

Original Research Article

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Yield Performance and Popularization of Stress Tolerant Rice Variety (Ranjit Sub-1) in Lakhimpur District of Assam, India

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ABSTRACT

Lakhimpur is a district of Assam which is most frequently affected by flood due to its topography. During periods of heavy rainfall in this region, sali (winter) rice is mostly affected and farmers suffer a great loss in income. Thus, considering the loss of the farmers, Krishi Vigyan Kendra Lakhimpur has introduced stress tolerant rice variety "Ranjit sub-1" developed by Assam Agricultural University in few pockets of the district. The variety was demonstrated during 2018-19 and 2019-20 using improved cultivation practices. Different data were collected during the demonstrations and comparison was made with farmer's variety. From the study it has been found that Ranjit sub-1 can survive in submerged condition upto 15 days from date of transplanting and even showed better yielding capacity in comparison to farmer's variety. Technology gap, extension gap and technology index was also calculated. Also, economic analysis was done where it has been found that net return of Rs. 24460 and Rs. 24600 was obtained for Ranjit sub-1 against Rs. 9700 and Rs. 10698 for farmer's variety during 2018-19 and 2019-20 respectively. Moreover, benefit cost ratio was found to be 1.58 and 1.54 of Ranjit sub-1 as against 1.31 and 1.35 for farmer's variety during 2018-19 and 2019-20 respectively. A significant impact of the technology was found among the farmers chosen and as such the variety proved as best suited under climate resilient agriculture.

Keywords

Flood, Stress tolerant rice variety, Submergence, Ranjit sub-1

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Introduction

Rice is the staple food for more than half of the world's population and cultivation of rice is the main occupation of those engaged in agriculture. In Assam rice occupies about two-third of the total cropped area in the state. The total area under rice in Assam is around 50 lakh hectares with total production of 52.0 lakh tonnes and average productivity of 2.1 t/ha. Lakhimpur is a district located in the north eastern part of Assam and agro

climatically lies in north bank plain zone of river Brahmaputra. It lies between 26°48' and 27°53' Northern latitude and 93°42' and 94°20' East longitude. It is located at 101 meter above mean sea level. According to data published by Directorate of Economics and Statistics, Govt. of Assam in 2017-18, the area under winter (sali) rice in the district is 70272 ha and average productivity is 3276 kg/ha. The district experiences abundant rainfall throughout the year, however from April/May-August /September occurrence of

heavy rainfall can be seen. The average rainfall in this region is 2949 mm. Lakhimpur is called as district of rivers as there are numbers of turbulent rivers and tributaries spreading all over the district. Due to this reason, during seasons of heavy rainfall the nearby places are adversely affected. It may be noted that sali season mainly coincides with the time of heavy rainfall in the district, *i.e.* May/June-July/August due to which rice crop suffers badly and there occurs great reduction in yield.

Materials and Methods

Since Lakhimpur district experiences heavy rainfall particularly in the time of crop establishment, the farmers in this region suffer adversely. Keeping this in view, an effort was made to introduce stress tolerant rice variety (STRV) Ranjit sub-1 developed by Assam Agricultural University, Jorhat in few flood affected pockets of Lakhimpur district. This variety is a long duration variety (150-155 days) and has the potency to survive in flood upto 15 days (2 weeks) from the date of sowing. The rice varieties traditionally used by farmers in the district could not withstand long flooding situation and after 5-6 days it eventually die leading to heavy yield loss. In some pockets of the district where flood water appeared for only 2-3 days comparison of yield and yield attributing characters of STRV was done with farmer's own variety. The demonstrations were conducted in 17.17 ha of area covering 94 numbers of farmers and 55.45 ha area covering 214 numbers of farmers with a view to analyse the potentiality and feasibility of the STRV during sali season of 2018 and 2019 respectively. All inputs including seeds, fertilizers, pesticides, biopesticides, weedicides etc. have been provided to the demonstrated plots whereas the farmer's variety plots were devoid of these improved practices. In the demonstration plots, line

transplanting was followed whereas in farmer's variety plot random transplanting was done. For the study, different data *viz.*, plant height (cm), tiller per hill, panicle length (cm), grains per panicle and grain yield (kg/ha) were collected from different demonstrations for two years. The average of data of the demonstrated varieties and farmer's variety has been studied and comparison was made between the two. Data on crop yield were recorded per five square meter and collected randomly from 3-4 places both for demonstrated and farmer's variety. The technology gap, extension gap and technology index (Samui *et al.*, 2000) were calculated using the formulae give below-

