ANNUAL RESEARCH REVIEW WORKSHOP
2022-23

XV. FARM MANAGEMENT DIVISION
BANGLADESH RICE RESEARCH INSTITUTE
GAZIPUR 1701

CONTENTS

1. PERSONNEL

Name	Designation	Degree
Md. Sirajul Islam	CSO & Head	*MS*
Dr. Md. Mamunur Rahman	PSO	*PhD*
Dr. Mohammad Rezaul Manir	PSO	*PhD*
Md. Mamunur Rashid*	SSO	*MS*
Setara Begum	SSO	*MS*
Md. Ayub Ali	Farm Superintendent	*MSc.*
Md. Shahjahan**	Farm Manager	*Dip. in Agriculture*
Md. Shahabuddin	SSA	*Dip. in Agriculture*
Mustafizur Rahman Shamim	SA	*Dip. in Agriculture*
Md Abul Hasan	SA	*Dip. in Agriculture*

*Deputation for PhD on 01.9.2021; **Joined on 15.01.2023

2. SUMMARY

Different kinds of research and development as well as management activities conducted by Farm Management Division can be discussed under three broad headings namely research, seed production and support services. Summary of these activities are described as follows-

2.1. RESEARCH

An experiment was conducted at the West Byde of BRRI farm, Gazipur during T. Aman and Boro'2022-23 seasons to evaluate the efficacy of newly developed mechanical rice transplanter cum fertilizer applicator. In T. Aman season, tiller m^{-2}, panicle m^{-2}, filled grain $panicle^{-1}$ and grain yield were statistically significant among the treatments. Mechanical transplanting along with 80% fertilizer deep placement gave the statistically highest grain yield (6.14 t ha^{-1}) of BRRI dhan87 in T. Aman season. On the otherhand, in Boro season, filled grain $panicle^{-1}$ and grain yield were statistically significant among the treatments. Mechanical transplanting along with 100% fertilizer hand broadcasting gave the highest grain yield (7.20 t ha^{-1}) of BRRI dhan92 which was statistically identical with hand transplanting along with 100% fertilizer hand broadcasting (7.17 tha^{-1}) followed by Mechanical transplanting + 80% Urea, TSP & MoP deep placement by transplanter cum fertilizer applicator, Mechanical transplanting + 100% Urea, TSP & MoP deep placement by transplanter cum fertilizer applicator & Mechanical transplanting + 70% Urea, TSP & MoP deep placement by transplanter cum fertilizer applicator (6.01, 5.64 and 5.46 t ha^{-1}, respectively). The efficacy of a mechanical seedling transplanter and deep placement of mixed fertilizer can have a significant impact on rice yield. The BCR was higher in mechanical transplanting with fertilizer deep placement than hand transplanting. Therefore, mechanical transplanting with fertilizer deep placement is more profitable (Tk. 144515-125707) = 18,808 tk/ha) than hand transplanting. Transplanting seedlings by hand is labor-intensive and time-consuming whereas mechanical transplanter automates the process, saving time and reducing labor requirements.

- An experiment was conducted at the west byde of BRRI farm, Gazipur during T. Aman and Boro 2022 -23 seasons to investigate the effect of foliar application of silicon's aqueous solution on the yield of aromatic rice. No significant differences were found among the treatments in all the variables except grain yield in Boro seasons. But in T.Aman season, grain yield was not significantly different among the treatments. Silicon application has significant effect on the yield of aromatic rice (BRRI dhan50) in Bangladesh condition. It increases rice plant resistance to lodging and drought and dry matter accumulation and can also positively affect the activity of some enzymes involved in the photosynthesis in rice as well as reduce the senescence of leaves and protects the plant against pests and diseases thus increases rice yield.
- An experiment conducted at the West Byde of BRRI farm, Gazipur during T. Aman 2022 season to find out the best planting time of fine rice varieties for higher yield and quality. The treatments were A. Transplanting dates, e.g. T_1 = 1 July, T_2 = 15 July, T_3 = 30 July, T_4 = 15 August, T5 = 30 August, T_6 = 15 September; and B. Varieties: V_1 = BRRI dhan34, V_2 = BRRI dhan90 and V_3 = Binadhan-13. The treatments were distributed in strip plot design with three replications (Transplanting dates in main plot and variety in sub plot) and spacing 20cm × 20cm. Twenty-day-old seedlings were transplanted on selected dates. For tested fine rice varieties, 15 August transplanting produced highest grain yield followed by 30 July and 30 August transplanting. The lowest the grain yield was found in 1 July transplanting. Milling outturn (%), head rice recovery (%) and protein content (%) were produced higher in 30 July to 15 August transplanting.
- A laboratory experiment was conducted at BRRI HQ, Gazipur in Farm Management Division, Grain Quality & Nutritional Division and BRRI Central laboratory from June 2022 to July 2023 to examine the effect of storage times in different container on quality of rice. We set up different storage times of Fresh harvested paddy (o month), 3, 6 & 9 months and different storage technologies of C_1 = Plastic Container, C_2 = Jute Sacks, C_3 = Plastic Bag, C_4 = Motka & C_5 = Grain Pro Bag. Sample were taken in 60 random treatments (3 replication × 4 storages time × 5 storage container) at 12% moisture content from BRRI dhan84 variety. The treatments

were distributed in completely randomized design (CRD) with three replications. The un-parboiled paddy was used for this experiment. BRRI dhan84
will be stored in the five storage technologies and milling quality was assessed at every 3-month interval up to 9 months from time of storage. During different storage times of BRRI dhan84 variety in Plastic Container showed pronounced effects on various quality traits. In case seed quality, germination percentage and seedling vigor index were decreased with increased storage times at different storage container. In grain quality, milling outturn (%), head rice recovery (%), cooking time (min) and moisture content (%) were increased with increased storage times at different storage container. On the other hand, content of amylose (%) protein (%) and alkali spreading value were decreased with increased storage times at different storage container. Vitamins (B-complex) contains were significantly differences with different storage container at different storage times. Vitamins were decreased with increased storage times at different storage technologies**.**

- An experiment was taken aiming to find out possible way(s) to increase soil resistance capacity and to develop artificial plough pan in BRRI farm. After Boro harvest in the previous year, a trench of 12 inch was dug and a 3-inch fine sand layer were placed at 8 inch (20cm) below from soil surface. After next T. Aman crop, compactions were carried out when the moisture content was suitable. The compactions were done twice in 11 days' interval using wheel-to-wheel tractor passages using a pressure of (approximately) 80 k Pa (in treatment plots only). There were found no significant differences among the treatment combinations in the experiment.
- An experiment was taken to determine fertilizers' effect on algal growth in rice field and to identify suitable fertilizer management to control algae in rice field. Treatments were: (i) Full dose basal fertilizer of DAP, MoP, Gypsum & Zinc (BRRI recommended); (ii) Full dose basal fertilizer of TSP, MoP, Gypsum & Zinc; (iii) Half dose basal fertilizer of DAP and Full Dose MoP, Gypsum & Zinc; (iv) Half dose basal fertilizer of TSP and Full Dose MoP, Gypsum & Zinc; and (v) Basal fertilizer of full dose TSP, MoP, Gypsum & Zinc, and 1/3rd Urea. For treatment (iii) and (iv), rest half dose DAP/TSP were applied during second urea top-dress. No significant differences were found among the treatments for yield and yield components. In the next year experiment, artificial inoculation of algae will be done to get a clear result and findings.
- The average wage rate per day (8.0 hrs work) was Tk. 573-648 at different locations around BRRI HQ and regional stations by conducted a survey of labourers' wage rate throughout the year. The highest wage rate of labourers was in May (Tk. 700-800 per day) due to harvesting and post-harvest operations of Boro rice and transplanting of Aus rice.
- The highest wage rate (650-750 Tk per day) with food was observed in Cumilla. The average labour wage rate without food varied between Tk 629-738 at different locations surrounding of BRRI Regional Stations and it was the highest (Tk 700-900) in Rajshahi. Working hour was also different based on location. The working time (8 hrs day^{-1}) of labourers was more or less similar except Barisal, Cumilla and Satkhira.
- In total 04, 11 and 12 varieties were cultivated in BRRI research field for the purpose of TLS production during Aus, T. Aman and Boro seasons, respectively in 2022-23. Yield of the varieties ranged from 3.50 t ha^{-1} to 5.23 t ha^{-1}, 2.54 t ha^{-1} to 6.14 t ha^{-1} and 4.87 t ha^{-1} to 8.60 t ha^{-1} in Aus, T. Aman and Boro varieties, respectively. Among the Aus varieties, BRRI dhan98 produced the highest yield (5.23 t ha^{-1}) where as BRRI dhan87 gave the highest yield (6.14 t ha^{-1}) in T. Aman followed by BRRI dhan95 (6.04 tha^{-1}) and BRRI dhan89 gave the highest yield (8.60 t ha^{-1}) followed by BRRI dhan104 (7.58) in Boro season.
- Farm Management division produced 16,868 kg TLS of which 3090 kg, 5700 kg and 8078 kg was produced in Aus, T.Aman and Boro seasons, respectively. In addition, 80 kg non-seed and 1507 kg mixed rice were produced during this period.
- In total 10,787 kg breeder seed was produced under the supervision of FMD. In T. Aman season, 4130 kg breeder seeds of BRRI dhan30 and BRRI dhan98 were produced whereas 6657 kg of BRRI dhan92 and Bangabandhu dhan100 were produced during Boro 2022-23 seasons.

- In total 13,152 kg seed was distributed by FMD during the reporting period in which 3020, 4162 and 5900 kg seeds were distributed in Aus, T. Aman and Boro seasons, respectively. These seeds were distributed to DAE, researchers, different research division and regional stations of BRRI, seed producers, different agricultural organizations and agencies, BRRI employees and farmers.
- Including regional stations, BRRI had 682 labors of which 464 regular and 218 irregulars at the start of the reporting time (1st July, 2022). At BRRI HQ, total number of laborers was 436 of which 281 regular and 155 irregular labors.
- Total labour utilization by different divisions and sections of BRRI HQ was 1,91,869 man days of which 57.38%, 39.79% and 2.83% were utilized for research, support service and holidays, respectively.
- In total Tk.10,98,78,631 was paid to the labourers as labour wage in which Tk.6,28,38,093, Tk. 4,36,04,938 and Tk. 3,189,000 were for research work, support service works, leaves and holidays, respectively.
- Including regional stations of BRRI in total 75,69,398 Tk was given to 15 labourers as financial benefits for retirement and also 24,923Tk was given to 11 laborers as medical financial benefits for injury in working time during the fiscal year 2022-23.
- BRRI has 284.40 ha of land of which 184.61 ha is cultivable. In total 81.85 ha of land were utilized by different research divisions in different season at BRRI HQ of which 6.18 ha in Aus, 37. 65 ha in T. Aman and 38.02 ha in Boro season. Among the research divisions, Plant Breeding division utilized the highest amount of land (25.41 ha) followed by GRS division (13.25 ha) and Hybrid Rice division (7.84 ha).
- This division manages the BRRI flower garden to maintain the aesthetic view of the office campus, arrange beautification of BRRI premises and playground during different observation of national, international and organizational events, and execute tree plantation, management of different fruit and other trees in BRRI. This division effectively carried out activities of mosquito control, graveyard management, playground management and help in other support services and management activities of BRRI.

