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Dissemination of salt tolerant paddy variety (GGV-05-01) through front line demonstration approach for sustainable paddy production in Koppal district

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Abstract
Frontline demonstrations (FLDs) on paddy were laid down at ten farmers fields to demonstrate production potential and economic benefits of improved production technologies comprising salt tolerant variety GGV-05-01 was compared with check variety (BPT-5204). ICAR-Krishi Vigyan Kendra, Koppal (Gangavathi), Karnataka state conducted during *kharif* season of 2019-20 and 2020-2021. The demonstrated plots were observed 18.73 per cent higher grain yield than check variety. The extension gap, technology gap and technology index were 13.55 q ha^{-1}, 4.08 q ha^{-1} and 4.53 per cent, respectively. Further, higher gross return (Rs. 1,32,885 ha^{-1}), higher net return (Rs. 84,073 ha^{-1}) and higher B:C (2.83) was observed in demonstrated plot as compared to check variety. Higher yield and returns due to reduced cost of cultivation, higher grain yield, and higher net returns in the demonstrated plot over the farmer's practice. Thus the productivity of paddy per unit area could be increased by adopting feasible and sustainable management practices with a suitable salt tolerance variety in TBP farmers of Koppal district.

Keywords: Salt tolerant paddy variety, front line demonstration approach, frontline demonstrations

Introduction
Rice is the most important food crop of India covering about one-fourth of the total cropped area and providing food to about half of the Indian population. This is the staple food of the people living in the eastern and the southern parts of the country. In India, rice occupies an area of 43.19 million hectare with a production of 110.15 million tonnes with an average productivity of 2550 kg per hectare (Anon, 2020) [1], which is almost half of the global average. In Karnataka state of India rice is grown over an area of 1.45 million hectare with an annual production of about 3.65 million tonnes with an average productivity of 2521 kg per hectare (Anon, 2020) [1].

Frontline demonstration is the new concept of field demonstration developed by the Indian Council of Agriculture Research (ICAR) with main objective to demonstrate newly released crop production and protection technologies and its management practices in the farmers' field under different agro-climatic regions of the country under different farming situations. While demonstrating the technologies in the farmers' field the scientists are required to study the factors contributing higher crop production, field constraints of production and thereby generate production data and feedback information (Meena and Singh, 2020) [3].

Salinity largely reduces the yield of rice in India. Salinity in arable land is mainly caused by the excessive use of irrigation water with improper drainage, poor quality irrigation water containing an excess level of salts, and flooding from seawater (Ismail *et al.*, 2007) [6].

The low productivity of paddy crop is due to poor adoption of improved technologies of paddy by the farmers. Hence, the Krishi Vigyan Kendra, Gangavathi (Koppal) has organized frontline demonstrations (FLD's) with improved salt tolerant variety along with recommended package of practices. The main purpose of these demonstrations was to enhance the production which in turn will increase the income levels of farmers and to transfer the latest production technologies to farmers in the district.

In Koppal district, more than 39,000 hectares of land is under paddy cultivation during *kharif* season. Major problem identified were non-availability of short duration varieties and lack of awareness of salt tolerant variety. Taking into account the above considerations, frontline demonstrations (FLDs) were carried out in a systematic manner on farmer's field to show the worth of a new salt tolerant variety and convincing farmers to adopt improved production

management practices of paddy for enhancing productivity.

Materials and Methods

ICAR-Krishi Vigyan Kendra Koppal (Gangavathi) was conducted frontline demonstrations in two consecutive years during *kharif* seasons 2019-20 and 2020-21 at farmer's fields in Gangavathi block. The demonstrated technology of paddy salt tolerant variety GGV-05-01 as compared with BPT-5204 (check variety). The agronomic practices were same followed in demo and farmer practices in FLD by KVK, Koppal during both the seasons in single locations with ten farmer's field.

