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Performance evaluation of climate resilient rice varieties in Lakhimpur district of Assam

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Abstract

Flood is the major problem of Assam which mainly affect the rice during kharif season every year. It is observed that in recent years sometimes along with flash flood, drought like situation also arises and affected huge area of rice due to aberrant climatic condition. Therefore, an On Farm Trial was conducted by Krishi Vigyan Kendra, Lakhimpur during kharif, 2022 to evaluate the yield performance of two newly developed climate resilient rice varieties viz., CR Dhan 801 and CR Dhan 802 having both submergence and drought tolerance ability against the recently popular recommended submergence tolerant rice variety Ranjit sub 1 in three selected villages of Lakhimpur district of Assam. The results showed that both the tested varieties viz., CR Dhan 801 and CR Dhan 802 performed more or less similar but slightly higher than the submergence tolerant rice variety Ranjit sub 1 in respect of yield, yield attributes and economic point of view. Therefore, it can be said that along with rice variety Ranjit sub 1, the climate resilient rice varieties viz., CR Dhan 801 and CR Dhan 802 may also be cultivated in Lakhimpur district of Assam under both flood and drought like situation. But prolong dry spell during the cropping period may affect the yield of crop and in that case both the climate resilient rice varieties CR Dhan 801 and CR Dhan 802 may show the better yield performance than the existing popular rice variety Ranjit sub 1.

Keywords: Climate resilient rice variety, flood, drought, economics, on farm trial, growth, yield

Introduction

Rice plays a critical role in the food security and economic growth of India, with the largest area (44.5 m ha) of the world and second highest production after China. It is the major food crops of Assam occupying an area of 23.08 lakh ha with a total production of 60.04 lakh tones (2022-23). Among different types of rice (*Ahu*, *Sali*, *Boro* and *Bao*) grown in Assam, winter (*Sali*) rice is considered as most important crop occupies an area of 18.51 lakh ha with a productivity of 26.35 q/ha (2022-23) (Anonymous, 2023) ^[1]. The occurrence of flood and followed by drought like situation across the state of Assam causing severe losses in production was observed during recent years. In Assam recent data shows that almost 9.3 lakh ha area was affected by flood, of which half of the area is chronically flood prone (Anonymous, 2019) ^[2]. Due to heavy and continuous rainfall in the monsoon, flood occurs from the month of June to September which is the peak time for cultivation of winter rice in Assam (Anonymous, 2022) ^[3]. Flood occurs at different growth stages of crop for different duration and variable depth of standing water. Lakhimpur is one of the district of Assam which is affected by severe flood in most of the times and also facing sometimes drought like situation due to aberrant climatic condition. Traditional long duration winter rice varieties having very low productivity are normally grown in the district and only 62,465 ha area is occupied by high yielding varieties of winter rice. These traditional long duration rice varieties are not having submergence and drought tolerant ability. Hence an On Farm Trial was conducted to evaluate climate resilient rice varieties (CR Dhan 801 and CR Dhan 802) having both submergence and drought tolerance ability against the submergence tolerant rice variety Ranjit sub 1 during *kharif* season of 2022 at farmers' field of Lakhimpur district of Assam.