3. DETAILED ACTIVITIES

The Farm Management Division (FMD) was established at the inception of BRRI in 1970. This division is one of the components of the Socio-economics and Policy Program Area of BRRI and carries out research as well as management and support services for the institute, such as, HYV rice seed production (breeder seed and truthfully labelled seed), fixing of labour wages, weed management methods and economics, water management (irrigation and drainage), maintenance of the BRRI office premises and field management, garden management and beautification of BRRI office areas, land and labor management for smooth conduct of field research at BRRI etc.

3.1. RESEARCH

3.1.1. Project-1: Rice Production Management

3.1.1.1. Expt. 1: Efficacy of mechanical seedling transplanter and deep placement of mixed fertilizer on rice yield

PI: MS Islam **CI:** S Begum, MR Manir, MM Rahman, and MA Hossen (FMPHT)

Objectives:

(i) To evaluate the efficacy of newly developed mechanical rice transplanter cum fertilizer applicator.

(ii) To observe the yield and yield contributing parameters.

Materials and Methods

This experiment was conducted at the West Byde of BRRI HQ farm, Gazipur during T. Aman and Boro, 2022-23 seasons to evaluate the efficacy of newly developed BRRI mechanical rice transplanter cum fertilizer applicator. Urea fertilizer along with TSP, MoP and Gypsum fertilizer can be placed and covered in 6-8 cm soil depth during mechanical transplanting using the developed rice transplanter. Randomized Complete Block (RCB) design was followed with three replications. Individual plot size was 8m × 5m along with 30 cm buffer spacing. Treatments of the study were T_1 = Mechanical transplanting along with 100% fertilizer (Urea, TSP, MoP and Gypsum) deep placement, T_2 = Mechanical transplanting along with 80% fertilizer (80% Urea and 100% TSP, MoP and Gypsum) deep placement, T_3 = Mechanical transplanting along with 70% fertilizer (70% urea and 100% TSP, MoP and Gypsum) deep placement, T_4 = Mechanical transplanting along with 100% fertilizer hand broadcasting (TSP, MoP and Gypsum fertilizer as basal dose and urea fertilizer in three splits) and T_5 = Hand transplanting of same seedling of rice transplanter along with 100% fertilizer hand broadcasting (TSP, MoP and Gypsum in basal dose and urea fertilizer in three split). In this experiment, BRRI dhan87 and BRRI dhan92 was used in T. Aman and Boro seasons, respectively. Twenty days old mat type seedlings were used in mechanical transplanting at 30 cm × 15 cm spacing whereas spacing of manual transplanting was 20 cm × 20 cm. All intercultural operations were done according to BRRI recommendation and were same for all treatments. Growth & yield components data were taken at harvesting time. Collected data were statistically analyzed using standard statistical procedure (Statistix 10).

Results and discussion

Yield contributing parameters such as filled grain panicle^{-1} and grain yield were statistically significant among the treatment in both the season. Growth and yield contributing parameters such as tiller number m^{-2}, panicle number m^{-2}, filled grain panicle^{-1} and grain yield were significantly affected by mechanical transplanting with deep placement of NPK fertilizers in T. Aman season. But in Boro season, numbers of tiller m^{-2} and panicle m^{-2} were not significantly affected by mechanical transplanting with deep placement of NPK fertilizers and hand transplanting with hand broadcasting of fertilizer.

Tiller number m^{-2}

In T. Aman season, number of tiller production per square meter was significantly affected by mechanical transplanting with deep placement of NPK fertilizers and hand transplanting with hand broadcasting of fertilizer. T_2 = Mechanical transplanting along with 80% fertilizer (80% Urea and 100% TSP, MoP and Gypsum) deep placement by transplanter cum fertilizer

applicator plot gave statistically the highest number of tiller m^{-2} (336) followed by other treatments. But in Boro season, number of tiller m^{-2} was not significantly affected by mechanical transplanting with deep placement of NPK fertilizers and hand transplanting with hand broadcasting of fertilizer. T_4 (Mechanical transplanting along with 100% fertilizer hand broadcasting) produced the highest number of tiller (401) per square meter and the lowest number (333) from the treatment T_5 = Hand transplanting along with 100% fertilizer hand broadcasting (TSP, MoP and Gypsum in basal dose and urea fertilizer into three splits). (Table 1)

Panicle number m^{-2}

In T. Aman, panicle production per square meter was significantly affected by mechanical transplanting with deep placement of NPK fertilizers and hand transplanting with hand broadcasting of fertilizer. T_2 = Mechanical transplanting along with 80% fertilizer (80% Urea and 100% TSP, MoP and Gypsum) deep placement plot gave statistically the highest panicle number/m^2 (321). The lowest number of panicle/m^2 among the treatments was observed in T_1 = Mechanical transplanting along with 100% fertilizer (Urea, TSP, MoP and Gypsum) deep placement (226). But in Boro season, number of panicle/m^2 was not significantly affected by mechanical transplanting with deep placement of NPK fertilizers and hand transplanting with hand broadcasting of fertilizer. T_4 (Mechanical transplanting along with 100% fertilizer hand broadcasting) gave the highest number of tiller production (384) per square meter and lowest number (328) from the treatment T_5 = Hand transplanting along with 100% fertilizer hand broadcasting (TSP, MoP and Gypsum in basal dose and urea fertilizer into three splits). (Table 1)

Filled grain $panicle^{-1}$

There were significant differences found among the treatments in case of number of filled grain $panicle^{-1}$ in both T. Aman and Boro season. The treatments T_5 = Hand transplanting of same seedling of rice transplanter along with 100% fertilizer hand broadcasting produced higher number of filled grain/panicle (179) in T. Aman and 160 in Boro season than other treatments and lower from treatment T_1 = Mechanical transplanting along with 100% fertilizer (Urea, TSP, MoP and Gypsum) deep placement (112) in T. Aman and 113 from T_3 in Boro season. (Table 1)

Unfilled grain $panicle^{-1}$

There were no significant differences among the treatments in case of number of unfilled grain $panicle^{-1}$ in both the season. (Table 1)

Grain yield

In T.Aman season, grain yield were significantly varied among the treatments (Table 1). Mechanical transplanting along with 80% fertilizer deep placement (T_2) gave the highest grain yield (6.14 t ha^{-1}) followed by T_5, T_4 & T_3 (4.98, 5.02 & 4.91 t ha^{-1} respectively). However, grain yield under treatment T_1 gave statistically lower yield compared to others. On the otherhand, during Boro season, T_4 (Mechanical transplanting along with 100% fertilizer hand broadcasting) gave the highest grain yield (7.20 t ha^{-1}) which was statistically identical with T_5 (Hand transplanting along with 100% fertilizer hand broadcasting (7.17 t ha^{-1}) followed by T_2, T_1 & T_3 (6.01, 5.64 and 5.46 t ha^{-1}, respectively). However, grain yield of treatment T_3 gave statistically lower yield than other treatments (Table 1).

Straw yield and 1000-grain wt

There were no significant differences found incase of straw yield and 1000-grain wt among the treatments in T. Aman season. The highest straw yield was found from T_3 . But in Boro season, straw yield and 1000-grain wt were highly significant among the treatments. T_4 gave the highest straw yield which was 6.47 t ha^{-1} and the lowest straw yield from T_2 (4.38 t ha^{-1}). T_2 gave the highest 1000-grain wt (25.15gm) than other trearment and T_1 gave the lowest 1000-grain wt (23.16gm). (Table 1)

Table 1. Yield and yield contributing parameters of rice as affected by mechanical seedling transplanting with deep placement of mixed fertilizer and hand transplanting with hand broadcasting in T. Aman and Boro, 2022-23 seasons

Treatment	Tiller m^{-2} (no.)	Panicle m^{-2} (no.)	Filled grain $panicle^{-1}$ (no)	Unfilled grain $panicle^{-1}$ (no)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	1000 grain wt (gm)
T. Aman season (BRRI dhan87)							
T_1	234	226	112	19	4.66	7.33	24.42
T_2	336	321	148	15	6.14	7.52	24.58
T_3	328	318	123	20	4.91	7.87	24.63
T_4	281	272	144	17	5.02	7.27	24.63
T_5	294	283	179	18	4.98	6.83	24.63
Lsd (0.05)	***	***	***	ns	***	ns	ns
CV%	9	10	14	30	8.66	8.51	1.15
Boro season (BRRI dhan92)							
T_1	387	374	117	21	5.64	4.38	23.16
T_2	382	364	116	19	6.01	4.3	25.35
T_3	379	361	113	27	5.46	4.77	24.58
T_4	401	384	123	29	7.20	6.47	24.02
T_5	333	328	160	17	7.17	6.38	25.15
Lsd (0.05)	ns	ns	***	ns	***	***	***
CV%	8	8	10	22	11.33	4.19	2.61

*** means statistically significant, ns= non-significant

T_1 = Mechanical transplanting along with 100% fertilizer (Urea, TSP, MoP and Gypsum) deep placement, T_2 = Mechanical transplanting along with 80% fertilizer (80% Urea and 100% TSP, MoP and Gypsum) deep placement, T_3 = Mechanical transplanting along with 70% fertilizer (70% urea and 100% TSP, MoP and Gypsum) deep placement, T_4 = Mechanical transplanting along with 100% fertilizer hand broadcasting (TSP, MoP and Gypsum fertilizer as basal dose and urea fertilizer in three split) and T_5 = Hand transplanting along with 100% fertilizer hand broadcasting (TSP, MoP and Gypsum in basal dose and urea fertilizer in three splits).

Cost of Production and Profitability

Seed rate ((@33.62 kg/ha) was higher in hand transplanting with fertilizer hand broadcasting than mechanical transplanting with fertilizer deep placement ((@27 kg/ha). Seedling development cost, labour cost for different operation (Transplanting, weeding, harvesting) and fertilizer cost (2550 tk/ha, 60000 tk/ha and 12100 tk/ha) was higher in hand transplanting with fertilizer hand broadcasting than mechanical transplanting with fertilizer deep placement (1800 tk/ha in tray, 45000 tk/ha and 9100 tk/ha).

Total variable cost (1,14,913 tk/ha) was higher in hand transplanting with fertilizer hand broadcasting than mechanical transplanting with fertilizer deep placement (97,365 tk/ha)

Gross benefit (2,41,880 tk/ha) and Gross Margin (144515 tk/ha) were higher in mechanical transplanting with fertilizer deep placement than in hand transplanting with fertilizer hand broadcasting (240620tk/ha and 125707 tk/ha). The BCR was higher in mechanical transplanting with fertilizer deep placement than hand transplanting. Therefore, mechanical transplanting with fertilizer deep placement is more profitable (Tk. 144515-125707) = 18,808 tk/ha) than hand transplanting.

