3.0 Title : Ratooning potentiality of Newly Released Sugarcane Varieties at Active Tista Floodplain Soils in Bangladesh

4.0 Title : Assessment of Chewing cane Genotypes for yield and juice quality at Active Tista Floodplain Soils in Bangladesh

PROGRAMME IN DETAILS

PROGRAMME AREA : CROP PRODUCTION
1.0 TITLE : EVALUATION OF SUGARCANE VARIETIES WITH SEQUENTIAL INTERCROPPING AT ACTIVE TISTA FLOODPLAIN SOILS IN BANGLADESH
LOCATION : Farmers filed, Gaibandha
INVESTIGATORS : Z H Sabuj, M R Islam, M M Rashid, M M Alam, T A Apon and A K M R Islam
NATURE OF STUDY : New
DURATION : 2025-2027
ESTIMATED COST(Tk) : 90,000/-

1.1 DEFINITION OF THE PROBLEM

Sugarcane (*Saccharum officinarum* L.) is a commercially important cash crop grown widely in tropical and subtropical regions, including Bangladesh. It plays a critical role in the rural economy, supporting both the sugar industry and thousands of smallholder farmers. In the context of increasing land scarcity and growing demand for diversified agricultural production, there is a pressing need to enhance the efficiency of land utilization through integrated cropping systems. Sequential intercropping- the practice of growing short-duration crops during the early growth phases of a long duration main crop such as sugarcane has emerged as a viable strategy to maximize land productivity, improve soil fertility, and generate additional income for farmers. Although previous studies have explored various intercropping combinations, limited research has been conducted to evaluate the performance of milling sugarcane genotypes under sequential intercropping in the specific agro-climatic context of the Tista floodplain. Therefore, this study was undertaken to assess the performance of selected milling sugarcane genotypes under sequential intercropping systems at the active Tista floodplain soils.

1.2 OBJECTIVES:

i. To select suitable cane varieties with high yield in AEZ 2 and
ii. To evaluate the best combination of intercrop with milling cane varieties.

1.3 METHODOLOGY:

Treatments:

T_1 : Isd 37
T_2 : BSRI Akh 45
T_3 : BSRI Akh 46
T_4 : BSRI Akh 48
T_5 : Isd 37 + Potato-Mung Bean
T_6 : BSRI Akh 45 + Potato-Mung Bean
T_7 : BSRI Akh 46 + Potato-Mung Bean
T_8 : BSRI Akh 48 + Potato-Mung Bean

Planting material : Two budded setts
Plot size : 8m × 6m
Replication : 3
Design : RCBD
Date of planting : November, 2025
Gross area : 0.20 ha

1.4 DATA TO BE COLLECTED:

For Sugarcane:

i. Germination (%) of setts
ii. Tiller population at 90, 120, 150 and 180 Days after planting (DAP)
iii. Unit stalk weight (kg), height(m), diameter(cm), internode no.
iv. Number of Millable cane
v. Brix % of cane juice
vi. Yield of cane (tha^{-1}) at harvest

For intercrop:

i. Intercrop population
ii. Intercrop yield (tha^{-1}) at harvest

1.5 WORK ELEMENTS:

1) Land selection and preparation
2) Cane planting and basal fertilizer application
3) Sowwing/planting of intercrop
4) Germination count
5) Fertilizer application (Top dressing)
6) Tiller count
7) Intercultural operation and pest control
8) Harvesting and yield record
9) Brix % record

1.6 TIME SCHEDULE:

AC. No.	Months																	
	2024			2025												2026		
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
1	→																	
2		→																
3		→																
4			→								→							
5					→			→										
6							→			→								
7								→			→							
8															→		→	
9																	→	

1.7 ECONOMIC IMPACT: Positive economic impact is expected.

1.8 EFFECT ON ENVIRONMENT:

This is environment friendly and there will be no adverse effect on surrounding environment for implementation.

1.9 UTILIZATIUON OF RESEARCH RESULTS:

The result of the study will help to reduce the cost of production and increase the yield of sugarcane.

PROGRAMME AREA : SUGARCANE VARIETAL IMPROVEMENT
2.0 TITLE : EVALUATION OF BSRI BRED SUGARCANE VARIETIES UNDER WATER-LOGGING CONDITION AT ACTIVE TISTA FLOODPLAIN SOILS IN BANGLADESH
LOCATION : BSRI Sub-station, Gaibandha
INVESTIGATORS : Z H Sabuj, M M Rashid, M R Islam , F H Shanta and M S Arefin
NATURE OF STUDY : On-going
DURATION : 2023-
ESTIMATED COST(Tk) : 25,000/-

2.1 DEFINITION OF THE PROBLEM:

Due to being an overpopulated country and some of the infrastructural development work, the cultivable area of land in Bangladesh is decreasing day by day. Due to the increasing demand for vegetables and cereal crops, sugarcane is gradually pushed into marginal and low-lying areas. Water-logging stress is one of the most important reasons behind the low yield of sugarcane. This experiment will evaluate the best possible yield of BSRI bred sugarcane varieties under water-logged conditions.