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - farmer's practice yield

Technology index (%) = Potential yield X 100

Results and Discussion

Lakhimpur district is encompassed by Siang and Papumpare District of Arunachal Pradesh in the North and Dhemaji District and in the East. The Subansiri and Ranganadi river controls the main drainage system in the district. The district experiences a warm humid climate with an average annual rainfall of 2949 mm with 125 rainy days (Sarmah *et al.*, 2013). The district receives south west monsoon rainfall from the month of April and continues up to September. The district also experiences substantial amount of pre-monsoon rainfall during the month of March to May. The high intensity rainfall leads to occurrence of flood in the district (Table 1). Since Lakhimpur district experiences heavy rainfall particularly in the time of crop establishment, the farmers in this region are adversely affected during kharif season.

From the study of two years of demonstrations, it has been found that the pockets chosen for demonstration of STRV in the district have been affected more or less by flood. It has been found out that the demonstrated variety Ranjit sub-1 can survive upto 2 weeks (15 days approx.) under flooded condition whereas the other varieties cultivated by farmers showed survival upto maximum 5-6 days from the day of stagnation by flood water. Also, study showed that the STRV can regain their health from the day of recession of flood water whereas the farmer's variety failed to do so after 5-6 days of recession of flood water in the field and eventually die which leads to a huge yield loss. From the study it was found that average plant height (cm), tiller per hill, panicle length (cm), grains per panicle and grains yield (kg/ha) of Ranjit sub-1 was 122 cm, 20, 24 cm, 236 and 5343 kg/ha respectively for the season 2018-19 whereas during sali season of 2019-20 it was 119 cm, 18, 21 cm, 221 and 5250 kg/ha respectively. During 2018-19, average plant height (cm), tiller per hill, panicle length (cm), grains per panicle and grains yield (kg/ha) of farmer's variety (*Var. Masuri*) were 90 cm, 9, 19 cm, 160 and 3460 kg/ha respectively whereas 87 cm, 8, 17 cm,

154 and 3340 kg/ha respectively for the year 2019-20. Thus, it is quite clear from the data presented in the Table 2 that Ranjit sub-1 showed better yield performance than farmer's variety in all attributes.

It is evident from the Table 3 that technology gap of 1157 kg/ha was obtained during 2018-19 whereas it was 1250 kg/ha during 2019-20. The technology gap observed may be due to difference in soil fertility and agricultural practices and can be overcome by adopting good management practices (Singh *et al.*, 2018). Also, from the table it can be seen that an extension gap of 1883 kg/ha was obtained during 2018-19 and 1910 kg/ha for the year 2019-20. This extension gap necessitates the need to bring awareness among the farmers for adoption of improved submergence tolerant rice varieties (Singh *et al.*, 2018).

Thus, it can be concluded that a technology index of 17.8% and 19.23% was found for the year 2018-19 and 2019-20 respectively. Technology index is a measure of feasibility of the improved technology in the field. Lower the value of technology index, more is the feasibility of the technology demonstrated (Chauhan, 2011).