Table. 2. Per hectare cost (Tk. ha^{-1}) of mechanical transplanting with deep placement of fertilizer and hand transplanting with hand broadcasting of fertilizer in MV rice production of Boro season 2023

Input-wise cost (Tk/ha)	Cost (Tk. ha^{-1}) of hand transplanting with fertilizer hand broadcasting	Cost (Tk. ha^{-1}) of mechanical transplanting with fertilizer deep placement
Seed	1513 (@33.62 kg/ha, 45 tk/kg)	1215 (@27 kg/ha, 45 tk/kg)
Seedling development	2550	1800 (in tray)
Land preparation (Ploughing and laddering)	7550	7550
Labour cost for different operation (Transplanting, weeding, harvesting)	60,000	45000
Irrigation	20,500	20500
Machine hire cost	00	1500
Fertilizer	12100	9100
Pesticide (Herbicide, insecticide, fungicide)	5200	5200
Threshing, winnowing, drying	5500	5500
Total variable cost (Tk./ha)	**1,14,913**	**97,365**

Table. 3. Per hectare profitability of mechanical transplanting with deep placement of fertilizer and hand transplanting with hand broadcasting of fertilizer in MV rice production of Boro season 2023

Item	Hand transplanting with fertilizer hand broadcasting	Mechanical transplanting with fertilizer deep placement
1. Total Variable cost	1,14,913	97,365
2. Rice Yield (t/ha)	7.17 t/ha	7.20 t/ha
3. Paddy price @30tk/kg (tk./ha)	2,15,100	2,16,000
4. Straw yield (t/ha)	6.38 t/ha	6.47 t/ha
5. Straw Price (Tk./ha) (@ 4 tk/kg)	25,520	25,880
6. Gross Benefit (tk/ha) (3+5)	2,40,620	2,41,880
7. Gross Margin (Tk./ha) (6-1)	1,25,707	1,44,515
8. BCR (Variable cost basis) (6/1)	**2.093**	**2.48**

Conclusion

It may be concluded that significant variation was recorded in case of number of tillerm^{-2}, number of panicle m^{-2}, filled grain/panicle and grain yield etc during T. Aman season and filled grain panicle^{-1}, grain yield, straw yield and 1000-grain wt during Boro season. From these results, mechanical transplanting with 80% fertilizer deep placement and mechanical transplanting with 100% fertilizer hand broadcasting practices are recommended for rice production. Mechanical rice transplanting is the most vital issue to overcome labor shortage and high wage of labour during transplanting. It has been also treated as time and labor saving, transplanting in proper time and maintaining proper plant density that helps to high productivity. Deep placement of fertilizer facilitates placing the fertilizer below the soil surface, closer to the rice root zone, reduced nutrient loss, enhancing nutrient uptake efficiency, promotes stronger and healthier root system. This can result in improved plant growth,

increased tillering and ultimately higher the grain yield. But this integrated approach can not always increase yield due to less soil plough pan and improper calibration of machine. Uniform application of fertilizer always not be ensured due to proper operation of machine by skilled operator. So, it's important to note that the efficacy of theses practices can vary depending on factors such as soil type, climate conditions, rice variety and proper implementation of techniques.

3.1.1.2. Expt. 2: Effect of foliar application of Silicon on yield of aromatic rice

PI: S Begum; **CI:** MS Islam, MR Manir and MM Iqbal (SSD)

Objectives:

To investigate the effect of foliar application of silicon's aqueous solution (sodium silicate) on yield of aromatic rice.

Materials and Methods

This experiment was conducted at the west byde of BRRI farm, Gazipur during T. Aman and Boro, 2022-23 seasons to investigate the effect of foliar application of different concentrations of silicon solutions on yield of aromatic rice. BRRI dhan70 and BRRI dhan50 were used in T. Aman and Boro seasons, respectively with maintaining 20 cm × 20 cm spacing during transplanting. All intercultural operations were done according to BRRI recommendation and were same for all treatments. Silicon was sprayed maintaining four concentrations (Si_1 = 0.0, Si_1 = 0.5, Si_1 = 1.0 and Si_1 = 1.5 %) in two different times (20 DAT and 35 DAT). The experiment was done following RCBD design. Yield and yield components data were taken at harvesting time. Growth data (plant height and tiller number) were collected. Collected data were statistically analyzed using standard statistical procedure (Statistix 10).

Results of T. Aman, 2022

Plant height

In T. Aman season, plant height was more or less similar among the treatments along the growth duration. No significant differences were found among the treatments. (Table 4)

Tiller m^{-2} & Panicle m^{-2}

Higher number of tiller m^{-2}, panicle m^{-2} was produced in 1.5% silicon's solution sprayed plot and lower in 1.0% silicon's solution sprayed plot. But the difference was very low and similar at maturity stage (Table 4).

Filled grain $panicle^{-1}$

Highest number of filled grain $panicle^{-1}$ was found in 1.5% silicon solution sprayed plot followed by 0.5%, 1.0% and control plot. There were no significant differences among the treatments at 20 DAT and 35 DAT.

1000- grain wt

There were no significant differences found in case of 1000-grain wt.

Grain yield

In T. Aman season, more yield was found in 1.5% silicon's solutions spray plot (4.31t ha^{-1}) than other treated plot. Yield differences among the treatments were not significant.

Conclusion

It may be concluded that no significant differences among the treatments were found in growth and yield parameters. Since the plots were lodged resulting low yield and no significant differences were found among the treatments.

Results of Boro 2022-23

Plant height

Plant height was more or less similar among the treatments along the growth duration. The longest plant height was (86.7cm) found in 1.0% silicon solution sprayed plot. (Table 4)

Tiller m^{-2} & Panicle m^{-2}

Higher number of tiller/m^2, panicle/m^2 were produced in 1.0% silicon's solution sprayed plot and lower in control plot. There were no significant different found among the treatments. (Table 4).

Filled grain $panicle^{-1}$

Control plot gave the highest number of filled grain $panicle^{-1}$ which was similar to 1.0% silicon solution spray plot but significant variation was not found.

1000-grain wt

There were no significant variations found among the treatments in case of 1000-GW. All the treatment gave more or less similar grain wt. Silicon solutions sprayed plot gave more grain wt. than control plot.

Grain yield

Significant variation was observed in the yield of BRRI dhan50 in different concentration of silicon's solution treated plots (Table 4). 1.0% silicon's solution sprayed plot gave the highest grain yield (6.23 t ha^{-1}) which was statistically significant among the treatments and the lowest grain yield (5.41 t ha^{-1}) was found from 1.5% silicon's solution sprayed plot.

Straw yield

1.0% silicon sprayed plot produced the highest straw yield than other treated plots

Table 4. Yield contributing parameters of BRRI dhan70 and BRRI dhan50 as affected by foliar spray of different concentration of silicon solution's during T.Aman and Boro, 2022-23 seasons

Treatment	Plant height (cm)	Tiller m^{-2} (no.)	Panicle m^{-2} (no.)	Filled grain $panicle^{-1}$ (no)	Unfilled grain $panicle^{-1}$ (no)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	1000 grain wt (gm)
T.Aman season (BRRI dhan70)								
Si_1	154.87	256	245	144	39	4.06	7.20	21.07
Si_2	153.27	258	245	131	32	4.03	7.41	21.00
Si_3	155.14	262	249	133	31	4.06	7.51	20.74
Si_4	156.93	267	256	148	34	4.31	7.36	20.70
lsd (0.05)	ns	ns	ns	ns	ns	ns	ns	ns
CV %	3.35	4	4	14	29	2.65	3.21	2.15
Boro season (BRRI dhan50)								
Si_1	84.73	345	330	141	31	5.68	6.55	15.50
Si_2	86.73	368	356	118	39	6.01	6.32	15.62
Si_3	85.87	382	368	140	27	6.23	6.30	15.78
Si_4	83.33	349	339	137	34	5.41	5.92	15.77
lsd (0.05)	ns	ns	ns	ns	ns	***	ns	ns
CV %	3.35	9.27	9.77	19.22	22.21	1.76	4.11	2.96

[S_1, S_2, S_3 and S_4 represent 0.0, 0.5, 1.0 and 1.5 % silicon solution conc.]

** means statistically significant, ns= non-significant

Conclusion

It may be concluded that effectiveness of silicon foliar application can vary depending on factors such as soil type, rice variety, application timing, dosage etc. These studies shown mixed results, with some studies reporting significant yield increases, while others show no significant differences among the treatments in growth and yield parameters. Therefore, we can say that foliar application of silicon has significant effect on yield of aromatic rice (BRRI dhan50).

3.1.1.3. Expt. 3: Influence of different dates of transplanting on growth, yield performance and quality of fine rice varieties

PI: MR Manir **CI:** MS Islam, MM Rashid, S Begum (FMD), HB Shozib and N Ferdous (GQND)

Objectives

To confirm the best planting time of fine rice varieties for higher yield and quality.

Materials and Methods

This experiment was conducted at the West Byde of BRRI farm, Gazipur during T. Aman 2022 season to find out the best planting time of fine rice varieties for higher yield and quality. The treatments were A. Transplanting dates, e.g. T_1 = 1 July, T_2 = 15 July, T_3 = 30 July, T_4 = 15 August, T5 = 30 August, T_6 = 15 September; and B. Varieties: V_1 = BRRI dhan34, V_2 = BRRI dhan90 and V_3 = Binadhan-13. The treatments were distributed in strip plot design with three replications (Transplanting dates in main plot and variety in sub plot) and spacing 20cm × 20cm. Twenty-day-old seedlings were transplanted on selected dates. All other intercultural operations were done as and when necessary. Yield and yield components data were taken at maturity stage. The collected data were analyzed using Crop stat 7.2 Software.

Results and Discussion

Results indicated that plant height and filled grain/panicles of tested varieties showed significant difference irrespective of transplanting dates. The highest plant height was observed in 1 July transplanting at all tested varieties than other transplanting dates (15 July, 30 July, 15 August, 30 August and 15 September). The highest number of panicles hill^{-1} were found in BRRI dhan34 and BRRI dhan90 at 30 August transplanting except Binadhan-13 than 15 August and 30 July transplanting. The lowest in 1 July, 15 July and 15 September transplanting. The highest filled grain panicle^{-1} (297.63) was observed from BRRI dhan90 at 15 August transplanting and lowest (142.0) in Binadhan-13 on 1 July transplanting (Table 5).

Table 5. Effect of transplanting dates and varieties on plant height (cm), number of panicles hill $^{-1}$ and filled grain panicles^{-1} in T. Aman 2022 at BRRI farm, Gazipur.

Variety	Transplanting dates																	
	1st July			15th July			30th July			15th August			30th August			15th September		
	PH	PN	GN	PH	PN	GN	PH	PN	GN	PH	PN	GN	PH	PN	GN	PH	PN	GN
V1	155.42	7.58	174.26	145.42	8.00	176.83	137.16	8.92	207.43	131.33	9.88	211.53	112.40	10.06	201.73	111.55	8.20	138.76
V2	115.58	7.66	261.60	117.10	7.35	273.03	115.33	9.09	288.07	102.08	9.52	297.63	86.58	11.22	288.66	86.66	7.98	243.93
V3	160.66	7.95	142.00	150.33	7.58	142.76	150.25	9.05	143.86	136.05	9.43	152.33	115.66	8.76	151.66	115.07	8.11	98.86
LSD (0.05)	5.49	1.11	25.11	5.49	1.11	25.11	5.49	1.11	25.11	5.49	1.11	25.11	5.49	1.11	25.11	5.49	1.11	25.11
CV	2.7	7.7	7.7	2.7	7.7	7.7	2.7	7.7	7.7	2.7	7.7	7.7	2.7	7.7	7.7	2.7	7.7	7.7

V_1 = BRRI dhan34, V_2 = BRRI dhan90, V_3 = Binadhan-13, PH = Plant height (cm), PN = Number of panicles hill $^{-1}$, GN = Filled grain panicles^{-1}

15 August transplanted plants produced the highest grain yield in BRRI dhan34, BRRI dhan90 and Binadhan-13 followed by 30 August and 30 July transplanting and the lowest in 1 July transplanting. After 30 August and before 30 July all tested fine rice varieties yield were decreasing. The highest harvest index was present in BRRI dhan34, BRRI dhan90 and Binadhan-13 at 30 August transplanting and the lowest in 1 July transplanting. The highest growth duration was present in 1 July transplanting in all tested varieties and the lowest in 15 September. The highest growth durations of Binadhan-13 were observed in all transplanting dates followed by BRRI dhan34 and the lowest in BRRI dhan90. (Table 6)

Table 6. Effect of transplanting dates and varieties on grain yield (t ha^{-1}), harvest index (%) and growth duration in T. Aman 2022 at BRRI farm, Gazipur.