2.2 OBJECTIVES:

1) To select suitable cane varieties with tolerance to water-logging condition in AEZ 2 and
2) To find out morphological and physiological changes due to prolonged wet condition.

2.3 METHODOLOGY:

Treatments:

T_1 = Isd 20
T_2 = Isd 34
T_3 = Isd 37
T_4 = Isd 39
T_5 = BSRI Akh 45
T_6 = BSRI Akh 46

Planting material : Two budded sett
Plot size : 8m × 6m
Replication : 3
Design : RCBD
Date of planting : December, 2025
Gross area : 0.20 ha

2.4 DATA TO BE COLLECTED:

1) Germination (%) of setts
2) Tiller population at 90, 120, 150 and 180 Days after planting (DAP)
3) Millable cane count
4) Brix% of cane juice
5) Yield of cane at harvest
6) Pol (%) of cane

2.5 WORK ELEMENTS:

1) Land selection
2) Monitoring of land preparation & planting date fixation
3) Basal fertilizer application and cane planting
4) Irrigation, weeding, mulching and pest control
5) Top dressing (1st & 2nd) of Urea and MoP
6) Leaf sample collection
7) Growth performance evaluation during grand growth period (grading of cane)
8) Cane harvest
9) Reporting

2.6 TIME SCHEDULE:

AC. No.	Months																	
	2025			2026												2027		
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
1	→																	
2		→																
3		→																
4			→								→							
5					→			→										
6							→		→									
7							→			→								
8															→		→	
9																	→	→

2.7 ECONOMIC IMPACT: Positive economic impact is expected.

2.8 EFFECT ON ENVIRONMENT:

This is environment friendly and there will be no adverse effect on surrounding environment for implementation.

2.9 UTILIZATIUON OF RESEARCH RESULTS:

The result of the study will help to decide farmers to select suitable cane varieties with tolerance to water-logging condition. This study has a great value for the localization.

PROGRAMME AREA : CROP PRODUCTION
3.0 TITLE : RATOONING POTENTIALITY OF NEWLY RELEASED SUGARCANE VARIETIES AT ACTIVE TISTA FLOODPLAIN SOILS IN BANGLADESH
LOCATION : Farmers field, Gaibandha
INVESTIGATORS : Z H Sabuj, M R Islam, M M Rashid, S Rashul and T A Apon
NATURE OF STUDY : On-going
DURATION : 2023-
ESTIMATED COST(Tk) : 30,000/-

3.1 DEFINITION OF THE PROBLEM:

A number of sugarcane varieties were released by the Bangladesh Sugarcrop Research Institute. Some of them, along with some local varieties, have been cultivated since the very old days in different parts of the country. But sugarcane ratooning is not so popular in Bangladesh like other developed countries where ratoon cane production almost equal to the plant cane. So, sugarcane ratooning could be a popular cultivation practice in Bangladesh. Therefore, the present experiment has been undertaken to find suitable ratoon sugarcane varieties for Active Tista Floodplain Soils (AEZ 2) for higher yield and economic benefit.

3.2 OBJECTIVES:

i. To select suitable cane variety(s) for ratoon in AEZ 2 and
ii. To increase farmers' earning through cultivating ratoon cane.

3.3 METHODOLOGY:

(i) Treatments :

T_1 = Isd 34
T_2 = Isd 37
T_3 = BSRI Akh 43
T_4 = BSRI Akh 44
T_5 = BSRI Akh 45
T_6 = BSRI Akh 46
T_7 = BSRI Akh 48

Planting materials : Two budded setts
Plot size : 8m × 6m
Replication : 3
Design : RCBD

3.4 DATA TO BE COLLECTED:

1) Germination (%) of clumps
2) Tiller population at 120, 150 and 180 Days after planting (DAP)
3) Unit stalk weight, height, diameter & internodes
4) Millable cane count (at harvest)
5) Brix (%) of cane juice
6) Yield of ratoon cane at harvest

