

Competitive Research Grant

Sub-Project Completion Report

on

BTRI Clones and Improved Seeds to the Stakeholders

Project Duration
June 2017 to September 2018

Botany Division and Agronomy Division
Bangladesh Tea Research Institute (BTRI)



Submitted to
Project Implementation Unit-BARC, NATP-2
Bangladesh Agricultural Research Council
Farmgate, Dhaka-1215



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Project Implementation Unit
National Agricultural Technology Program-Phase II Project (NATP-2)
Bangladesh Agricultural Research Council (BARC)
New Airport Road, Farmgate, Dhaka – 1215
Bangladesh

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Acronyms

BARC	Bangladesh Agricultural Research Council
BT	Bangladesh Tea
BTRI	Bangladesh Tea Research Institute
BTS	Bangladesh Tea Seed
Co-PI	Co-Principal Investigator
CRG	Competitive Research Grant
GD	Goods
GoB	Government of Bangladesh
Ha	Hectare
Kg	Kilogram
LoA	Letter of Agreement
N/A	Not Applicable
NATP	National Agricultural Technology Project
NCP	Nucleus Clone Plot
PCR	Project Completion Report
PI	Principal Investigator
PIU	Project Implementation Unit
PP	Project Proposal
PSO	Principal Scientific Officer
T. E.	Tea Estate
UPS	Uninterrupted Power Supply
VP	Vegetative Propagated

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Executive Summary

The current CRG sub-project entitled “BTRI Clones and Improved Seeds to the Stakeholders” had been undertaken for the period from June 2017 to September 2018. The approved budget for the project was 15 lakhs only and implemented in both nursery of the Bangladesh Tea Research Institute (BTRI) and the field of five tea estates after signing the LoA with Bangladesh Agricultural Research Council (BARC) on 13 July 2017.

The project had two objectives. The first objective was to establish a zonal nursery at BTRI. The primary and secondary beds (Vegetatively Propagated (VP) nursery) were prepared by placing agro-net on top at a height of 5-6 ft for shading. The bed size was 5 ft x 50 ft towards north-south direction. The nodal leaf cuttings of BT1, BT4, BT5, BT6, BT9, BT11, BT12, BT13, BT14, BT15, BT16, BT17, BT18, B207/39 and TV1 clones were collected from Bangladesh Tea Research Institute (BTRI) farm and had been planted in the nursery. A total number of 13,000 saplings of BT1, BT4, BT5, BT6, BT9, BT11, BT12, BT13, BT14, BT15, BT16, BT17, BT18, B207/39 and TV1 clones had been raised in the nursery in order to supply the improved planting materials to the stakeholder for establishing Nucleus Clone Plot (NCP) and seedbarie.

The second objective of the project was to support tea estates with particular emphasis on less developed tea estates for developing NCP and seedbarie, so that they can meet up the demand of sufficient improved planting material from their won source. In that context, ten tea gardens of greater Sylhet (e.g. Madhabpur T. E., Patrokhola T.E., Jagcherra T.E., Chatlapore T. E., Moulvi T. E., Patharia T. E., Ruthna T. E., Doloi T. E., New Shomunbagh T. E. and Imam-bawani T. E.) were surveyed for establishing Nucleus Clone Plot (NCP) as well as biclonal seedbarie (tea seed orchard). In this continuation, two NCP were established in Madhabpur and Patrokhola Tea Estate. The NCP of Madhabpur T. E. consisted of BT2, BT9, BT12, BT13 and BT17 where NCP of Patrokhola T. E. comprised of BT4, BT5, BT6, BT14 and BT16 clones. After land preparation each clone had been planted in single block. The size of each block was 12m × 12m having 1.2m × 1.2m planting spacing. Twenty five (25) plants were planted per block. On the other hand, two biclonal seedbarie of BTS1 and BTS2 were established in Jagcherra and Chatlapore Tea Estate, respectively. The seedbarie of BTS1 seed stock had been developed by planting BT1 and TV1 clones in 3:1 ratio within the orchard and the spacing of plants was 4m × 4m and 5m × 5m for tillah and flat respectively. The seedbarie of BTS2 seed stock had been established by planting B207/39 and TV1 clones in 1:1 ratio within the orchard and the spacing of plants was 5m × 5m in flat land.