Variety	Transplanting dates																	
	1st July			15th July			30th July			15th August			30th August			15th September		
	GY	HI	GD	GY	HI	GD	GY	HI	GD	GY	HI	GD	GY	HI	GD	GY	HI	GD
V1	3.26	0.34	161.00	3.36	0.35	151.33	3.90	0.37	134.66	3.96	0.39	123.66	3.93	0.39	120.33	3.35	0.38	116.66
V2	4.68	0.44	132.33	4.73	0.46	116.33	5.26	0.46	111.66	5.36	0.45	110.33	5.12	0.46	111.66	4.51	0.46	111.66
V3	2.77	0.33	178.33	3.06	0.36	165.00	3.44	0.39	148.33	3.64	0.39	135.33	3.55	0.40	128.66	3.26	0.40	121.00
LSD (0.05)	0.34	0.16	1.06	0.34	0.16	1.06	0.34	0.16	1.06	0.34	0.16	1.06	0.34	0.16	1.06	0.34	0.16	1.06
CV	5.2	2.5	0.5	5.2	2.5	0.5	5.2	2.5	0.5	5.2	2.5	0.5	5.2	2.5	0.5	5.2	2.5	0.5

V_1 = BRRI dhan34, V_2 = BRRI dhan90, V_3 = Binadhan-13, GY = Grain Yield (tha^{-1}), HI = Harvest Index (%), GD = Growth Duration

Milling outturn and head rice recovery percentage were significant differences of transplanting dates and varieties. The highest milling outturn and head rice recovery percentage was found in BRRI dhan34 followed by BRRI dhan90 with 15 August transplanting. The lowest head rice percentage was present in 15 July transplanting with Binadhan-13. 15 July to 15 August transplanting, BRRI dhan34 produced the highest protein content than BRRI dhan90 and the lowest in Binadhan-13 at different transplanting dates (Table 7).

Table 7. Effect of transplanting dates and varieties on grain qualities in T. Aman fine rice varieties 2022 at BRRI farm, Gazipur.

Variety	Grain quality																	
	1st July			15th July			30th July			15th August			30th August			15th September		
	MO	HR	PC	MO	HR	PC	MO	HR	PC	MO	HR	PC	MO	HR	PC	MO	HR	PC
V1	72.36	66.92	9.97	72.36	66.42	10.06	72.51	67.82	10.04	72.54	67.80	10.06	72.35	67.66	9.96	71.20	66.03	9.93
V2	68.77	65.57	9.70	69.85	67.02	9.73	70.25	67.39	9.76	70.64	67.24	9.76	69.94	66.23	9.66	69.20	67.25	9.70
V3	69.87	54.65	8.22	68.44	54.08	8.22	69.05	55.56	8.39	69.70	55.90	8.64	68.23	55.56	8.43	67.92	55.12	8.28
LSD (0.05)	0.74	0.93	0.21	0.74	0.93	0.21	0.74	0.93	0.21	0.74	0.93	0.21	0.74	0.93	0.21	0.74	0.93	0.21
CV	0.6	0.9	1.4	0.6	0.9	1.4	0.6	0.9	1.4	0.6	0.9	1.4	0.6	0.9	1.4	0.6	0.9	1.4

V1= BRRI dhan34, V2 = BRRI dhan90, V3 = Binadhan-13, MO% = Milling outturn%, HR% = Head rice% & PC% = Protein content

Conclusion

It may be concluded that during T. Aman season, 30 July to 15 August transplanted plants produced statistically identical yield of tested fine rice varieties. Milling outturn (%), head rice (%) and protein content (%) were produced higher in 30 July to 15 August transplanting.

3.1.1.4. Expt.4: Effect of storage times in different storage technologies on quality of rice

PI: MR Manir **CI:** MS Islam, MM Rashid, S Begum (FMD), HB Shozib and N Ferdous (GQND)

Objectives

i. To observe the grain quality of rice variety at different storage time and storage technologies.

ii. To identify the suitable storage technologies for preservation of rice seed.

Materials and Methods

The laboratory experiment was conducted at BRRI HQ, Gazipur in Farm Management Division, Grain Quality & Nutrition Division and BRRI Central laboratory from June 2022 to July 2023, to examine the effect of storage times in different container on quality of rice. For this purpose, we set up different storage times of Fresh harvested paddy (o month), 3, 6 & 9 months and different storage technologies of C_1 = Plastic Container, C_2 = Jute Sacks, C_3 = Plastic Bag, C_4 = Motka & C_5 = Grain Pro Bag. Sample were taken in 60 random treatments (3 replication × 4 storages time × 5 storage container) at 12% moisture content from BRRI dhan84 variety. The treatments were distributed in completely randomized design (CRD) with three replications. The un-parboiled paddy was used for this experiment. BRRI dhan84 will be stored in the five storage technologies and milling quality was assessed at every 3-month

interval up to 9 months from time of storage. The collected data were analyzed using R Software.

Results and Discussion

Seed quality parameters i.e. germination percentage (GM %) and seedling vigor index (SVI) were significantly affected due to different storage time and technologies. The highest GM% (98.00) and SVI (14.23) were observed in Grain Pro Bag at 3 months' storage times and the lowest GM% (67.00) and SVI (7.30) in Jute Sacks at 9 months' storage times. GM% and SVI decreased with time of storage durations at different storage (Table 8). Grain quality of rice is important parameters for researchers, consumers and traders. Consumer's acceptance of rice depends on its physicochemical properties of rice. Ageing of rice is one of the typical steps between harvesting and consuming. During storage time of rice, a number of physicochemical properties changes that causes impact on rice cooking and eating quality. However, the main components of rice like starch, protein and lipids remains unchanged during storage time and only structural changes take place along with change in flavors and texture.

Table 8. Seed quality of rice at different storage time and storage technologies

SC / ST	Seed quality											
	Germination (%)						Seedling Vigor Index (10 DAS)					
	C_0	C_1	C_2	C_3	C_4	C_5	C_0	C_1	C_2	C_3	C_4	C_5
FH	94.00	-	-	-	-	-	12.56	-	-	-	-	-
3M	-	91.66	84.33	86.33	86.33	98.00	-	12.44	10.86	12.23	12.40	14.23
6M	-	90.33	80.66	83.66	84.66	92.00	-	12.41	10.89	12.14	11.10	13.22
9M	-	86.66	67.00	76.00	83.00	85.00	-	9.83	7.30	9.53	9.23	10.08
LSD (0.05)	2.64						0.64					
CV	1.85						3.41					

ST = Storage Time, SC = Storage Container, FH = Fresh Harvested, M = Month C_0 = No Container, C_1 = Plastic Container, C_2 = Jute Sacks, C_3 = Plastic Bag, C_4 = Motka & C_5 = Grain Pro Bag

Fresh harvested paddy was found that initially milling outturn (%) was 69.19% and head rice recovery was 58.80% (based on milled rice). After storage times, the highest milling outturn (68.58%) and head rice recovery (60.48%) were found in 9 months' storage time at Plastic Container followed by Grain Pro Bag and Plastic Bag and the lowest in Jute Sacks at different storage times (Fig. 1). Milling outturn (%) and head rice recovery (%) increased with time of storage durations at different storage technologies.

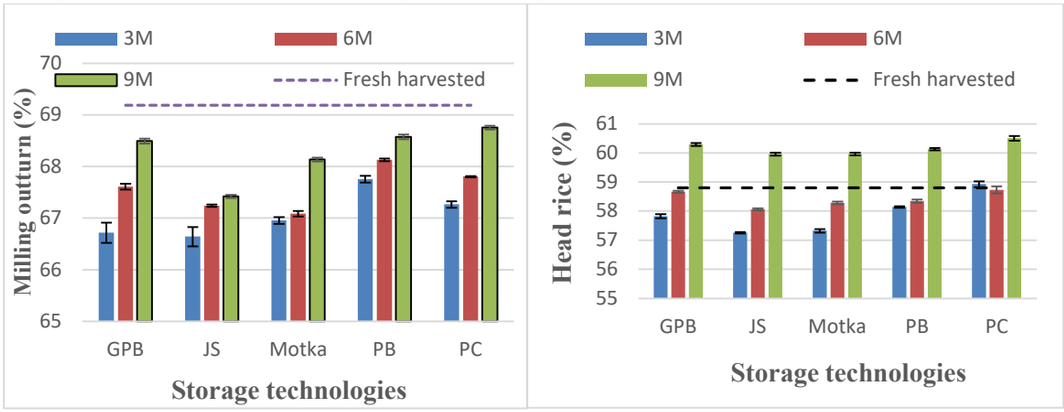

Fig. 1. Physical properties of rice at different storage time and technologies

GPB = Grain Pro Bag, JS = Jute Sacks, PB = Plastic Bag, PC = Plastic Container & M = Month

Amylose and protein content of fresh harvested milled rice were 26.56% and 8.56%. Amylose and protein content decreased with storage times at different storage technologies. The highest amylose (27.03%) at Jute Sacks and protein content (8.7%) were present in Grain Pro Bag with 3 months storage times and lowest in 9 months storage time at different storage technologies (Fig. 2).

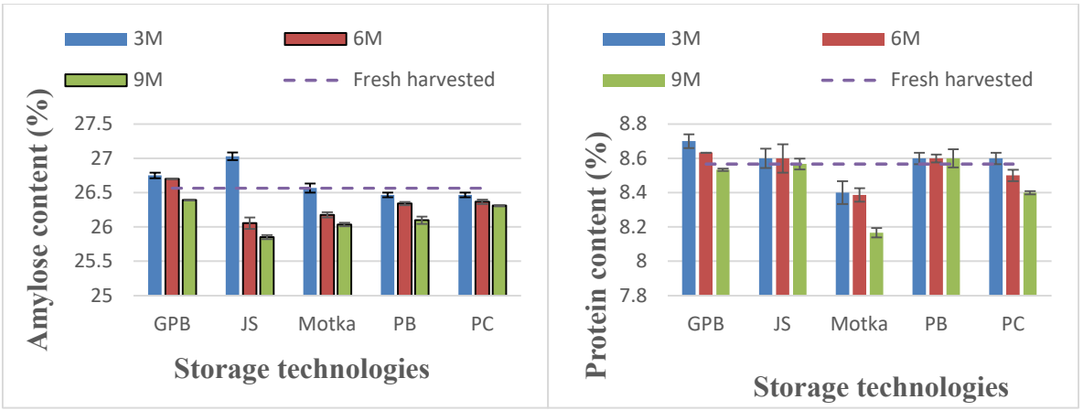

Fig. 2. Chemical and cooking properties of rice at different storage time and technologies

GPB = Grain Pro Bag, JS = Jute Sacks, PB = Plastic Bag, PC = Plastic Container & M = Month

Alkali spreading value and cooking time of fresh harvested milled rice were 5.06 and 18.00 minute. Alkali spreading value decreased with storage times at different storage technologies. The highest alkali spreading value was present in 3 months storage times at different storage technologies and the lowest in 9 months storage times at different storage technologies. Cooking time increased with time of storage durations at different storage technologies. The highest cooking time was found in 9 months storage times at different storage technologies and the lowest in 3 months storage times at different storage technologies (Fig. 3).

