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IMPACT OF FRONTLINE DEMONSTRATION OF ZINC SULPHATE APPLICATION ON PRODUCTIVITY AND PROFITABILITY OF PADDY IN SIVASAGAR DISTRICT OF ASSAM

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ABSTRACT

The high yielding variety Ranjit is the most popular rice variety in Sivasagar district as is the case for the entire state of Assam. However, its productivity in Sivasagar district is still quite below its potential, primarily because of non-adoption of the management practices recommended to the farmers. To demonstrate the effect of latest technologies on the productivity, the KVK, Sivasagar carried out altogether 24 Front Line Demonstrations (FLD) on the variety with application of Zinc sulphate @ 25kg/ha + NPK @ 60:20:40 kg/ha (recommended dose of fertilizer for paddy in Assam) covering an area of 12 ha of farmers field in five different villages namely Belimukhia, Hulalgaon, Phoolpanichiga, Namti, Bhekurichapori during the year 2018 – 2020. The results recorded in these demonstrations were compared with those under the farmers' local practice. The results revealed that application of Zinc sulphate along with RDF in paddy enhanced the average yield to 53.17 q/ha in FLD plots as compared to 32.17 q/ha recorded under farmer's own practice. The percent increase in yield recorded 33.88%. the extension gap was recorded 21 q/ha whereas technology gap and technology index were observed 6.83 q/ha and 11.37 % respectively. The results revealed that the FLD was effective in changing attitude, knowledge and adoption of improved technologies of paddy cultivation and ultimately in obtaining sustainable income from paddy cultivation in Sivasagar district of Assam.

Keywords: *FLD, paddy, extension gap, technology gap*

INTRODUCTION

Zinc deficiency is a worldwide problem in crop production and a serious problem, especially in rice croplands of Asia (Tisdale *et al.* 1997) and, next to nitrogen (N) and phosphorus (P) deficiency, Zn deficiency is now considered the most widespread nutrient disorder in lowland rice (Neue and Lantin, 1994; Quijano-Guerta *et al.*, 2002).Zn is known to be an essential component in a variety of plant enzymes and has been linked to RNA synthesis and stability.Zinc has multiple roles in the human body including the efficient functioning of cellular metabolic activities and stimulation of the immune system. Zinc is also present in nearly 300 enzymes in the human body (Anderson *et al.*, 2001; Barnett *et al.*, 2010). Zinc deficiency is recognized as one of the major nutrient disorders in humans and its effects are more profound in children (Boonchuay *et al.*, 2013).

Symptoms caused by Zn deficiency that usually appear 2 to 3 weeks after transplanting (WAT) rice seedlings (Wissuwa *et al.*, 2006), leaves develop brown blotches and streaks that may fuse to cover older leaves entirely, plants remain stunted and in severe cases may die, while those that recover will show substantial delay in maturity and reduction in yield (Yoshida and Tanaka, 1969; Van Breemen and Castro, 1980; Neue and Lantin, 1994). Rice plants deficient in Zn show limited tillering, stunted growth and may die. Crop stands are uneven and grain yields are severely reduced. Sudha and Stalin, 2015 reported, reduced rice grain yields with low zinc concentrations when there is low supply of zinc. Flood-irrigated rice is more prone to Zn deficiency (Rehman *et al.*, 2012) as submergence condition of rice cultivation influences electrochemical and biochemical reactions and alters pH, PCO2 as well as the concentration of certain ions.

Front Line Demonstration (FLD) is an important tool for transferring latest technology from experimental field to farmer's field. Considering the importance of Zinc in rice productivity and its deficiency in farmers field, FLDs were conducted in farmers' field to assess the effect of Zinc sulphate on productivity and profitability of rice in Sivasagar district of Assam.