Materials and Methods

The On Farm Trials was conducted at different locations of the district covering three numbers of farmers' during *kharij*, 2022 in three different villages *viz.* Dignukhuri, Pukhurioria and Orangbasti of Lakhimpur district of Assam. Flash flood affected plots of different villages were selected and all the information related to flood and drought as well as productive performance of existing traditional varieties grown in the villages were collected from the participating farmers. The technological options (TO) consisted of two climate resilient varieties of winter rice *viz.*, CR Dhan 801 and CR Dhan 802 and one submergence tolerant winter rice variety Ranjit sub 1 (check) were tested in the farmer's field (Table-1). The climate resilient varieties CR Dhan 801 and CR Dhan 802 were developed by ICAR-National Rice Research Institute (NRI), Cuttack and notified for release in the year 2019 and the check variety Ranjit sub 1 was developed and recommended by Assam Agricultural University, Jorhat, Assam and released during the year 2018 (Thakuria *et al.*, 2023)⁴. All the varieties were sown on 23rd June, 2022 in the nursery bed in all the locations. The crop was transplanted during 20th to 22nd July, 2022 with the seedling age of 28-30 days maintaining a spacing of 20 cm x 15 cm. After transplanting, the experimental plots were affected by flood for nine days *w.e.f.* 5th to 13th Oct, 2022. During the crop growth period drought like situation were also observed. Rainless period for three times, first during 14th - 20th Aug, 2022 (7days), second during 24th - 28th Aug, 2022 (5 days) and third during 7th -16th Sep, 2022 (10 days) were also observed. The recommended fertilizer dose of @ 60-20-40 kg N, P₂O₅ and K₂O/ha was applied as half of N and whole dose of P₂O₅ and K₂O at the time of final puddling. The remaining part of N was applied half at tillering stage *i.e.*, 20-30 days after transplanting and other half at panicle initiation stage. Different observations *viz.*, Plant height, days to 50% flowering, days to maturity, numbers of effective tillers per plant, number of grains per panicle, yield, Gross return, Net return and Benefit Cost ratio (B: C) were recorded.

Results and Discussion

The recorded data shown that among all the three rice varieties,

CR Dhan 801 and CR Dhan 802 attained almost similar plant height with the maturity duration of 141-142 days (Table-3). On the other hand, the check variety Ranjit Sub 1 attained slightly more plant height (130.2 cm) and matured in 151 days. Both the variety CR Dhan 801 and CR Dhan 802 had more numbers of effective tiller/ hill (14.8 and 14.7) than the check variety Ranjit Sub 1 (13.6). Different varieties having different tiller number might be due to the variety's unique genetic potentiality (Dangc *et al.*, 2021)⁵. The varieties CR Dhan 801 and CR Dhan 802 recorded almost same yield of 50.2 q/ha and 50.1 q/ha respectively against the check yield of 49.6 q/ha (Ranjit Sub 1). The various economic parameter such as cost of cultivation, gross return, net return, benefit cost ratio was calculated based on the input and output prices of commodities prevailing during the year of experiment (Table-3). The economic indicator clearly revealed that net return from the variety CR Dhan 801 and CR Dhan 802 were almost similar (Rs. 21,664/ha and Rs. 21,534/ha) and higher than the check variety Ranjit Sub 1 (Rs. 20,884/ha). The benefit cost ratio of 1.50, 1.49 and 1.48 were recorded for the variety CR Dhan 801, CR Dhan 802 and Ranjit Sub 1 respectively which was slightly higher in case of CR Dhan 801 than other two varieties. This is due to more yield obtained under improved variety as compared to check variety.

Conclusion

The climate resilient winter rice varieties *viz.*, CR Dhan 801, CR Dhan 802 with more numbers of effective tillers observed even in case of submergence and drought like situation recorded slightly higher yield than the check variety Ranjit Sub 1. Therefore, it can be concluded that along with submergence tolerant rice variety Ranjit Sub 1, the climate resilient rice varieties CR Dhan 801 and CR Dhan 802 may also be cultivated considering the yield and economic benefits for the farmers of Lakhimpur district of Assam. Moreover, prolong dry spell during the cropping period may affect the yield and yield attributes of crop and in that case both the climate resilient rice varieties CR Dhan 801 and CR Dhan 802 may show the better yield performance than the existing recently popular submergence tolerant rice variety Ranjit sub 1.