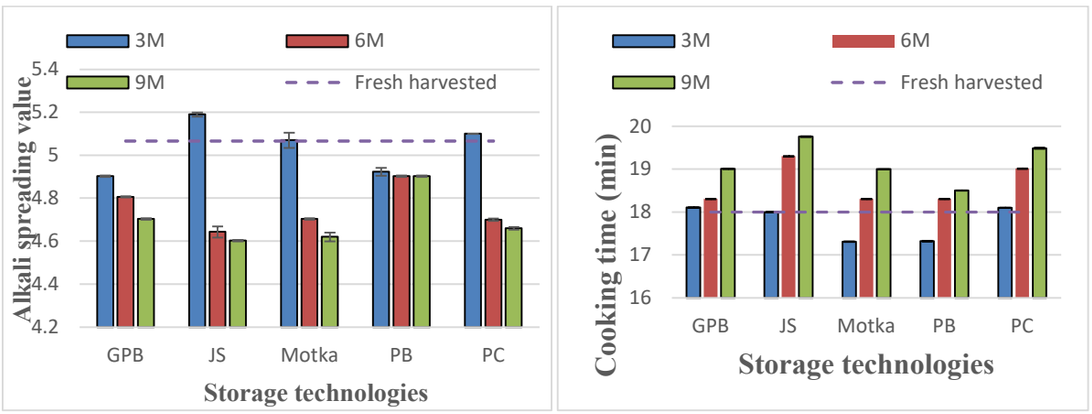

Fig. 3. Chemical and cooking properties of rice at different storage time and technologies

GPB = Grain Pro Bag, JS = Jute Sacks, PB = Plastic Bag, PC = Plastic Container & M = Month

Moisture plays an important role in determining the rice quality. Higher moisture content increases the microbial deterioration and storage temperature and intervals. Moisture content was significantly affected due to the different storage times and technologies. The highest moisture content was found in 9 months' storage times at different storage technologies and the lowest in 3 months' storage durations at different storage technologies. The results observed that good moisture content was maintains in Plastic Container followed by Grain Pro Bag and lowest in Jute Sacks (Fig. 4).

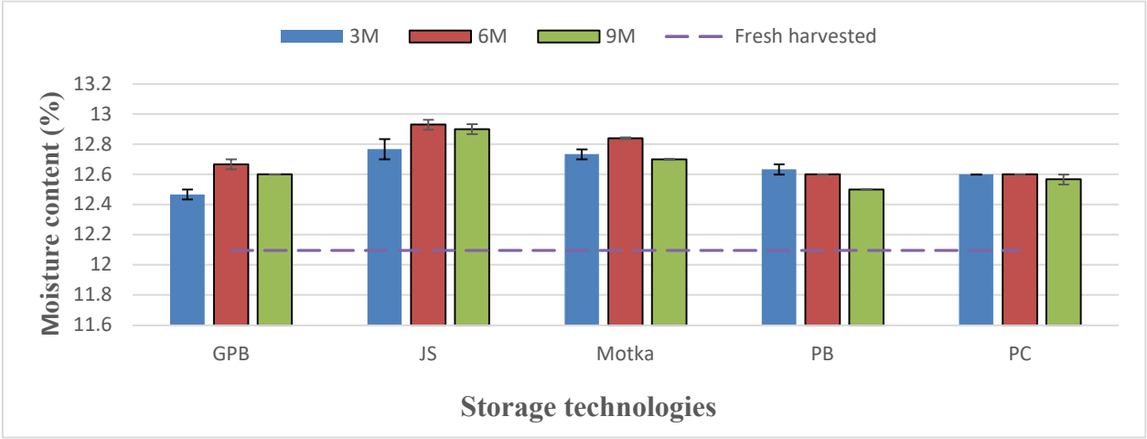

Fig. 4. Chemical and cooking properties of rice at different storage time and technologies

GPB = Grain Pro Bag, JS = Jute Sacks, PB = Plastic Bag, PC = Plastic Container & M = Month

Vitamin is an organic molecule that are required in the diet in very small amounts. They provide specialized and distinct tasks in the development and reproduction, as well as in the maintenance of health and life. Storage times increased with decreased vitamins B- complex at different storage technologies. Initially, fresh harvested milled rice contains vitamin B1(0.22mg/100g) and B2 (0.045mg/100g). The highest vitamins B1 and B2 were contains in 3 months storage time at different containers and lowest in 9 months storage times at different containers. The highest vitamins B1 (0.22mg/100g) and B2 (0.045mg/100g) were contains in Plastic Container and Jute Sacks and the lowest (0.16 m/100g and 0.040mg/100g) in Plastic Bag and Motka (Fig. 5).

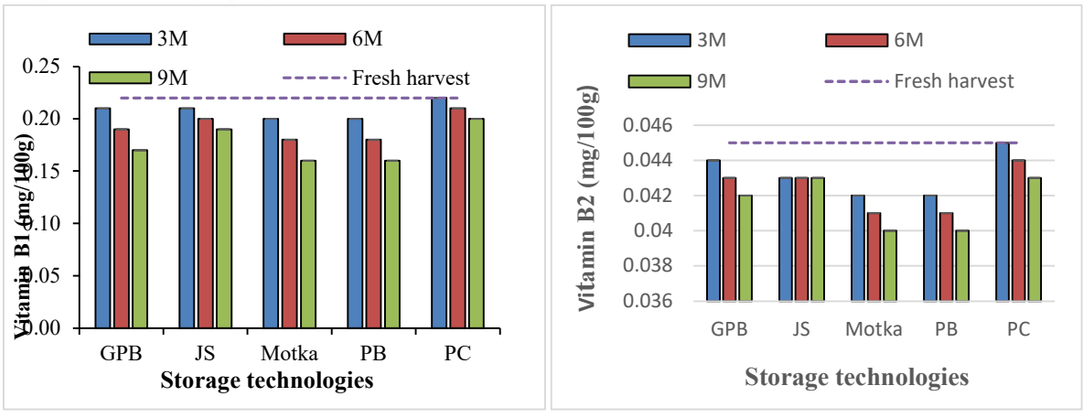

Fig. 5. Vitamins (B-complex) of rice at different storage time and technologies
GPB = Grain Pro Bag, JS = Jute Sacks, PB = Plastic Bag, PC = Plastic Container & M = Month

Initially, fresh harvested milled rice contains vitamin B3 (5.72mg/100g) and B6 (0.26mg/100g). The highest vitamin B3 and B6 were contains in 3 months storage time at different containers and the lowest in 9 months storage times at different containers. The highest vitamin B3 (5.67mg/100g) and B6 (0.25mg/100g) were contains in Plastic Container and the lowest (5.16 mg/100g and 0.21 mg/100g) in Plastic Bag (Fig. 6).

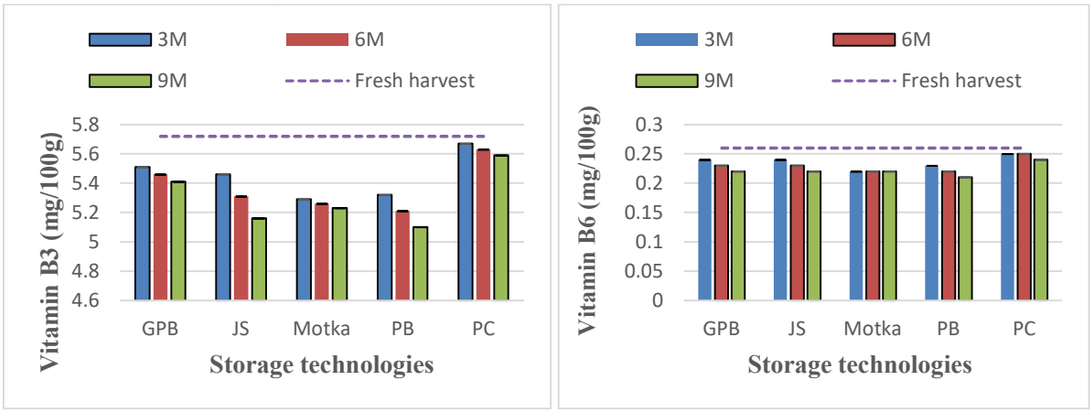

Fig. 6. Vitamins (B-complex) of rice at different storage time and technologies
GPB = Grain Pro Bag, JS = Jute Sacks, PB = Plastic Bag, PC = Plastic Container & M = Month

Initially, fresh harvested milled rice contains vitamin B12 (21mg/100g). The highest vitamin B12 was contain in 3 months storage time at different containers and lowest in 9 months storage times at different containers. The highest vitamin B12 (21mg/100g) was contain in Plastic Container at 3 months storage times and lowest (6mg/100g) in Plastic Bag at 9 months storage times (Fig. 7).

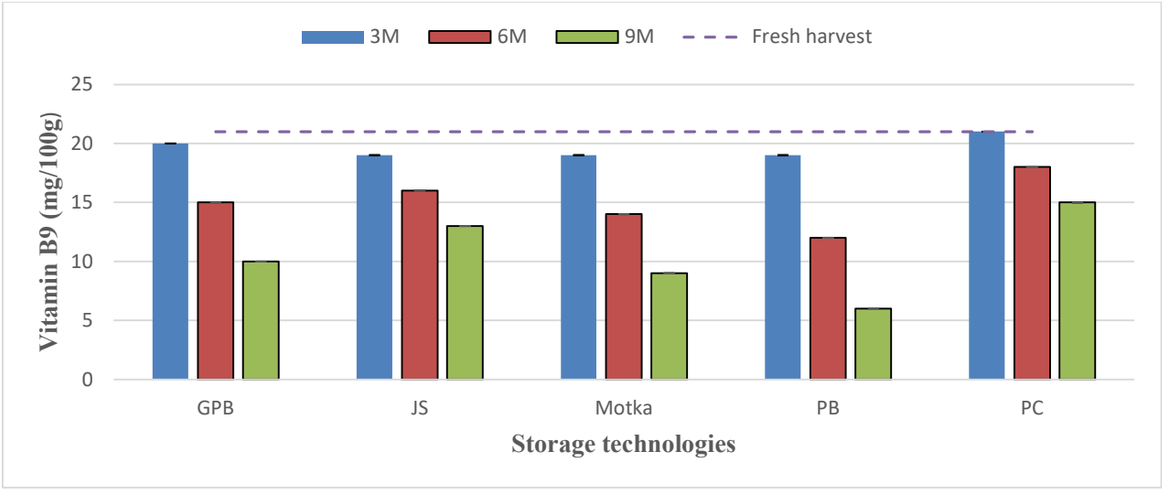

Fig. 7. Vitamins (B-complex) of rice at different storage time and technologies
GPB = Grain Pro Bag, JS = Jute Sacks, PB = Plastic Bag, PC = Plastic Container & M = Month

Conclusion

It may be concluded that during different storage times of BRRI dhan84 variety in Plastic Container showed pronounced effects on various quality traits. In seed quality, Germination percentage and seedling vigor index were decreased with increased storage times at different storage container. In grain quality, milling outturn (%), head rice recovery (%), cooking time and moisture content were increased with increased storage times at different storage container. On the other hand, content of amylose (%) and protein (%), and alkali spreading value were decreased with increased storage times at different storage container. Vitamins (B-complex) contains were significantly differences with different storage container at different storage times. Vitamins were decreased with increased storage times at different storage technologies.