As perennial in nature, raising tea saplings and its dissemination is time consuming factor. So, it was very challenging to supply the clonal saplings to the rest of the tea garden during stipulated period of the project. The saplings are ready and it will be disseminated to rest of the garden in order to establish NCP and seedbarie gradually.

According to the plan, three procurements and payments to the suppliers for furniture (GD1), computer & accessories (GD2) and digital camera (GD3) were also completed during the project period.

CRG Sub-Project Completion Report (PCR)

A. Sub-project Description

1. **Title of the CRG sub-project:** BTRI Clones and Improved Seeds to the Stakeholders

2. **Implementing organization:** Bangladesh Tea Research Institute

3. **Name and full address with phone, cell and E-mail of PI/Co-PI (s):**

Principal Investigator: Dr. Md. Abdul Aziz, Principal Scientific Officer, Botany Division, BTRI, P.O.: Srimangal-3210, U.Z: Srimangal, Dist.: Moulvibazar. Phone: 08626-71225 (On request) (Office), Cell Phone: 01718280981, email: aabtri@gmail.com

Co-Principal Investigator: Dr. Toufiq Ahmed, Principal Scientific Officer, Agronomy Division, BTRI, P.O.: Srimangal-3210, U.Z: Srimangal, Dist.: Moulvibazar. Phone: 08626-71225 (On request) (Office), Cell Phone: 01716504680, email: toufiqtea@yahoo.com

4. **Sub-project budget (Tk):**
 - 4.1 Total: Approved Budget Tk. 15,00,000.00 (Taka Fifteen lakhs Only)
 - 4.2 Revised (if any): N/A

5. **Duration of the sub-project:**
 - 5.1 Start date (based on LoA signed): 13 July 2017
 - 5.2 End date: 30 September 2018

6. **Justification of undertaking the sub-project:**

The cultivation of tea in Bangladesh has concurrently developed with North-East India. But the production of tea is less than that of India. The important reason of such low production is assumed to be due to the inferior stock of genetic materials. Bangladesh Tea Research Institute (BTRI) so far released 18 outstanding quality clones and four seed stocks. But till to date, hardly 6-9% clonal plantation is covered in tea gardens of Bangladesh (BTB 2001). As a result, the overall production has not risen to the desired level. Moreover, there is a tendency of tea planters to plant Indian clones in their gardens. It must be kept in mind that clones selected from the indigenous plant population and tested under prevailing climatic and soil condition are more suitable and adaptive to respond for better crop production, pest and disease resistance in the long run. Moreover, if a planter selects a sub-optimal clone/variety for his estates, his profits will be sub-optimal for 50 years or even longer. Therefore, it is critical that planters should select the best material available when the decision is finalized. About 17 thousand hectare new tea (7677.87 hectare for extension and 535.19 hectare for small holdings and 8651.24 hectare for very old tea which have to be replanted) has been projected to come in the field (Anonymous, 2015). As a matter of policy 50% of the area should be planted with improved clones and 50% with improved seedlings. So, about 17 thousand hectares have to be planted with approved or proven clones suited to our environment. In the project, five locations have been proposed where 7.5 lakhs rooted plants will be grown per annum i.e. 15 lakhs plants will be grown in two years. But the industry will require 2.4 crore saplings to plant 17 thousand hectare clonal plantation in the same period. Thus, BTRI can fulfill only 6.67% of the total need. Rest

93.33% i.e. 2.24 crore clonal plants has to be raised by gardeners' own resources and private sector nurseries.