Table 1: Technological options of the experiment

| Technology Option | Variety | Source of technology and year of release |
|-------------------|--------------|--|
| TO-1 | CR Dhan 801 | ICAR-National Rice Research Institute (NRI), Cuttack and notified for release in the year 2019 |
| TO-2 | CR Dhan 802 | |
| TO-3 | Ranjit Sub 1 | Assam Agricultural University, Jorhat, Assam and released in the year 2018. |

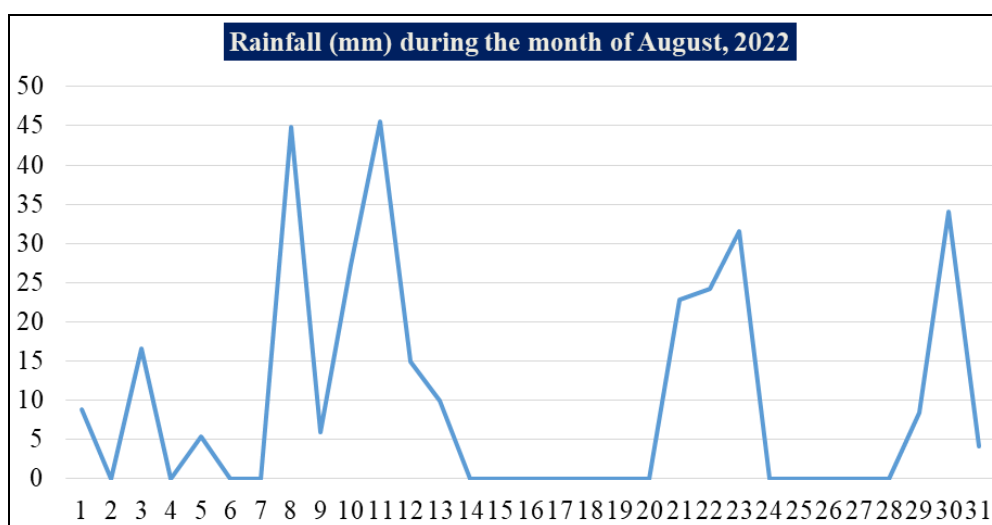
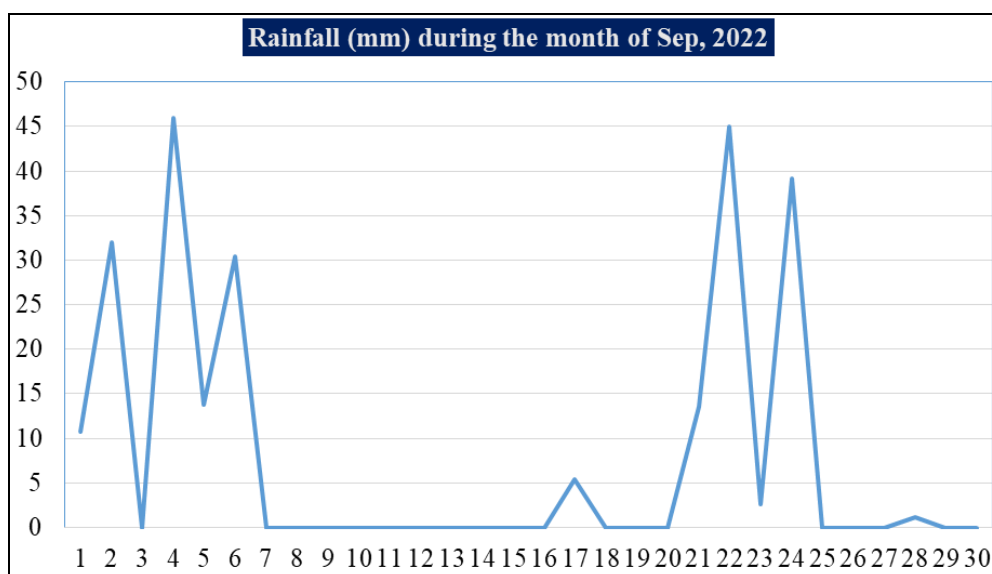
Table 2: Characteristics of rice varieties selected for the experiment