3.1.1.5. Expt. 5: Artificial plough pan development for facilitating modern farm machineries

An experiment was taken aiming to find out possible way(s) to increase soil resistance capacity and to develop artificial plough pan in BRRI farm.

Materials and Methods

The experiment was conducted in plot number 18 of block C in west byde of BRRI farm during Boro, 2023 using a strip plot design with 3 replications. Two treatments were applied in this experiment, namely (i) method of soil management treatments and (ii) water management treatments (Table 9). BRRI dhan74 was used in the experiment. After Boro harvest in the previous year, a trench of 12 inch were dug and a 3 inches' fine sand layer were placed at 8 inches (20 cm) below from soil surface in the plots of treatments M3. In T. Amand season, the land was taken under normal T. Aman rice (BRRI dhan87) cultivation so that the land and soil become settled down perfectly. After T. Aman crop, when the soil moisture reached to suitable range (15-20%) then compactions were carried out using suitable tractor wheel. The compactions were done twice in 11 days' interval using wheel-to-wheel tractor passages using a pressure of (approximately) 80 kPa (in treatment plots only). In control plots, no compactions were done. After final compaction, the land was kept undisturbed for two weeks. After two weeks, the land was irrigated and prepared by tilling with power tiller and finally by using hydro tiller. Finally laddering was done and the treated plots were transplanted by the seedlings of BRRI dhan74. Soil resistance couldn't be measured due to having no availability of the soil penetrometer. Yield and yield components were collected and analyzed using standard protocol.

Table 9. Treatment combinations were as follows

Treatment A (Methods)	Treatment B (Water management)
M1: Control (normal practice).	
M2: Compaction of soil by tractor[1] after harvesting.	W1: Continuous flooding
M3: Placing a 3 inches' fine sand layer at 8 inches (20cm) below soil surface and compaction.	W2: Alternate Wetting and Drying
M4: Compaction of soil by tractor[1] after T. Aman harvesting and fallow in Boro season.	

Results and Discussion

There were found no significant differences among the treatment combinations in the experiment (Table 19). Grain yield ranges between 5.86 to 6.56 t ha^{-1}. On an average, plots of creating 3 inches' fine sand layer in 8 inches below the soil surface and compaction after rice harvesting produced 6.25 t ha^{-1} whereas compaction of soil after rice harvest produced 6.22 t ha^{-1} and the control plot (conventional practice) produced 6.21 t ha^{-1} rice. Though, alternate wetting and drying (W2) produced 6.32 t ha^{-1} yield which is higher than the yield of continuous flood irrigated treatment plots (6.13 t ha^{-1}), but was statistically similar yielder. Sterility percentage were very low in all the treated plots. Generally, BRRI dhan74 shows low sterility compared to most of the other varieties which is also found in this study. Grain yield and yield contributing characters are shown in table 10. It was clearly found that compaction of the land either placing fine sand layer below soil surface or not, produced same paddy yield compared to the non-compacted (control) plots. It clearly indicated that compaction of soil does not have any negative influence on yield and yield contributing characters of the rice grown.

In the present study, we found that after compaction of soil, tillage operation using tiller was comparatively easier in the compacted plots (according to the tiller driver and scientific assistant). Tiller was stuck down into mud in one of the uncompacted (control) plot like previous years. Though we could not have opportunity to prove the soil resistance improvement, but tillage operation indicated that soil compactness might have created some benefits in smooth tillage operation in the treated plots.

Table 10. Yield and yield components as affected by different treatments of artificial plough pan development methods.

Treatme-nts	Plant height (cm)			Tiller per square meter			Thousand grain weight (g)			Grain per panicle (No.)			Sterility percentage			Grain yield (t ha^{-1})		
	W1	W2	Av	W1	W2	Av	W1	W2	Av	W1	W2	Av	W1	W2	Av	W1	W2	Av
M1	90	91	91	276	317	296	30.4	29.6	30.0	83	74	78	9	9	9	5.86	6.56	6.21
M2	88	92	90	299	301	300	29.3	28.9	29.1	79	82	80	12	11	11	6.29	6.21	6.25
M3	90	89	90	275	292	283	30.2	30.2	30.2	85	75	80	9	12	10	6.23	6.20	6.22
M4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Av	89	91		283	303		29.9	29.6		82	77		10	11		6.13	6.32	
CV (%)	2.8			11.4			3.0			8.7			17.3			5.7		
lsd	ns			ns			ns			ns			ns			ns		

[M1=Control; M2=Compaction of soil by tractor after harvesting; M3=Compaction after placing a 3-inch fine sand at 8 inches below soil surface; M4= Compaction of soil by tractor after harvesting and fallow in Boro season. W1= Continuous flooding W2=Alternate Wetting and Drying] ns= non – significant

Conclusion

Since no significant differences among the treatment combinations were observed in yield and yield attributes, therefore, it could be assumed that soil compaction and placing of sand layer below 8 cm of soil surface do not affect rice yield. When soil penetrometer is available, then it could be measured whether artificial plough pan developed or not.

3.1.1.6. Expt. 6: Determination of fertilizer management to control algae infestation in rice field

Algae infestation is one of the most common problems in BRRI farm, Gazipur. Especially, during two years back in Boro season, the problem was found in almost all the plots. Some plots were severely affected where transplanted seedling establishment was hampered greatly. Therefore, an experiment was taken to determine fertilizers' effect on algal growth in rice field and to identify suitable fertilizer management to control algae in rice field.

Materials and Methods

The experiment was conducted at plot number 25 (N) of block A in the west byde of BRRI. BRRI dhan28 was used in Boro, 2023 season following RCB Design with 3 replications. Treatments were: (i) Full dose basal fertilizer of DAP, MoP, Gypsum & Zinc (BRRI recommended); (ii) Full dose basal fertilizer of TSP, MoP, Gypsum & Zinc; (iii) Half dose basal fertilizer of DAP and Full dose MoP, Gypsum & Zinc; (iv) Half dose basal fertilizer of TSP and Full dose MoP, Gypsum & Zinc; and (v) Basal fertilizer of full dose TSP, MoP, Gypsum & Zinc, and 1/3rd Urea. For treatment (iii) and (iv), rest half dose DAP/TSP were applied during second urea top-dress. Algae infestation were found very low this year. Therefore, only the algae infested area coverage (% area occurrence) and severity score of the infestation (score between 1-9, based on the eye estimation of concentration of the algae occurrence) were recorded after 7 days later of first urea top dress. Yield and yield components were collected and analyzed using standard protocol.

Results and Discussion

No significant differences were found among the treatments for yield and yield components (Table 11). This year, algae infestation was comparatively low compared to last two years. Seedling after transplanting were not hampered due to no apparent algae infestation at early stage. After two weeks when the plots were top dressed by urea, at that time algae infestation were relatively higher. After one week of first urea top dress, the algae infestations were high and data of algae infestation were collected in collaboration of an agronomist. Since, the occurrence and severity of the infestation were low in most of the cases, therefore, we decided to wait until suitable concentration or infestation of algae take place to collect fresh weight and dry weight measurement of the algae. But with the growth of rice plants, the algae infestation reduced and other method of algae infestation measurement weren't possible to carry out.

In the present study, it was observed that the yield of DAP used plots (T1 and T3) and basal urea with TSP (T5) produced little higher yield (not significant) compared to TSP (without urea) treated plots. All other characters do not show this pattern at all. Other characters were very much similar for all the treatments. Since nitrogen were applied in the form of DAP or urea in these plots, therefore, we can conclude that basal nitrogen might have positive effect in yield. It was also found that algae infestation of these basal nitrogen included plots were little bit higher.

Though algae occurrences and severity (Fig 8.) varied among different treatments, but their occurrence and severity were not so much to influence the yield and yield contributing characters. Therefore, significant influences were not found among the treatments. In the next year experiment, artificial inoculation of algae will be done just after transplanting to get a clear result and findings.

Table 11. Yield and yield components as affected by different fertilizer management practices to control algal infestation in rice field.

Treatments	PH	TPSM	FGPP	TGW	SP	GY

T1	104	310	104	21.77	19.22	5.79
T2	102	320	100	21.99	16.80	5.48
T3	100	332	104	22.50	22.08	5.85
T4	100	342	92	21.46	19.28	5.57
T5	102	331	91	21.32	19.74	5.76
CV (%)	**3.6**	**8.0**	**8.3**	**4.4**	**21**	**5.7**
Lsd	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**

[T1=Full dose basal fertilizer of DAP, MoP, Gypsum & Zinc (BRRI recommended); T2=Full dose basal fertilizer of TSP, MoP, Gypsum & Zinc; T3=Half dose basal fertilizer of DAP and Full dose MoP, Gypsum & Zinc; T4=Half dose basal fertilizer of TSP and Full dose MoP, Gypsum & Zinc; and T5=Basal fertilizer of full dose TSP, MoP, Gypsum & Zinc, and 1/3rd Urea. PH=Plant height, TPSM=Tiller per square meter, FGPP=Filled grain per panicle, TGW=Thousand grain weight, SP=Sterility percentage and GY=Grain yield (t ha^{-1})]

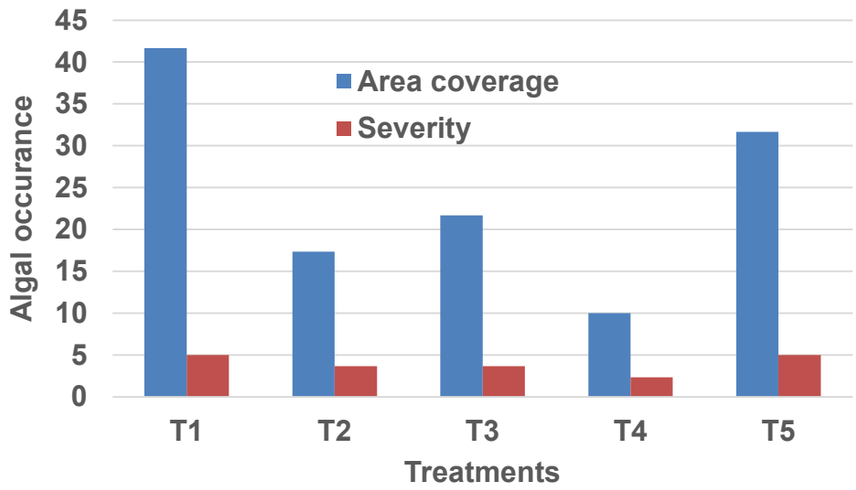

Figure 8. Algal occurrence (area coverage) and severity in different fertilizer management plots during Boro 2023.

[T1=Full dose basal fertilizer of DAP, MoP, Gypsum & Zinc (BRRI recommended); T2=Full dose basal fertilizer of TSP, MoP, Gypsum & Zinc; T3=Half dose basal fertilizer of DAP and Full dose MoP, Gypsum & Zinc; T4=Half dose basal fertilizer of TSP and Full dose MoP, Gypsum & Zinc; and T5=Basal fertilizer of full dose TSP, MoP, Gypsum & Zinc, and 1/3rd Urea.]

Conclusion

It seems that full dose basal of DAP or TSP with basal urea dose influences algae infestation. Since the severity of algae infestation were very low, therefore further research is needed using artificial inoculation of algae.

3.1.2. Project 2. Labor Management System

3.1.2.1 Expt. 7. Monitoring labor wage rate at different locations of Bangladesh

PI: MS Islam **CI:** S Begum and MR Manir

Materials and Methods

A survey was conducted throughout the year to find out the labourers' wage rate at different locations around BRRI HQ such as Joydebpur, Chowrasta, Salna, Board Bazar and Konabari, Tongi area and at different locations surrounding of BRRI Regional Stations.