Innovated technologies need to be disseminated at the field level. Sufficient planting materials are to be raised in quickest time to mitigate the need of the industry. But due to lack of such facilities, this objective could not be fulfilled so long. Time has come to take an appropriate measure to raise required improved planting materials through the establishment of seven zonal nurseries in collaboration with nearby tea gardens. Besides, the raising of clonal cuttings, the production of polly- and bi-clonal seeds also be taken in these zonal multiplication centres to facilitate the growers. In addition, motivational activities will be geared up to increase the production of clonal and improved seed stocks inside each garden to meet the demand of planting materials. Such step would definitely help disseminate BTRI clones and improved seeds to the tea gardens of Bangladesh within a stipulated period of time.

7. Sub-project goal:

Dissemination of improved planting materials (clones and improved seed varieties) which are developed by Bangladesh Tea Research Institute to the tea industry for improving the productivity and quality of Bangladesh tea.

8. Sub-project objective (s):

- a) Establishment of zonal nurseries under BTRI.
- b) To support tea estates with particular emphasis on less developed tea estates.

9. Implementing location (s):

A vegetatively propagated (VP) nursery has been established at BTRI farm, Srimangal. NCP and biclonal seedbarie will be developed in ten different tea gardens (e.g. Madhabpur T. E., Patrokhola T.E., Jagcherra T.E., Chatlapore T. E., Moulvi T. E., Patharia T. E., Ruthna T. E., Doloi T. E., New Shomunbagh T. E. and Imam-bawani T. E.) of greater Sylhet.

10. Methodology in brief:

a. Survey of the project implementing area

Ten tea gardens of greater Sylhet (e.g. Madhabpur T. E., Patrokhola T.E., Jagcherra T.E., Chatlapore T. E., Moulvi T. E., Patharia T. E., Ruthna T. E., Doloi T. E., New Shomunbagh T. E. and Imam-bawani T. E.) was surveyed for establishing Nucleus Clone Plot (NCP) as well as biclonal seedbarie (tea seed orchard).

b. Establishment of a vegetative propagated (VP) Nursery at BTRI

The primary and secondary beds (VP nursery) were prepared by placing agro-net on top at a height of 5-6 ft for shading. The bed size was 5 ft x 50 ft towards north-south direction. The nodal leaf cuttings of BT1, BT4, BT5, BT6, BT9, BT11, BT12, BT13, BT14, BT15, BT16, BT17, BT18, B207/39 and TV1 clones were collected from Bangladesh Tea Research Institute (BTRI) farm and had been planted in the nursery.

c. Establishment of Nucleus Clone Plot and Seedbarie to the stakeholders' gardens

Nucleus Clone Plot

As per demand of Stakeholders, the clonal saplings of 24 inches height of BT2, BT4, BT5, BT6, BT9, BT12, BT13, BT14, BT16 and BT17 were supplied and used for establishing Nucleus Clone Plot

(NCP). Each clone was planted in four blocks. The size of each block was 6m × 6m with 1.2m × 1.2m planting spacing (Figure 1). There were 25 plants per block.