OBJECTIVE

To study the impact of Front Line Demonstration on application of Zinc sulphate on production and productivity of paddy in Sivasagar district over traditional method of paddy cultivation

METHODOLOGY

Front Line Demonstrations were conducted in 24 different farmers field of Sivasagar district of Assam during the year 2018-19, 2019-20 and 2020-21. The district is situated in Assam between 94° 25' to 95° 22' E longitudes and 26° 45' to 27° 15' N latitudes. It is surrounded by the Disang river in the east and Jhanji in the west. Tirap district of Arunachal Pradesh is situated in the south, while the river Brahmaputra lies in the north of the district. The district has a climate which is characterized by a highly humid atmosphere, abundant rains and general coolness. The average annual rainfall in the district is 2504 mm. About 64% of the total rainfall is received during the monsoon season with July being the wettest month. The mean maximum and mean minimum temperatures are 28.600 and 17.400 respectively. The demonstrations were conducted in five different villages namely Belimukhia, Hulalgaon, Phoolpanichiga, Namti, Bhekuri chapori. Each demonstration was conducted on 0.5 ha and 0.39 ha area adjacent to the demonstration plot was kept as farmers' practices. Under demonstration, Zinc sulphate @ 25kg/ha+ NPK@60:20:40 kg/ha was applied and in farmers' plot traditional practice was followed. Paddy variety Ranjit was used for both demonstration and check plots (Table.1). The soil fertility statuses were estimated by soil analysis of

Table 1:Comparison between adoptions of demonstration package and farmers practice under FLDs (n=24)

Particular	Demonstration package	Farmer' practice
Paddy variety	Ranjit	Ranjit
Optimum seed rate	45kg/ha	40-50kg/ha
Time of Transplanting	July	July-August
Type of transplanting	Line	-
Fertilizer application	NPK@60:20:40 kg/ha	-
Zinc sulphate application	Zinc sulphate @ 25kg/ha	-

composite soil sample from each plot before transplanting and after harvesting of crop. Yield parameters and soil fertility status were collected from both the plots before and after the implementation of the FLD programme. The economic parameters were calculated based on the prevailing market prices of inputs and minimum support prices of outputs. The data were collected from both FLDs as well as control plots and finally the extension gap, technological gap, technological index along with the benefit-cost ratio were calculated using the formula given by Samui *et al.*(2000).

Technology gap = Potential yield –Demonstration yield

Extension gap = Demonstration yield – Farmers yield

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$$

RESULTS AND DISCUSSION

Crop yield

The productivity of rice ranges from 51qt/ha to 54.5qt/ha with an average of 53.17qt/ha against the average yield 32.17qt/ha at farmers' field (Table 2).Yield was recorded 51qt/ha under recommended practice and 32qt/ha under farmers' practice in 2018. Similarly in 2019, yield was recorded 54qt/ha under recommended practice whereas it was 33qt/ha under farmers' practice. In 2020, under recommended practice yield was recorded 54.5qt/ha against the farmers' practice 31.5qt/ha. In comparison to the farmers' practice, there was an increase of 29.8, 35 and 36.9 percent in productivity of rice crop under the recommended practice in the year 2018.2019 and 2020 respectively.

Similar type of results in increase the yield of Rabi onion FLDs was reported by Arora *et al.* (2014), in cumin FLDs was found by Sondarva, *et al.*, (2014)., in paddy FLDs was reported by Dhenge *et al.*(2014) and Shah *et al.*(2019) reported increase in the yield of major pulse FLDs plots.

Soil fertility status

Gap analysis

The results indicate that the front line demonstrations have given a good impact of Zinc sulphate application in rice on the farming community of these districts as they were motivated by the improved Agricultural technologies used in the frontline demonstrations. The results clearly indicated the positive effects of FLDs over the existing practices toward in enhancing the yield of rice production in adopted district.