The demonstration of paddy salt tolerant varieties in the field is shown as in Fig 1 and 2. The data was collected from both demonstrated plot as well as farmer practices, grain yield and extension gap, technological gap, technological index along with the benefit-cost ratio were calculated. The gap analysis were calculated using the formula as suggested by Samui *et al*. (2000) [5].

Extension gap (q ha^{-1}) = Demonstration yield (q ha^{-1}) –Yield of local check (q ha^{-1})

Technology gap (q ha^{-1}) = Potential yield (q ha^{-1}) – Demonstration yield (q ha^{-1})

$$\text{Technology index (\%)} = \frac{\text{Potential yield-Demonstration yield}}{\text{Potential yield}} \text{X } 100$$

Results and Discussion

Grain Yield

The results of front-line demonstration indicated that, grain yield of paddy from both the plots *i.e.*, demonstration and farmers' practices were compared and an average yield of demonstrated plots was 18.73 per cent higher than that of check variety (Table 1). The results were observed that grain yield under demonstrated plots were 84.87 and 86.97 q ha^{-1} with an average of 85.92 q ha^{-1} from the year 2019-20 and 2020-21. However, it was 72.28 and 72.45 q ha^{-1} with an average of 72.36 q ha^{-1} under check variety. The higher yield under demonstrated plots might be due to growth and yield performance of GGV-05-01 and which ultimately increased the yield. The similar results were reported by (Samant, 2017) [4].

Extension Gap

The higher extension gap (14.52 q ha^{-1}) was observed during 2020-21 and lowered (12.59 q ha^{-1}) was in 2019-20 (Table 1) which may be due to higher yield of rice variety in demonstration plots. More and more use of latest production technologies

with high yielding salt tolerant variety will subsequently change this alarming trend of galloping extension gap. The new improved technologies will eventually lead to the farmers to discontinue the old varieties and to adopt new variety. Similar results were reported by Sharma *et al.* (2011) [7].

Technology Gap and Index

The average technology gap was observed 4.08 q ha^{-1}. The demonstrations in both the year recorded technology gap of 5.13 q ha^{-1} during 2019 and 3.03 q ha^{-1} in 2020. Technology gap indicate the needs to create awareness among the farmers through various extension activities.

The Technology index was reduced from 5.70 to 3.36% during 2019 to 2020 (Table 1) which showed the higher feasibility of the demonstrated technology of salt tolerant GGV-05-01 in farmers field. This finding was in corroboration with the findings of Sujathamma *et al.* (2015) [8].

Economics of paddy cultivation

The demonstrated technology was higher gross return (Rs. 1,32885 ha^{-1}), higher net return (Rs. 84073 ha^{-1}) and higher benefit cost ratio (2.83) on overage of both the years as compared to check variety (Table 2). Higher net returns which might be due to higher grain yield. The similar results were also reported by (Daniela *et al*., 2017) [2].

Table 1: Grain yield and gap analysis of FLDs and farmer practices

Year	Yield (q/ha)		% Increase yield	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
	Demo plot	Farmers practices (Check variety)				
2019-20	84.87	72.28	17.43	12.59	5.13	5.70
2020-21	86.97	72.45	20.04	14.52	3.03	3.36
Average	85.92	72.36	18.73	13.55	4.08	4.53

Table 2: Economic analysis in demonstrated plots and farmer practice

Year	Gross returns (Rs./ha)		Net returns (Rs./ha)		B:C	
	Demo	FP	Demo	FP	Demo	FP
2019-20	120523	117086	83923	68936	3.29	2.43
2020-21	145248	128599	84223	57624	2.38	1.81
Average	132885	122842	84073	63280	2.83	2.12

Note: Demo-Demonstration plot, FP: Farmers practice

Fig 1-2: The demonstration of paddy varieties in the field

Conclusion

The results concluded that, demonstrated technology of improved salt tolerant variety of GGV-05-01 was found higher productivity and profitability as compared to check variety (BPT-5204) in TBP area in Koppal District.

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