Table.1 Rainfall characteristics during *kharif* in Lakhimpur district of Assam

Historical trends in rainfall	Normal	Year (s)				
	Rainfall (mm)	2015	2016	2017	2018	2019
Annual rainfall (mm)	2999.2	3222.5	3355.5	3782.2	2689.9	832.1
June	618	904.8	577.2	737.0	443.2	18.3
July	548	384.0	781.1	685.0	687.5	151.1
August	469	650.1	189.1	538.3	497.9	104.7
September	444	225.2	639.1	428.3	326.8	49.2
Total <i>Kharif</i> rainfall (mm)	2079	2191.1	2186.5	2388.6	1955.4	323.3
No. of rainy days (<i>Kharif</i>)	80	67	71	73	65	32

Table.2 Grain Yield Performances of Ranjit sub-1 And Farmer’s Variety (Masuri) during 2018-19 and 2019-20

Year	No. of Demonstrations	No. of farmers	Area (ha)	Demo yield (kg/ha)	Farmers’ practice (kg/ha)	Yield increase (%)
2018-19	116	94	17.17	5343	3460	54.42
2019-20	148	214	55.45	5250	3340	57.18

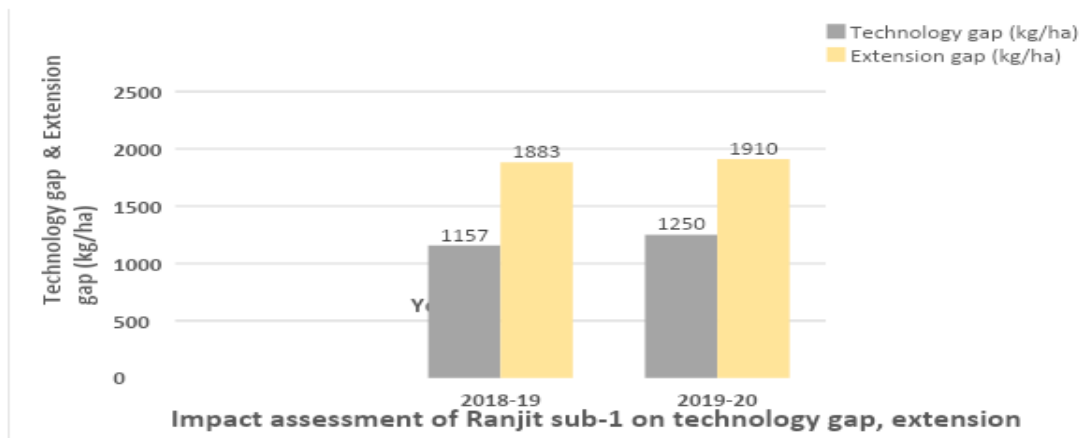
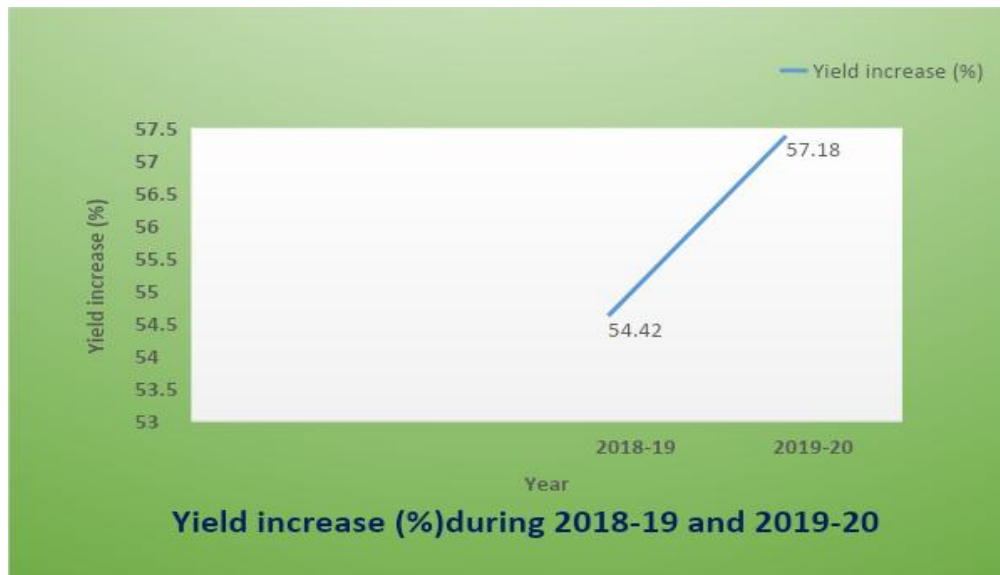
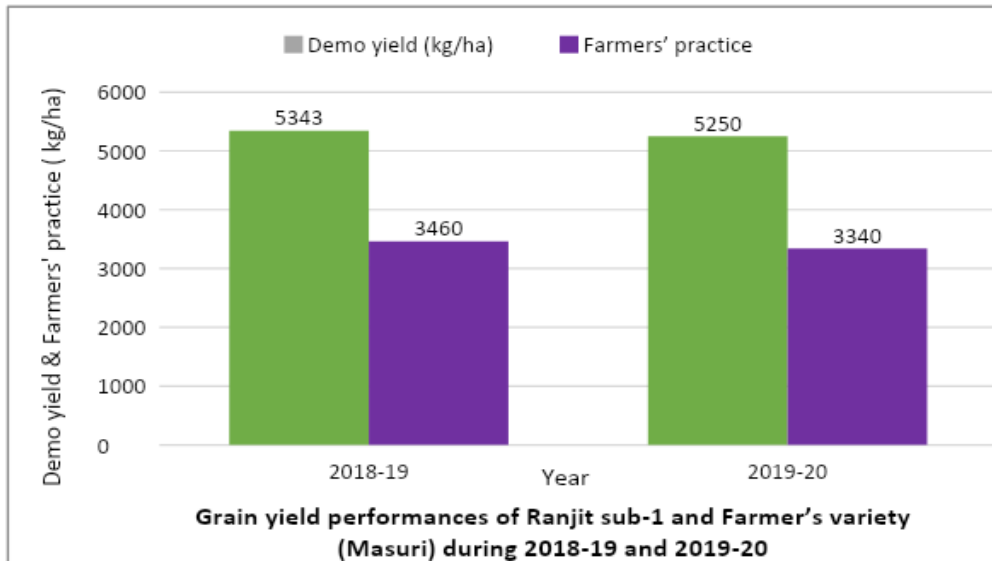
Table.3 Impact assessment of Ranjit sub-1 on technology gap, extension gap and technological index