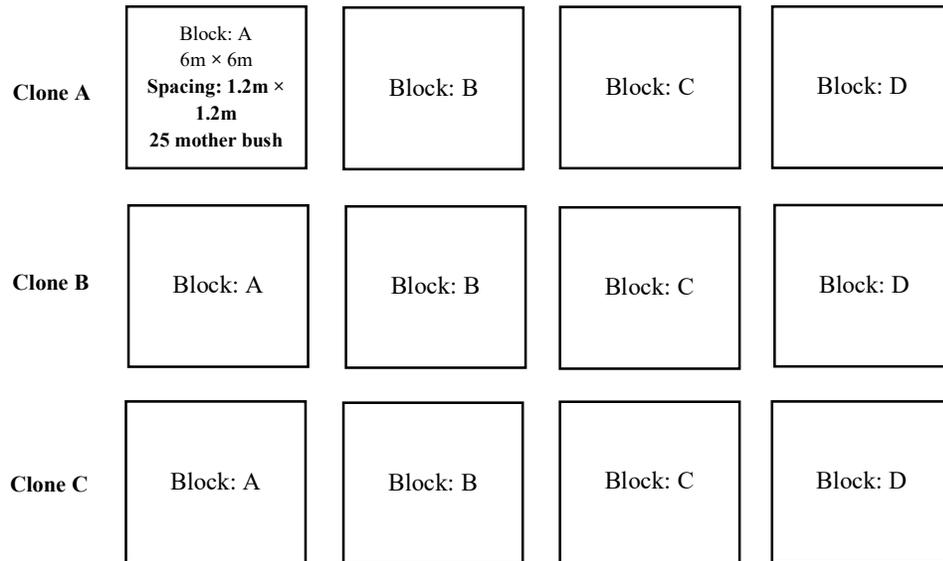
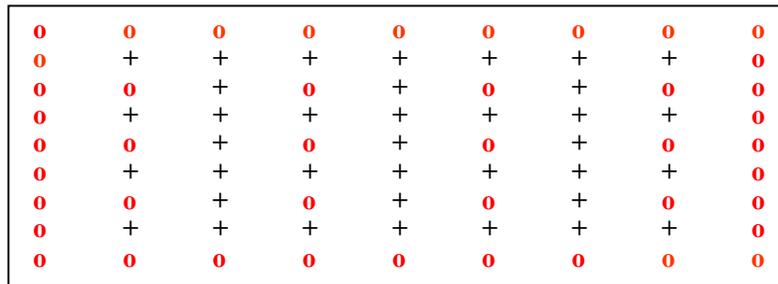


Figure 1. Lay out of Nucleus Clone Plot (NCP)

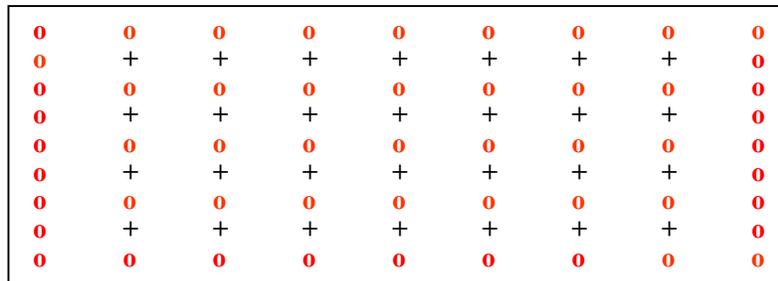
Biclonal seedbarie (Seed Orchard)

The seedbarie of BTS1 and BTS2 seed stock was developed. BTS1 consisted of BT1 and TV1 clones with the ratio of 3:1 where BTS2 comprised of B207/39 and TV1 clones with the ratio of 1:1. The spacing of plants was 4m × 4m and 5m × 5m for tillah and flat, respectively. The layout of both seedbarie is presented in Figure 2 and Figure 3.



+ = BT1 and o = TV1 (3:1)

Figure 2. Layout of a BTS1 biclonal seedbarie



+ = B207/39 and o = TV1 (1:1)

Figure 3. Layout of a BTS2 biclonal seedbarie

11. Results and discussion:

a) Survey of the project implementing area

Ten tea gardens of greater Sylhet (e.g. Madhabpur T. E., Patrokhola T.E., Jagcherra T.E., Chatlapore T. E., Moulvi T. E., Patharia T. E., Ruthna T. E., Doloi T. E., New Shomunbagh T. E. and Imam-bawani T. E.) were surveyed for establishing Nucleus Clone Plot (NCP) as well as biclonal seedbarie (tea seed orchard).

b) Establishment of a vegetatively propagated (VP) Nursery at BTRI

A total number of 13,000 saplings of BT1, BT4, BT5, BT6, BT9, BT11, BT12, BT13, BT14, BT15, BT16, BT17, BT18, B207/39 and TV1 clones had been raised on the nursery in order to supply the improved planting materials to the stakeholders for establishing Nucleus Clone Plot (NCP) and seedbarie.