3.5 WORK ELEMENTS:

1) Land selection and preparation
2) Land preparation supervision
3) Cane planting and basal fertilizer application
4) Germination count
5) Fertilizer application (Top dressing)
6) Tiller count
7) Intercultural operation and pest control
8) Harvesting and yield record
9) Brix % record

3.6 TIME SCHEDULE:

AC. No.	Months																	
	2025			2026												2027		
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
1	→																	
2		→																
3		→	→															
4			→	→	→	→	→	→	→	→	→							
5				→	→	→	→	→	→									
6							→	→	→	→								
7							→	→	→	→	→							
8															→	→	→	
9																	→	→

3.7 ECONOMIC IMPACT: Positive economic impact is expected.

3.8 EFFECT ON ENVIRONMENT:

This is environment friendly and there will be no adverse effect on surrounding environment for implementation.

3.9 UTILIZATIUON OF RESEARCH RESULTS:

The result of the study will help to decide farmers to select suitable ratooning varieties for higher yield and economic result for this area.

4.0 TITLE : ASSESSMENT OF CHEWING CANE GENOTYPES FOR YIELD AND JUICE QUALITY AT ACTIVE TISTA FLOODPLAIN SOILS IN BANGLADESH
LOCATION : Farmers' field (Gobindaganj, Gaibandha)
INVESTIGATORS : Z H Sabuj, M M Rashid, M R Islam , F H Shanta and M S Arefin
NATURE OF STUDY : New
DURATION : 2025-2028
ESTIMATED COST(Tk) : 1,20,000.00

4.1 DEFINITION OF THE PROBLEM:

Sugarcane (*Saccharum officinarum* L.) is one of the most important commercial crops in tropical and subtropical regions, valued primarily for its juice, which is used in the production of sugar, ethanol, and various beverages. In Bangladesh, sugarcane cultivation plays a significant role in the rural economy, particularly in regions with fertile alluvial soils such as the Tista Floodplain. This agro-ecological zone, characterized by its rich loamy soils and favorable climatic conditions, offers an ideal environment for sugarcane growth and juice extraction potential.Chewing sugarcane genotypes are specially cultivated for direct consumption due to their high juice content, sweetness, softness, and pleasant flavor. However, the juice quality of sugarcane can vary significantly depending on the genotype, environmental conditions, and soil characteristics. This study aims to analyze and compare the juice quality traits of selected chewing sugarcane genotypes cultivated in this region.

4.2 OBJECTIVES:

- To evaluate suitable chewingcane genotypes for juice purpose and
- To select superior cane genotypes with high yield and juice quality in AEZ 2.

4.3 METHODOLOGY:

The experiments will be set up at the farmers' field following Randomized Complete Block Design with three replications.

Treatments:

T_1 = BSRI Akh 41
T_2 = BSRI Akh 42
T_3 = Black Ruby
T_4 = Q-69 (check variety)

Design : RCB;
Replication : 3;
Plot size : 8m x 6m;
Gross area : 0.33 acre;
Planting material : Double budded sett

4.4 DATA TO BE COLLECTED:

i. Brix%
ii. Pol % of juice
iii. Pol % of cane
iv. Purity %
v. RS %
vi. pH
vii. Fibre %

4.5 WORK ELEMENT:

Activity No.	Name of activity
1	Land selection
2	Layout of the field
3	Basal fertilizer application on the basis of soil test value and plantation of sett in the field
4	Establishment data collection at 60 days after plantation (DAP)
5	Tiller counting at 90,120, 150, 180 and 210 days after plantation (DAP)
6	First top dressing of urea and MP at 120 DAP
7	Second top dressing of urea and MP at 150 DAP
8	Detrashing and earthingup.
9	Tying
10	Chewable cane counting, Brix %, pol%, purity%, rs%, pH at harvest
11	Yield of cane at harvest
12	Data analysis & Interpretation

4.6 TIME SCHEDULE:

Act. No.	Year	2025			2026												2027		
	Month	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
1		→																	
2,3			→		→														
4							→												
5						→					→								
6										→									
7,8											→								
8										→		→							
9													→	→					
10,11																→	→		
12																	→	→	

4.7 ECONOMIC IMPACT:

The result of the experiment will help the growers to select suitable cane genotypes for higher juice quality in the region & farmers will be benefited by cultivating that specific chewing cane.

4.8 EFFECT ON ENVIRONMENT:

There is no negative impact on environment.

4.9 UTILIZATION OF RESEARCH RESULTS:

The result of the study will help to decide farmers to select suitable chewing cane genotypes with higher juice quality. This study has a great value for the localization.