| Name of the Variety | Characters of the variety |
|---------------------|--|
| CR Dhan 801 | Duration: 140 days Year of notification: 2019 Suitable land type: Lowland Grain type: Short bold Submergence tolerant: 2 weeks Potential Yield Normal condition: 63 q/ha Submergence: 40 q/ha Drought: 29 q/ha |
| CR Dhan 802 | Duration: 142 days Year of notification: 2019 Suitable land type: Lowland Grain type: Short bold Submergence tolerant: 2 weeks Potential Yield: Normal condition: 65 q/ha |

| | |
|--------------|---|
| | Submergence: 43 q/ha Drought: 23 q/ha |
| Ranjit Sub 1 | Duration: 150-155 days Year of notification: 2018 Suitable land type: Lowland Grain type: Medium slender Plant height: 115 cm Yield: 5.0-5.5 t/ha Submergence tolerant: 2 weeks |

Table 3: Performance of climate resilient rice varieties at farmers' field

| Parameter | CR Dhan 801 | CR Dhan 802 | Ranjit Sub 1 |
|-----------------------------|-------------|-------------|--------------|
| Date of sowing | 23.06.22 | 23.06.22 | 23.06.22 |
| Date of harvesting | 11.11.22 | 12.11.22 | 21.11.22 |
| Duration (days) | 141 | 142 | 151 |
| Days to 50% flowering | 111 | 112 | 120 |
| Effective tiller/hill | 14.8 | 14.7 | 13.6 |
| Plant height (cm) | 115.1 | 115.1 | 130.2 |
| Grain/panicle | 218.5 | 216.7 | 217.3 |
| Yield (q/ha) | 50.2 | 50.1 | 49.6 |
| Cost of cultivation (Rs/ha) | 43596 | 43596 | 43596 |
| Gross return (Rs/ha) | 65260 | 65130 | 64480 |
| Net return (Rs/ha) | 21664 | 21534 | 20884 |
| B: C ratio | 1.50 | 1.49 | 1.48 |

**Fig 1:** Rainfall received during Aug, 2022**Fig 2:** Rainfall received during Sep, 2022

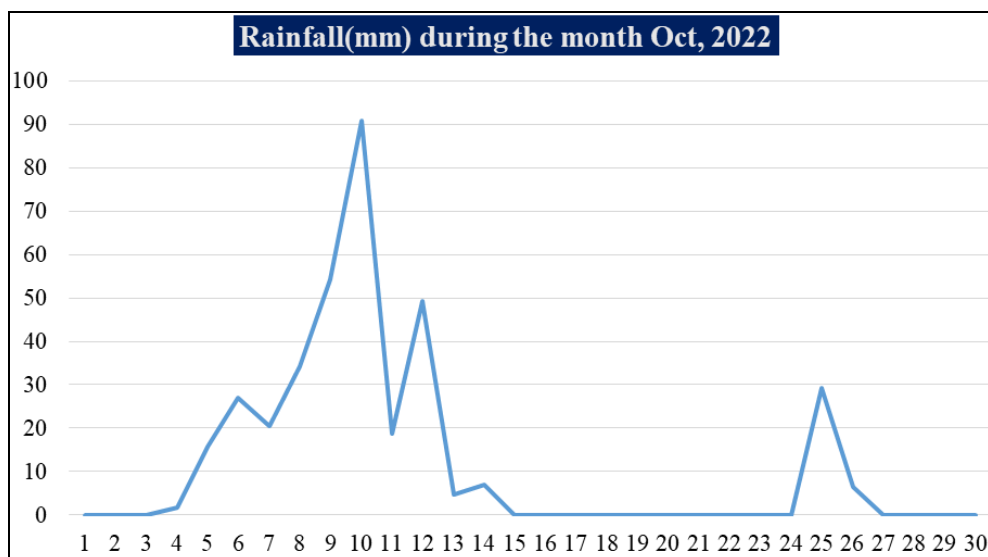


Fig 3: Rainfall received during Oct, 2022

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