Figure 4. Front side of Nursery



Figure 5. Nursery bed with agro-shade

c) Establishment of Nucleus Clone Plot and Seedbarie to the stakeholders' gardens

Nucleus Clone Plot

- i) The clonal saplings of BT2, BT9, BT12, BT13 and BT17 had been planted in order to establish Nucleus Clone Plot (NCP) in Madhabpur Tea Estate. Each clone had been planted in single block. The size of each block was 12m × 12m with 1.2m × 1.2m planting spacing. There were 25 plants per block.
- ii) The clonal saplings of BT4, BT5, BT6, BT14 and BT16 had also been supplied to Patrokhola Tea Estate in order to establish NCP. After land preparation each clone had been planted in single block. The size of each block was 12m × 12m with 1.2m × 1.2m planting spacing. There were 25 plants per block.



Figure 6. Planting of NCP in Madhabpore T. E.



Figure 7. Planting of NCP in Patrokhola T. E.

Biclinal seedbarie (Seed Orchard)

- i) The seedbarie of BTS1 seed stock had been developed by planting BT1 and TV1 clones in Jagcherra Tea Estate. The spacing of plants was 4m × 4m and 5m × 5m for tillah and flat, respectively. The ratio of BT1 and TV1 was 3:1 within the orchard.
- ii) The seedbarie of BTS2 seed stock had been established by planting B207/39 and TV1 clones in Chatlapore Tea Estate. The spacing of plants was 5m × 5m in flat land. The ratio of B207/39 and TV1 was 1:1 within the orchard.



Figure 8. Land preparation for seedbarie in Jagcherra T. E.



Figure 9. Land preparation for seedbarie in Chatlapore T. E.

12. Research highlight/findings(Bullet point – max 10 nos.):

- Ten improved clones of tea having 3000 to 3500 kg/ha yield with above average cup quality have been disseminated to the stakeholders.
- Two seedbaries have been established in order to get improved tea seed variety in two tea gardens. The yield performance of those progeny is 3500 to 4000 kg/ha with above average cup quality.
- The rest of the improved planting materials will be supplied to the other tea estates in order to established NCP and seedbarie gradually.

B. Implementation Position

1. Procurement:

Description of equipment and capital items	PP Target		Achievement		Remarks
	Phy (#)	Fin (Tk)	Phy (#)	Fin (Tk)	
(a) Office equipment	a. Desktop Computer- one b. Laptop Computers-one c. UPS (offline)- one d. Scanner- one e. Digital Camera- one	195000.00	a. Desktop Computer- one b. Laptop Computer- one c. UPS (offline)- one d. Scanner- one e. Digital Camera- one	195000.00	Completed
(b) Lab &field equipment	-	-	-	-	-
(c) Other capital items	a. File cabinet- one b. Computer table- one c. Computer chair- one	28500.00	a. File cabinet- one b. Computer table- one c. Computer chair- one.	28500.00	Completed

2. Establishment/renovation facilities: N/A

Description of facilities	Newly established		Upgraded/refurbished		Remarks
	PP Target	Achievement	PP Target	Achievement	

3. Training/study tour/ seminar/workshop/conference organized: N/A

Description	Number of participants			Duration (Days/weeks/ months)	Remarks
	Male	Female	Total		
(a) Training					
(b) Workshop					

C. Financial and physical progress

Fig in Tk

Items of expenditure/activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
A. Contractual staff salary	154035	136040	136040	0	100%	-
B. Field research/lab expenses and supplies	700000	692537	692537	0	100%	-
C. Operating expenses	200000	198292	196792	1500	99%	-
D. Vehicle hire and fuel, oil & maintenance	135000	131961	131961	0	100%	-
E. Training/workshop/seminar etc.	0	0	0	0	-	-
F. Publications and printing	50000	0	0	0	0%	-
G. Miscellaneous	37465	16150	16150	0	100%	-
H. Capital expenses	223500	223500	223500	0	100%	-