BSRI SUB-STATION, BANDARBAN

LIST OF EXPERIMENTS

1.0 Title : Floral behavior study of exotic and local germplasm of sugarcane and hybridization for developing high sugar, high yield and disease-resistant sugarcane clones

2.0 Title : Selection of suitable sugarcane varieties for *gur* production under Bandarban Hill Tracts of Bangladesh

PROGRAMME IN DETAILS

1.0 TITLE : **FLORAL BEHAVIOR STUDY OF EXOTIC AND LOCAL GERMPLASM OF SUGARCANE AND HYBRIDIZATION FOR DEVELOPING HIGH SUGAR, HIGH YIELD AND DISEASE-RESISTANT SUGARCANE CLONES**

LOCATION : BSRI sub-station, Bandarban

INVESTIGATORS : M O Sheikh, A Chakraborty, R K Ganapati, N A Munna, M R Alam and M A Rahman

NATURE OF STUDY : On-going

DURATION : 2025-26

ESTIMATED COST(Tk) : 75,000/-

1.1 DEFINITION OF THE PROBLEM:

Sugarcane is a major cash crop contributing to the sugar and bioenergy industries. However, its productivity is often limited by constrains such as low flowering, poor synchrony in flowering, susceptibility to disease and low sugar recovery. Exploring the floral behavior of both exotic and local germplasm is essential for targeted hybridization, especially for the development of superior clones. This research aims to overcome the barriers to flowering and hybrid seed production in sugarcane to accelerate varietal development.

1.2 OBJECTIVE :

1. To study the floral behavior (flowering time, pollen viability, stigma receptivity) of exotic and local sugarcane germplasm;
2. To identify suitable parental combinations for hybridization targeting high sugar and high yield and
3. To carry out controlled hybridization for developing disease-resistant sugarcane clones.

1.3 METHODOLOGY:

This study will examine breeding potential using 162 parental clones (local & exotic clones). Flowering data will be collected through key developmental stages. The Elongation Stage will be measured by counting the days from mid-October to the start of flag leaf formation. The Flag Leaf Stage will be measured by counting the days from the beginning of flag leaf formation to full flag leaf emergence. The full Emergence Stage will be tracked by counting the days from tip emergence to the full extension of the inflorescence. Finally, the Percentage of Flowering will be determined by dividing the number of flowering stalks by the total number of plants and multiplying by 100.

a) Weather data:

Temperature, day length, and relative humidity are key environmental variables influencing the timing of sugarcane flowering and pollen viability. To address this, daily averages of minimum and maximum temperature, day length, and relative humidity will be recorded during flower development phases.

b) Data of flowering propensity:

Data on flowering propensity will be collected from the clones, focusing on the number of flowered canes and the total number of canes. Each clone's flowering performance will be evaluated and scored on a 1–5 scale to categorize their propensity: very low (≤10% flowered canes), low (11–30%), medium (31–60%), high (61–80%), and very high (>80%). This scoring system will facilitate a systematic comparison of flowering potential across different clones.

c) Pollen functionality and Germination Assessment of the flower

To evaluate pollen viability, anthers from matured but unopened spikelets will be squashed in a 10% iodine solution. The resulting slides will be examined under a light microscope to determine the percentage of viable pollen. Varieties with less than 10% viable pollen were treated as female parents while those with more than 10% viable pollen were treated as male. For pollen tube germination assessment, an *in vitro* germination medium will be prepared, consisting of one liter of water, 300 mg calcium nitrate, 100 mg boric acid, 100 mg magnesium sulfate, and 300 g sucrose. This medium will be autoclaved, stored in small flasks, and used as needed. Pollens will be collected in the early morning, sieved, and cultured in individual petri dishes per

genotype. The cultures will be maintained at 25°C and 95% relative humidity for 30 minutes. The percentage of germination will be calculated based on the total number of pollen grains. After pollen viability test targeted flowering clones will be selected to set cross. The resultant fuzz will be collected and stored under optimal conditions for future germination testing.

d) Controlled Hybridization Techniques:

- Selection of flowering cones
- Bagging, Tagging and hand pollination
- True seed collection and germination
- Raising seedlings in seed bed

TREATMENT: Not applicable

DATA TO BE RECORDED:

1. Days to Elongation stage
2. Days to Inflorescence tip emergence
3. Days to Inflorescence full emergence
4. Date of flowering initiation
5. Date of flowering
6. % Pollen viability
7. % Pollen tube germination
8. Frequency of male flowers
9. Frequency of female flowers
10. Flowering Propensity
11. Record temperature, rainfall, and photoperiod at flowering time
12. Flower size, shape, and number of florets
13. Flowering time
14. Length of the flowering period
15. Assess the type and structure of flowers produced (e.g. spikelets, panicles).