The findings (Table 2) revealed that a gap exists

between the actual farmers yield and potential yield of the crop. Use of proper technological interventions has the potentiality to increase the present level of rice productivity at farmers field of the district where the farmers only adopted the technology of HYV (var. Ranjit) but other related technology like fertilizer dose and application methods were neglected. Hence, to exploit the potential technology of RDF along with Zinc sulphate application through FLDs were needed to increase to awareness among the farmers.

Table 2: Grain yield performance of front line demonstration on paddy (n=24)

Year	Area (ha)	no. of FLDs	Yield (qt/ha)			% Increase over Farmers practice	Technology gap (qt/ha)	Extension gap (qt/ha)	Technology Index (%)
			Potential yield	RP	FP				
2018	4	8	60	51	32	29.8	9	19	15
2019	4	8	60	54	33	35	6	21	10
2020	4	8	60	54.5	31.5	36.84	5.5	23	9.1
			Average	**53.17**	**32.17**	**33.88**	**6.83**	**21.00**	**11.37**

The extension gap ranged between 19-23 q/ha which indicated that there is a need to create awareness among the farmers through trainings and demonstrations on application of improved technology to reverse the trend of wide extension gap. Average technology gap was recorded 6.83q/ha which indicated that farmers cooperation in application of improved technology at their fields with an encouraging result.

Technology index shows the feasibility of the technology at the farmer's field. The lower the value of technology index, more is the feasibility. In our study, an average 11.37% technology index was recorded which indicated the feasibility of the technology in the district. Similar findings were also recorded by Baishya *et al.* (2015) and Joshi *et al.*(2015), Vinaya *et al.* (2017), Rai *et al.* (2020) and Bordoloi and Islam (2020).

Table 3: Economics of front line demonstration on paddy (n=24)

Year	Cost of cultivation (₹/ha)		Gross return (₹/ha)		Net return (₹/ha)		Additional Return (₹/ha)	Net return increase over FP (%)	B:C ratio	
	RP	FP	RP	FP	RP	FP			RP	FP
2018-19	31262	25767	76,500	48,000	45,238	22,233	23,005	103	2.45	1.86
2019-20	32,870	25,751	81,000	49,500	48,130	23,749	24,381	103	2.46	1.92
2020-21	32,582	26,015	81,750	47,250	49,168	21,235	27,933	131	2.51	1.82
Average	**32,238**	**25,844.33**	**79,750**	**48,250**	**47,512**	**22,405.67**	**25,106.33**	**112.33**	**2.47**	**1.87**

Economic analysis

Different variables like seed, labour, fertilizers, bio fertilizers and pesticides were considered as cash inputs for the demonstrations as well as farmers practice. The data show in Table-3 clearly indicated that cost of cultivation, gross and net return as well as benefit cost ratio were observed higher in the frontline demonstration plots. An average net return of ₹ 47,512 from the FLD plots were obtained as compared to the net return of ₹ 22,405 from farmer's field. An average net return increase over farmers practice was recorded 112.33% which is very much satisfactory over traditional practice. Similarly, the highest B.C ratio was recorded in the demonstrated technology (2.47) followed by Farmer's practice (1.87). The gross and net return as well as BC ratio were found higher under demonstration plots might be due to increase in the yield under the demonstration plots because of adoption of recommendation scientific cultivation practices helps in increase the growth and yield attributing characters. Similar results have been reported earlier on wheat by Tiwari *et al.* (2003) and on Rice by Lathwal (2010), Vinaya et al. (2015) and Patel*et al.* (2020).

CONCLUSION

The productivity enhanced under FLDs over farmers practice of paddy cultivation created greater awareness and motivated the other farmers to adopt appropriate production technology of paddy cultivation in these villages of Sivasagar district of Assam. Application of Zinc sulphate as soil amendment along with recommended dose of fertilizer for paddy was found to be the main reason for increase in yield and incurred maximum income against the farmers' practices thus leads to productivity and profitability of farmers in the Sivasagar district of Assam.

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CONFLICT OF INTEREST

There is no conflict between author.

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