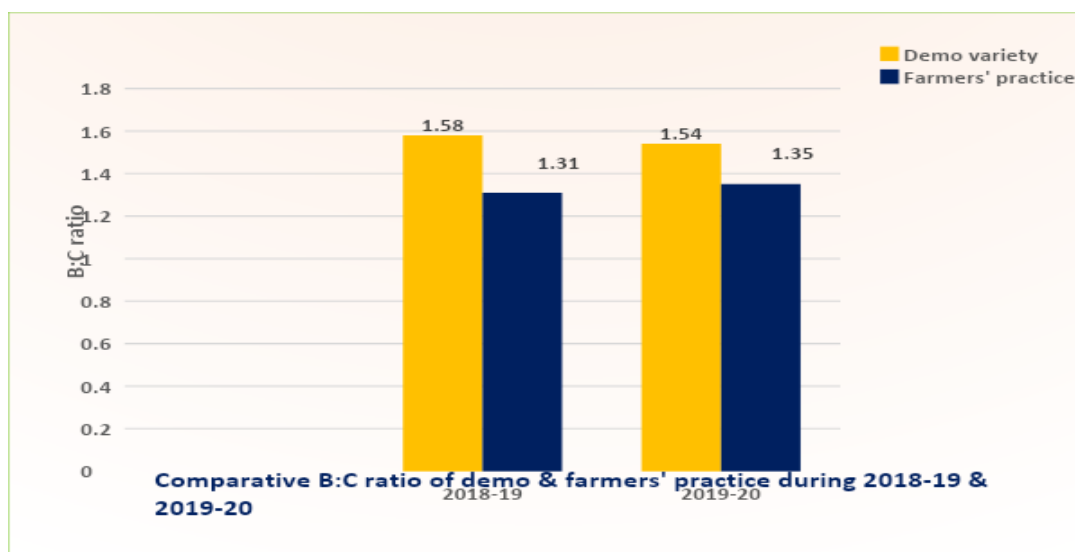
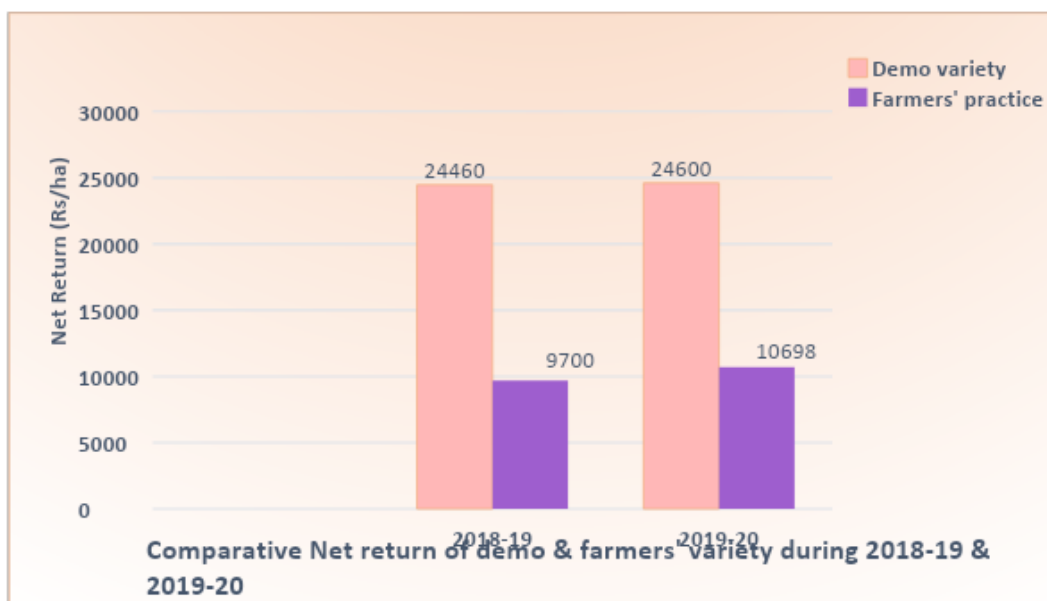
Year	Technology gap (kg/ha)	Extension gap (kg/ha)	Technology index (%)
2018-19	1157	1883	17.80
2019-20	1250	1910	19.23

Table.4 Economic analysis of ranjit sub-1 and farmer’s variety

Year	Demonstration				Farmers’ practice			
	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio
2018-19	45650	72110	24460	1.58	30550	40250	9700	1.31
2019-20	45650	70250	24600	1.54	30550	41248	10698	1.35







The findings presented in Table 4 shows that the benefit cost ratio (B: C) in demonstrated variety (1.58) was more than the farmers' variety (1.31) for the year 2018-19. During 2019-20, the B: C ratio (1.54) was also found to be more in case of demonstrated variety then the farmer's variety (1.35). Thus, it can be concluded that farmer's income was more in demonstrated technology than their own practice. Moreover, it has been surveyed that 80 more farmers have been influenced by the improved technology and showed good

response with respect to adoption of the STRV in their areas.

From the above study, it has been concluded that Ranjit sub-1 was able to withstand flood upto maximum 15 days whereas farmer's variety failed to do so even after 5-6 days and finally die. In conditions where flood water appeared for 2-3 days, yield for demonstrated variety and farmer's variety was analysed separately. Thus, it can be concluded that other than providing better yield, stress

tolerant rice variety like Ranjit sub-1 even helped the farmers to increase their income and thus acted as a boon for agriculture.

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