1.4 WORK ELEMENT:

1. Documentation of breeding germplasm
2. Flowering record
3. Record temperature, Relative humidity, and photoperiod at flowering time
4. Laboratory determination for pollen viability %
5. Laboratory determination for pollen tube germination%
6. Assessment of the type of flower produced
7. Cross setting
8. Fuzz collection
9. Assess the seed set for each cross

1.5 TIME SCHEDULE:

Sl.	2025				2026												
No.	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J
1		→															
2		→	→	→	→												
3		→	→	→													
4												→	→	→			
5														→	→	→	
6																	
7														→	→	→	
8																→	→
9																→	→

1.6 ECONOMIC IMPACT:

Improved understanding of sugarcane flowering can significantly boosts breeding efficiency and crop yields. By enhancing hybridization programs and developing climate-adapted varieties, this research can lead to higher sugar content varieties and increase productivity.

1.7 EFFECTS OF ENVIRONMENT:

Friendly to the environment.

1.8 UTILIZATION OF RESEARCH RESULTS:

Flowering varieties are valuable for hybridization programs, especially in variable climates where unpredictable flowering and pollination impact breeding success. Insights into reproductive traits will help preserve genetic diversity and enhance breeding for higher sugar content, increased yield, and development of climate-adapted varieties.

PROGRAMME AREA : VARIETAL IMPROVEMENT
2.0 TITLE : SELECTION OF SUITABLE SUGARCANE VARIETIES FOR *GUR* PRODUCTION UNDER BANDARBAN HILL TRACTS OF BANGLADESH
LOCATION : Gualiakhola, Bandarban sadar
INVESTIGATORS : M O Sheikh, A Chakraborty, M K Begum, M S Arefin, M A Habib and M M Rashid
NATURE OF STUDY : On-going
DURATION : 2023-26
ESTIMATED COST(Tk) : 40,000/-

2.1 DEFINITION OF THE PROBLEM:

Cultivation of chewing sugarcane varieties is already established and quite popular in Bandarban Hill Tracts. Besides chewing sugarcane, the hill dwellers of Bandarban can develop their self-social development by producing *gur* from profitable and suitable *gur* varieties. The selection of suitable sugarcane varieties for *gur* (unrefined sugar) production in the Bandarban Hill Tracts of Bangladesh is a critical agricultural practice aimed at enhancing local sugarcane farming. Bandarban characterized by its hilly terrain and specific climatic conditions, requires tailored sugarcane varieties that can thrive in its unique environment.

2.2 OBJECTIVE :

1. To identify the suitable sugarcane varieties with high yield potential and quality *gur* production and
2. To assess the adaptability of different sugarcane varieties to the Hill Tracts specific climatic and soil conditions.

2.3 METHODOLOGY:

TREATMENTS: 4 (Four)

T_1 = Isd 37
T_2 = Isd 41
T_3 = BSRI Akh 45
T_4 = BSRI Akh 48

Plot Size : 8m × 6m
Design : RCBD
Replication : 3
Planting method : 2 budded setts

Data to be recorded:

1. Germination count (%)
2. No. of tillers/ha (at 120 DAT, 150 DAT & 180 DAT)
3. No. of millable cane/ha at harvest
4. Cane height (m) and diameter (cm)
5. Brix (%) of cane at harvest
6. Estimated cane yield (t/ha)
7. *Gur* Recovery after *gur* preparation
8. Physical and chemical properties of *gur*

2.4 WORK ELEMENTS:

1. Plantation of *gur* variety
2. Germination count (%)
3. Tiller count
4. Measurement of stalk height, girth and internode length
5. Observation on reaction to pests and diseases
6. Cane yield at harvest
7. *Gur* preparation and *gur* yield data collection

2.5 TIME SCHEDULE:

AC No.	Month															
	2025				2026											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1			→													
2					→	→										
3							→	→	→							
4													→	→	→	
5				→	→	→	→	→	→	→	→	→	→	→	→	→
6																→
7																→

2.6 ECONOMIC IMPACT: Positive economic impact is expected.

2.7 EFFECTS ON ENVIRONMENT: No adverse effect on environment. It is eco-friendly

2.8 UTILIZATION OF RESEARCH RESULTS:

The result obtained from this study may help growers to know suitability of *gur* variety in this location. On the basis of results will be able to take correct decision about the high yielding, pest and disease tolerant gur varieties.

Website: www.bsri.gov.bd