Results and Discussion

It was observed that the average wage rate per day (8.0 hrs) was Tk. 573-648 (Table 12). The highest wage rate of labourers was in May (Tk. 700-800 per day) due to harvesting and post-harvest operations of Boro rice and transplanting of Aus rice. Another higher rate was during July-August (TK 650-750) due to harvesting and post-harvest operations of Aus rice and transplanting of Aman rice. The third higher wage rate was observed during December-January (Tk 600-700 per day) due to the peak period for harvesting and post-harvest operation of T. Aman rice and transplanting of Boro rice. (Table 12)

Laborer's wage rate differs according to the location of the work. The average labour wage rate with food varied between Tk 496-563. The lowest wage rate with food was found in Habiganj, Satkhira and Sirajganj areas (400-500 Tk per day). The highest wage rate with food was observed in Cumilla (650-750 Tk per day) followed by Bhanga and Barisal (650-700 Tk per day). Working hour also different based on location (Table 12). The working time (8 hrs day^{-1}) of labourers was more or less similar except Barisal, Cumilla and Satkhira. The average labour wage rate without food varied between Tk 629-738 at different locations surrounding of BRRI Regional Stations. The highest wage rate without food was found in Rajshahi (Tk 700-900) and the lowest (Tk 500-600) was in Sirajganj, Rangpur and Sonagazi (Table 13).

Table 12. Labourer's wage rate at different places around BRRI Gazipur during' 2022-23

Month	Wage rate (Tk)*	Remark
April	550-600	Normal period
May	700-800	Peak period. Harvesting and post-harvest operation of Boro rice and transplanting of Aus rice.
June	550-650	Normal period
July	650-750	Peak period. Harvesting and post-harvest operation of Aus rice and transplanting of Aman rice.
August	600-700	
September	520-580	Normal period
October	500-560	
November	550-600	
December	600-700	Peak period. Harvesting and post-harvest operation of Aman rice and transplanting of Boro rice.
January	600-650	
February	560-650	
March	500-540	Normal period
Average	573-648	

*Wage rate of each month is the average rate of different places such as Joydebpur, Chowrasta, salna, Board Bazar, Konabari area.

Table 13. Laborer's wage rate with food and without food at different locations of Bangladesh during 2022-23.

Location	Average wage rate (Tk) with food	Average wage rate (Tk) without food	Working time
Gazipur	500-600	700-750	6.0am - 3.0pm
Habiganj	400-450	800-850	7.0am - 2.0pm
Rangpur	450-500	500-600	8.0am - 4.0pm
Rajshahi	500-600	700-900	6.0am - 2.0pm
Barisal	650-700	750-800	8.0am - 5.0pm
Sonagazi	450-500	500-600	6.0am - 2.0pm
Cumilla	650-750	800-850	6.0 am - 4.0pm
Satkhira	400-450	500-600	7.0am - 12.0pm
Kushtia	450-500	550-750	6.0am - 2.0pm
Bhanga	650-700	700-850	6.0am - 2.0pm
Gopalganj	450-500	550-700	6.0am - 2.0pm
Sirajganj	400-500	500-600	6.0am - 2.0pm
Average	**496-563**	**629-738**	**-**

3.2. Project 3. Rice Seed Production

3.2.1. Expt. 8. Performance of different rice varieties in seed production plots during 2021-22

PI: MS Islam **CI:** MM Rahman, MR Manir and S Begum

In total 04, 11 and 12 varieties were cultivated in BRRI research field for the purpose of TLS production during Aus, T. Aman and Boro seasons, respectively in 2022-23. The varieties were harvested at 80-90% maturity and yields (t ha^{-1}) were adjusted to 14% moisture content. Yield of the varieties ranged from 3.50 t ha^{-1} to 5.23 t ha^{-1}, 2.54 t ha^{-1} to 6.14 t ha^{-1} and 4.87 t ha^{-1} to 8.60 t ha^{-1} in Aus, T. Aman and Boro varieties, respectively. Among the Aus varieties, BRRI dhan98 produced the highest yield (5.23 t ha^{-1}) (Table 14) where as BRRI dhan87 gave the highest yield (6.14 t ha^{-1}) in T. Aman followed by BRRI dhan95 (6.04 tha^{-1}) (Table 15) and BRRI dhan89 gave the highest yield (8.60 t ha^{-1}) in Boro season followed by BRRI dhan104 (7.58 t ha^{-1}) (Table 16).

Table 14. Yield of different BRRI varieties in TLS production plot of FMD during Aus 2022 season.

Variety	Plant Height (cm)	Tiller m^{-2} (no.)	Grain $panicle^{-1}$ (no.)	Sterility Percentage (%)	TGW (g)	Yield (t ha^{-1})
BRRI dhan48	121	297	74	32	23.93	4.16
BRRI dhan83	111	243	81	30	23.55	4.18
BRRI dhan98	104	298	89	25	23.26	5.23
BRRI dhan82	118	217	99	18	23.17	3.50

Table 15. Yield of different BRRI varieties in the TLS production plots under FMD during T. Aman 2022.

Variety	Tiller m^{-2} (no.)	Grain $panicle^{-1}$ (no.)	Sterility Percentage (%)	TGW (g)	Yield (t ha^{-1})
BR22	208	135	11	20.09	4.85
BR23	221	140	17	26.24	5.88
BRRI dhan34	208	183	19	18.36	2.54
BRRI dhan46	245	97	20	19.12	5.16
BRRI dhan71	233	141	15	17.65	3.89
BRRI dhan75	196	83	26	20.92	4.24
BRRI dhan79	208	116	21	24.21	5.15
BRRI dhan87	336	148	22	24.58	6.14
BRRI dhan93	123	152	11	20.39	4.84
BRRI dhan95	172	139	13	21.25	6.04
BRRI dhan98	241	115	25	24.52	4.90
Naijarshail	196	118	18	19.35	3.73

Table 16. Yield of different BRRI varieties in the TLS production plots under FMD during Boro 2023

Variety	Plant Height (cm)	Growth duration (days)	Tiller m^{-2} (no.)	Grain panicle^{-1} (no.)	Sterility Percentage (%)	TGW (g)	Yield (t ha^{-1})
BRRI dhan28	101	138	290	99	19	21.81	6.75
BRRI dhan29	96	164	277	121	14	22.51	6.73
BRRI dhan50	80	161	296	115	21	18.56	5.99
BRRI dhan67	105	148	310	89	17	20.63	6.47
BRRI dhan74	90	139	293	80	10	29.76	6.23
BRRI dhan81	98	141	267	124	12	22.80	7.01
BRRI dhan84	100	137	297	74	28	26.01	4.87
BRRI dhan88	88	147	283	124	11	21.52	6.93
BRRI dhan89	105	165	305	75	41	27.55	8.60
BRRI dhan92	103	165	316	131	19	24.98	6.90
BRRI dhan96	93	140	271	116	20	20.77	5.64
Bangabandhu dhan100	101	110	277	170	21	19.53	7.43
BRRI dhan101	105	156	251	170	15	26.29	7.02
BRRI dhan102	100	161	298	107	22	20.81	6.66
BRRI dhan104	105	139	375	210	20	19.08	7.58

3.2.2. Truthfully Labeled Seed (TLS) Production

Rice seed production is one of the important mandates of FMD. This division produced two types of seeds, such as, breeder seed and truthfully labeled seed. In different rice seasons, FMD produced about 16,868 kg TLS of which 3090 kg, 5700 kg and 8078 kg was in Aus, T. Aman and Boro seasons, respectively. In addition, 80 kg non-seed and 1507 kg mixed rice were produced during this period (Table 17). This division also purchased TLS 800 kg of BRRI dhan103 and 4400 kg of BRRI dhan102 seeds from the farmers during the reporting period.

Table 17. TLS production of different rice varieties during 2022-2023

Variety	Season			Total (kg)
	Aus	Aman	Boro	
BR22	-	700	-	700
BR23	-	550	-	550
BRRI dhan28			320	320
BRRI dhan29			405	405
BRRI dhan30		500		500
BRRI dhan34	-	370	-	370
BRRI dhan46	-	330	-	330
BRRI dhan48	430			430
BRRI dhan50			400	400
BRRI dhan52		300		300
BRRI dhan67			385	385
BRRI dhan70		70		70
BRRI dhan71	-	350	-	350
BRRI dhan74			280	280
BRRI dhan75	-	320	-	320
BRRI dhan79		330		330
BRRI dhan81			545	545
BRRI dhan82	170			170
BRRI dhan83	240			240
BRRI dhan84			332	332
BRRI dhan87	-	460	-	460

BRRI dhan88			675	675
BRRI dhan89			1600	1600
BRRI dhan92			1170	1170
BRRI dhan93		300		300
BRRI dhan95	-	240		240
BRRI dhan96	-		310	310
BRRI dhan98	2250			2250
Bangabandhu dhan100			280	280
BRRI dhan101			576	576
BRRI dhan102			590	590
BRRI dhan103		720		720
BRRI dhan104			210	210
Nizershail		160		160
Seed (Total)	**3090**	**5700**	**8078**	**16868**
Non seed		**-**	**80**	**80**
Mixed rice	**-**	**-**	**1507**	**1507**
Grand total	**3090**	**5700**	**9665**	**18455**

3.2.3. Breeder Seed Production

In total 10,787 kg breeder seed was produced under the supervision of FMD during T. Aman and Boro season of 2022-23. In total 4130 kg breeder seeds of BRRI dhan30 and BRRI dhan98 in T. Aman season 2022 were produced whereas 6657 kg breeder seeds of BRRI dhan92 and Bangabandhu dhan100 were produced during Boro 2022-23 seasons (Table 18).

Table 18. Breeder seed production of different varieties during 2022-2023

Variety	Season			Total (kg)
	Aus	T. Aman	Boro	
BRRI dhan30	-	314	-	**314**
BRRI dhan98	-	3816	-	**3816**
BRRI dhan92	-		3540	**3540**
Bangabandhu dhan100	-		3117	**3117**
Total	-	**4130**	**6657**	**10787**

3.2.4. Seed Distribution

For popularizing and dissemination of BRRI rice varieties, 13153 kg truthfully label seed was distributed by FMD during the reporting period. In total 3020, 4162 and 5900 kg seeds were distributed during Aus, T. Aman and Boro seasons, respectively (Table 19). These seeds were distributed to DAE, researchers, different research division and regional stations of BRRI, seed producers, different agricultural organizations and agencies, BRRI employees and also farmers.

Table 19. TLS distribution of different varieties during 2022-2023.