D. Achievement of Sub-project by objectives: (Tangible form)

Specific objectives of the sub-project	Major technical activities performed in respect of the set objectives	Output (i.e. product obtained, visible, measurable)	Outcome (short term effect of the research)
Establishment of zonal nurseries under BTRI.	<ul style="list-style-type: none"> ✓ Nursery bed preparation ✓ Collection of cuttings and planting in the bed ✓ Mortality counting ✓ Infilling (ensuring maintenance) to the nursery bed/tube 	<ul style="list-style-type: none"> ✓ A VP nursery was established at BTRI and a total number of 13,000 saplings of BT1, BT4, BT5, BT6, BT9, BT11, BT12, BT13, BT14, BT15, BT16, BT17, BT18, B207/39 and TV1 clones had been raised on that nursery. 	<ul style="list-style-type: none"> ✓ The raised improved planting materials from that nursery are being supplied to the stakeholders according to their demand for establishment of Nucleus Clone Plot (NCP) and seedbarie.
To support tea estates with particular emphasis on less developed tea estates.	<ul style="list-style-type: none"> ✓ Land preparation of planting area. ✓ Staking for setting up layout design. ✓ Planting for NCP and seedbarie according to layout design. 	<ul style="list-style-type: none"> ✓ Two different NCPs have been developed at Madhabpur and Patrokhola Tea Estate. ✓ Two different seed orchards were established at Jagcherra and Chatlapore Tea Estates. 	<ul style="list-style-type: none"> ✓ By establishing NCP and seedbarie these four tea gardens will be self-supported for using BTRI released improved planting materials in their plantations. Thus, they can contribute to increase their productivity.

E. Materials Development/Publication made under the Sub-project: N/A

Publication	Number of publication		Remarks (e.g. paper title, name of journal, conference name, etc.)
	Under preparation	Completed and published	
Technology bulletin/booklet/leaflet/flyer etc.			
Journal publication			
Information development			
Other publications, if any			

F. Technology/Knowledge generation/Policy Support (as applied):**i. Generation of technology (Commodity & Non-commodity)**

BTRI tea clones for enhancing quality seed production.

ii. Generation of new knowledge that help in developing more technology in future

Dissemination and using of BTRI released improved clone and seed variety in different location and environment help in further tea crop improvement.

iii. Technology transferred that help increased agricultural productivity and farmers' income

As improved planting material (improved clones and biclonal seed variety) that help increased tea productivity and planters'/farmers' income.

iv. Policy Support

Policy makers can think about developing mechanism for strengthening linkage between BTRI and Tea gardeners for rapid dissemination of improved technologies.

G. Information regarding Desk and Field Monitoring**i) Desk Monitoring [description & output of consultation meeting, monitoring workshops/seminars etc.): N/A****ii) Field Monitoring (time & No. of visit, Team visit and output):**

Date of visits	Team Members	Remarks
16-10-2017 & 02-01-2018	Dr. Mohammad Ali, Director, BTRI	Good
30-01-2018	Dr. Md. Aziz Zilani, Member Director (Crops), BARC Dr. Rina Rani Saha, PSO (Crops), BARC	Satisfactory
24-06-2018	Dr. Mohammad Ali, Director, BTRI	Good



Figure 10.Nursery monitoring by BARC officials.



Figure 11. Monitoring of NCP in Madhabpore T. E.

I. Lesson Learned/Challenges (if any)

i) Understood what kind of planting material is needed for the stakeholders.

J. Challenges (if any)

Reconciliation between demand and supply of planting materials to the stakeholder was very big challenge. As perennial in nature, raising tea saplings and its dissemination is time consuming factor. So, it was very challenging job to supply the clonal saplings to the rest of the tea garden during stipulated period of the project. However, the saplings are ready and it will be disseminated to rest of the gardens in order to establishing NCP and seedbarie gradually.

Signature of the Principal Investigator
Date

Seal

Counter signature of the Head of the
organization/authorized representative

Date

Seal