Variety	Season			Total (kg)
	Aus	T. Aman	Boro	
BR22	-	525	-	447

BR23	-	538	-	275
BRRI dhan28			570	570
BRRI dhan29			620	620
BRRI dhan34	-	268	-	65
BRRI dhan46	-	325	-	257
BRRI dhan48	410			430
BRRI dhan50			205	205
BRRI dhan52		300		247
BRRI dhan58			150	150
BRRI dhan67			250	250
BRRI dhan70		78		76
BRRI dhan71	-	301	-	301
BRRI dhan75	-	287	-	300
BRRI dhan81			405	405
BRRI dhan82	150			170
BRRI dhan83	230			240
BRRI dhan84			150	150
BRRI dhan87	-	2773	-	2773
BRRI dhan88			255	255
BRRI dhan89			1040	1040
BRRI dhan92			1015	1015
BRRI dhan95	-	221		221
BRRI dhan96	-		305	306
BRRI dhan98	2230			2250
Bangabandhu dhan100			935	935
Seed (Total)	**3020**	**4162**	**5900**	**13152**

3.3. Project 4: Support Services

PI: M S Islam **CI:** M M Rahman, M R Manir, M M Rashid and S Begum

3.3.1. Land and Labour Management

Including regional stations, BRRI had 682 labors of which 464 regular and 218 irregulars at the start of the reporting time (1st July, 2022). In BRRI HQ, total number of laborers was 436 of which 281 regular and 155 irregular labors (Table 20)

3.3.2. Soil Health Improvement

In order to improve soil health and productivity of BRRI farm, this division was also taken a series of activities such as incorporation of Dhaincha as green manuring crops and rice straw, application of cowdung, compost and green grasses etc. according to the requirement of different research and seed production plots.

3.3.3. Irrigation and Drainage Management

Irrigation and drainage management is one of the important tasks carried out by FMD. Irrigation of the plots is done according to the land preparation and cultivation schedule and the needs of the plots in all the season (Aus, T. Aman and Boro). In addition, drainage system is to be managed in all the year round, especially when heavy rain and depression occurs.

Table 20. Land and labor strength of BRRI, in the date of 1st July 2022

Station	Total land (ha)	Cultivable land		Labour (no.)						
		Area (ha)	% of total land	Regular			Irregular			Total
				Male	Female	Total	Male	Female	Total	

HQ, Gazipur	76.83	44.45	57.86	232	49	281	124	31	155	436
Cumilla	24.68	16.03	64.95	10	1	11	12	1	13	24
Hobiganj	35.03	25.90	73.94	19	2	21	11	0	11	32
Sonagazi	45.77	34.00	74.28	31	2	33	4	0	4	37
Barisal	39.17	24.61	62.83	18	3	21	3	0	3	24
Rajshahi	13.24	8.92	67.37	21	3	24	6	0	6	30
Bhanga	11.46	9.55	83.33	12	2	14	5	0	5	19
Rangpur	6.07	4.05	66.72	28	1	29	4	1	5	34
Satkhira	20.00	8.10	40.50	18	1	19	2	0	2	21
Kushtia	4.05	3.0	74.07	9	0	9	1	0	1	10
Sirajganj	4.05	3.0	74.07	2	0	2	7	1	8	10
Gopalganj	4.05	3.0	74.07	-	-	-	5	0	5	5
Total	**284.40**	**184.61**	**62.22**	**400**	**64**	**464**	**184**	**34**	**218**	**682**

3.3.4. Labor Utilization

Total labour utilization in different divisions was 1,91,869-man days of which 57.38 %, 39.79 % and 2.83 % were utilized for research, support service and holidays, respectively in BRRI HQ (Table 21). Among the research divisions, Plant Breeding division utilized the highest laborers (15874-man days; 8.44%) followed by FMPHT division (7948-man days; 4.23%) and GRS division (6708-man days; 3.57%) for research purposes.

Table 21. Division/Section wise labor utilization during 2022-23

Sl. no	Division	Number of labor days utilized	
		Total	Percentage (%)
(A) Research			
1.	Plant Breeding	15874	8.44
2.	Hybrid rice	6570	3.49
3	Biotechnology	5277	2.81
4.	Genetic Resources and Seed	6708	3.57
5.	Entomology	4950	2.63
6.	Plant Pathology	4156	2.21
7.	Agronomy	4094	2.18
8.	Plant Physiology	5377	2.86
9.	Soil Science	6451	3.43
10	Rice Farming System	3794	2.02
11.	Grain Quality and Nutrition	2485	1.32
12.	Adaptive Research	3984	2.11
13.	Training	1600	0.85
14.	Agricultural Economics	1172	0.62
15.	Farm Machinery and Post-Harvest Technology	7948	4.23
16.	Workshop Machinery & Maintenance	4136	2.20
17.	Irrigation and Water Management	2713	1.44
18.	Agricultural Statistics	2624	1.40
19.	Farm Management a) Research	4512	2.40
	b) Seed production	13506	7.17
Total		**107931**	**57.38**
(B) Support Services			
19.	Farm Management		
	a) Common Services	2581	1.37
	b) Garden Mgt.	11983	6.37
20.	Building & Construction		
	a) Caretaking	10679	5.68
	b) Electrical	8414	4.47

21.	Publication and Public Relation	765	0.41
22.	Administration & Support Service		
	a) Administration	10692	5.69
	b) Audit	411	0.21
	c)Transport	9431	5.02
	d) Store	1822	0.97
	e) Hostel/Dormitory	5703	3.03
	f) Security	8142	4.33
	g) Planning and Evaluation	445	0.24
	h) Medical	923	0.49
23.	Accounts & Finance	2833	1.51
Total		**74824**	**39.79**
(C) Leaves			
24.	a) Casual leave	2576	1.37
	b) Govt. Holidays	2739	1.46
Total		**5315**	**2.83**
Grand Total (A+B+C)		**191869**	**100**

3.3.5. Labor Wages

It was found that total labour wages were 10,98,78,631/- of which 6,28,38,093/-, 4,36,04,938/- and 3,189,000/- were paid to the labourers for research work, support service works, leaves and holidays, respectively (Table 22).

Table 22. Division /Section wise labour wages during 2022- 23

Sl.no	Division/Section	Wages Incurred (Tk.)
(A) Research		
1.	Plant Breeding	9202943
2.	Hybrid rice	3826156
3.	Biotechnology	3080660
4.	Genetic Resource and Seed	3913862
5.	Entomology	2883321
6.	Plant Pathology	2422867
7.	Agronomy	2389977
8.	Plant Physiology	3135475
9.	Soil Science	3760377
10.	Rice Farming System	2214566
11.	Grain Quality and Nutrition	1447142
12.	Adaptive Research	2313235
13.	Training	931472
14.	Agricultural Economics	703200
15.	Farm Machinery & Post Harvest Technology	4637433
16.	Workshop Machinery & Maintenance	2411904
17.	Irrigation and Water Management	1633800
18.	Agricultural Statistics	1534848
19.	Farm Management a) Research	2631268
	b) Seed production	7763587
Total		**6,28,38,093**
B) Support Services		
19.	Farm Management a) Common Services	1501958
	b) Garden Mgt.	6983558
20.	Building & Construction a) Caretaking	6177097
	b) Electrical	4900550
21.	Publication and Public Relation	459000

22.	Administration & Support Service	
	a) Administration	6238060
	b) Transport	5492562
	c) Audit	246600
	d) General Store	1077100
	e) Hostel	3321749
	f) Security	4747065
	g) Planning & Evaluation	267000
	h) Medical	537196
23.	Accounts & Finance	1655443
Total		**4,36,04,938**
(C) Leaves		
24.	a) Casual leave	1545600
	b) Govt. Holidays	1643400
Total		**31,89,000**
Grand Total (A+B+C)		**109878631**

* This expenditure excluded the temporary laborers engaged by the respective divisions/sections.

3.3.6. Retirement Benefits

Including BRRI regional stations of BRRI in total 75,69,398 Tk was given to 15 laborers as financial benefits for retirement during the fiscal year 2022-23. (Table 23)

Table 23. Retirement benefits of laborers during 2022-23

Working Place	**Male**	**Female**	**Amount** (Tk.)
BRRI HQ	5	-	29,88,000
BRRI R/S	10	-	45,81,398
Total	**15**	**-**	**75,69,398**

3.3.7. Medical Financial Benefits

In total 24,923Tk was given to 11 laborers as medical financial benefits for injury during the reporting year 2022-23. (Table 24)

Table 24. Medical financial benefits of laborers in working time injury during 2022-23

Types of Laborers	**Medical benefits**	
	Laborer number	**Amount (Tk.)**
Regular	6	16,864
Irregular	5	8,059
Total	**11**	**24,923**

3.3.8. Land Utilization

BRRI has 284.40 ha of land of which 184.61 ha is cultivable. In total 81.85 ha of land were utilized by different research divisions in different season at BRRI HQ of which 6.07 ha in Aus, 37. 65 ha in T. Aman and 38.02 ha in Boro season. Among the research divisions, Plant Breeding division utilized the highest amount of land (25.41 ha) followed by GRS division (13.25 ha) and Hybrid Rice division (7.84 ha). (Table 25)

Table 25. Land utilization by different division/sections during 2022-23

Sl	**Divisions /Section**	**Land area used (ha)**			
		Aus	**T. Aman**	**Boro**	**Total**
1.	Plant Breeding	2.83	11.29	11.29	25.41

2.	Genetic Resources and Seed	0.11	6.57	6.57	13.25
3.	Entomology	1.27	1.15	1.39	3.81
4.	Soil Science	0.47	2.17	2.17	4.81
5.	Biotechnology	0.40	1.28	1.28	2.96
6.	Plant Physiology	-	0.61	0.61	1.22
7.	Hybrid Rice	-	3.86	3.98	7.84
8.	Agronomy	0.20	1.51	1.51	3.22
9.	Plant Pathology	-	1.04	1.02	2.06
10.	Rice Farming Systems	-	1.44	1.46	2.90
11.	Adaptive Research	-	1.34	1.34	2.68
12.	Grain Quality and Nutrition	0.12	0.66	0.66	1.44
13.	Farm Machinery and Post-harvest Technology	-	0.53	0.53	1.06
14.	Irrigation and Water Management	-	0.71	0.71	1.42
15.	Agricultural Statistics	-	0.51	0.51	1.02
16.	Farm Management: a) Research	-	0.53	0.57	1.10
	b) Seed production	0.78	2.45	2.42	5.65
Grand total		**6.18**	**37.65**	**38.02**	**81.85**

3.3.9. Garden Management

This division manages the BRRI flower garden of the office campus. The office area and different gate area and others beautification areas were managed and maintain the aesthetic view of the campus and created visible flower garden during summer and winter season.

3.3.10. Beautification of BRRI

Beautification of BRRI premises and playground for observing of different national, international and organizational events were carried out by different means such as embellishing, cleaning, arranging flower pots etc. by Farm Management division.

3.3.11. Tree Plantation and Management

Tree plantation and management of different fruits and other trees in the BRRI farm are another management work of FMD. Pruning, training and other management of the trees are done as regular basis.

3.3.12. Graveyard Management

BRRI has one graveyard which is situated in the deep-water research area. Farm Management division conduct all activities related to graveyard management. A graveyard management committee headed by Head of FMD is working in this regard.

3.3.13. Mosquito Control Activities

FMD tried to control mosquito infestation by spraying insecticides/mosquito oil in BRRI residential and office area during the reporting period. For effective control of mosquitoes, total community approach is to be considered along with this activity.

3.3.14. Play Ground Management

BRRI has two playgrounds which are regularly maintained by FMD. Specially, maintaining of grass cover to the playground in suitable playing condition by cutting the grass regularly is a hard job.

3.3.15. Sale Proceeds

This division earned in total of 69,555 Tk. by selling different farm products such as rice straw, dead tree and branches, green coconut, betel nut, jackfruit etc. and services (trolley use). The money was deposited to Accounts and Finance section for increasing government revenue (Table 26).

Table 26. Sale proceeds of FMD during 2022-23

SL	Items	Amount (Tk)
1	Dead tree and branches	7100
2	Green Coconut	435
3	Straw	56,500
4	Betel nut	3000
5	Jackfruit	1200
6	Trolley fare	1320
	Total	**69,555**