Impact of Saline Soil Management: Practices on Soil Health and Paddy Cultivation in Mandya, Karnataka

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ABSTRACT

The occurrence of saline soil in paddy cultivating belt of Cauvery command area of Mandya district has decreased the yield substantially which prompted Krishi Vigyan Kendra, Mandya to take up frontline demonstration (FLD) on saline soil management from 2006-07 to 2008-09, in Hemmanahalli village, Maddur taluk, Karnataka. The study revealed that the FLD substantially reclaimed the saline soil by decreasing the pH and EC from 8.34 & 4.67 to 8.15 & 3.23 dS/m respectively over three years. Also, it had substantial influence on organic carbon build up from 0.33 to 0.39 per cent. The grain yield was 35.21q/ha in FLD compared to 28.76 q/ha in farmers' practice (FP) during 2008-09 which amounts to 22.43 per cent increase. The economic analysis revealed that though the initial cost involved in adoption of FLD was higher compared to farmers practice, the net return gradually increased and farmers could realize benefit of Rs. 1.99 per rupee invested in FLD compared to Rs. 1.7 in FP.

***Key words**: Impact; Saline soil; Frontline demonstration; Soil properties;*

Soil Soil salinity is the major constraint faced by the paddy growers of Mandya, Karnataka. The prime reason for the development of soil salinity is the faulty irrigation practices followed by the farmers. Majority of the paddy cultivating area in Mandya comes under the Cauvery command area where the farmers have less control over the water management. The traditional practices of flooding and puddling are resulting in accumulation of salt in the soil. Over which the application of huge quantity of fertilizers and use of less organics is aggravating the soil salinity. According to survey, paddy is cultivated in Mandya district in an area of 86,721 hectares with the production of 2, 20,048 tonnes and productivity of 3547 kg/ ha (*Anonymous, 2006*). More than 5000 hectares of area is prone to soil salinity problem where, famers are harvesting only 2867 kg/ha as against the potential productivity of 4600 kg/ha. The farmers are unaware of strategies for management of problematic soil, advantages of organic manures and growing salt tolerant paddy varieties. In this context, Krishi Vigyan Kendra made an intervention to create awareness about the saline soil management through frontline demonstration.

METHODOLOGY

The front line demonstration (FLD) on Saline Soil Management was conducted in Hemmanahlli and Bevinahalli villages located in Maddur and Mandya taluks respectively under KVK operational area from 2006-07 to 2008-09. The FLD was implemented in an area of 4 hectares of ten farmers (1 acre/ demo). Before the implementation, the farmers were educated on the causes and the strategies to manage soil salinity through group discussion, training and field visits. The technology demonstrated were growing and *in situ* incorporation of green manure crop (*Sesbania rostrata*) before paddy; application of gypsum based on soil test; growing of IR-30864 - a saline tolerant variety; transplanting of 30 days aged seedlings; application of bio-fertilizers- *Azospirillum* (@1 kg/ha) and *Bacillus magaterium* (@2 kg/ha) & application of chemical fertilizer based on soil test, as per the recommendations of University of Agricultural Sciences, Bangalore. The farmers practices of non-application of green manure, gypsum, bio fertilizers, application imbalanced chemical fertilizers and growing of *Tanu* paddy was taken as check plot. The data were systematically recorded and analysed to

draw the inferences on impact of saline soil management demonstration. The soil samples were analyzed at soil test laboratory, KVK Mandya.

RESULTS AND DISCUSSION

Impact on soil properties: The impact of three years study on soil properties (Table 1) showed that the technological intervention reduced pH of soil from 8.34 to 8.15 and EC of soil from 4.67 to 3.23 dS/m. The reduction was substantially more during second and third year compared to first year. While, in the farmers practice (FP) the pH and EC increased to an extent of 0.39 and 3.2 per cent respectively over three years. This clearly indicates that saline soil management practices of incorporation of green manure and application of gypsum helped in reclamation of saline soil. This result is in line with the findings of *Mohammad (2001)*. This also had positive effect on organic carbon build up in soil. The mean increase in OC was 9.85 per cent in the demonstration plot, while in FP the mean decrease in OC was -2.34 per cent.

The saline soil management practices followed in FLD resulted in increased availability of major nutrients (Table 2) compared to FP. The build up in phosphorus was higher (10.2%) followed by nitrogen (6.96%) and potassium (5.04%). This could be attributed to application of green manure and bio-fertilizer. The similar results were recorded in the study conducted by *Jena et.al, (1988)*. In farmers practice, though they applied more nitrogen the build up was meagre (0.66%) as the soil could not retain inorganic nitrogen for longer period (*Singh, 2009*). While, the phosphorus and potassium depleted to 24.1 and 147.8 kg/ha compared to base data of 27.3 and 159.7 kg/ha respectively. This reduction was to an extent of 11.7 and 7.45 per cent respectively over three years.

Table 1. Impact of saline soil management on soil electro-chemical properties.

Year	pH		% deviation		EC (dS m-1)		% deviation		OC (%)		% deviation	
	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP
BI	8.34	8.36	-	-	4.67	4.53	-	-	0.33	0.32	-	-
2006-07	8.33	8.38	-0.12	+0.24	4.32	4.62	-7.49	+1.99	0.35	0.33	+6.06	+3.13
2007-08	8.26	8.39	-0.96	+0.36	3.84	4.78	-17.77	+5.52	0.38	0.31	+15.15	-3.13
2008-09	8.15	8.44	-2.28	+0.96	3.23	4.77	-30.84	+5.30	0.39	0.29	+18.18	-9.38
Mean	8.27	8.39	-0.84	0.39	4.02	4.68	-14.03	3.20	0.36	0.31	9.85	-2.34

* Before implementation of FLD

Table 2. Impact of saline soil management on soil nutrients (kg ha-1).

Year	Avail. N		% deviation from BI		Avail. P_2O_5		% deviation from BI		Avail. K_2O		% deviation from BI	
	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP
BI*	233.4	228.5	-	-	26.4	27.3	-	-	161.3	159.7	-	-
2006-07	245.2	231.4	+5.06	+1.27	27.4	26.4	+3.8	-3.3	164.8	153.4	+2.17	-3.94
2007-08	256.8	229.6	+10.03	+0.48	30.2	25.8	+14.4	-5.5	174.3	151.8	+8.06	-4.95
2008-09	263.2	230.5	+12.77	+0.88	32.4	24.1	+22.7	-11.7	177.3	147.8	+9.92	-7.45
Mean	249.7	230.0	+6.96	+0.66	29.1	25.9	+10.2	-5.1	169.4	153.2	+5.04	-4.09

* Before implementation of FLD

Table 3. Impact of saline soil management on yield and economics of paddy cultivation.

Year	Grain yield (q/ha)		% deviation from FP	Gross cost (Rs./ha)		% deviation from FP	Gross return (Rs./ha)		% deviation from FP
	Demo	FP	Demo	Demo	FP	Demo	Demo	FP	Demo
2006-07	31.23	29.67	+5.26	17267	13234	+30.5	24861	22036	+11.37
2007-08	32.64	30.14	+8.29	16897	13250	+27.5	27980	23598	+15.66
2008-09	35.21	28.76	+22.43	16236	13343	+21.7	31668	22632	+28.53
Mean	33.03	29.52	+11.99	16800	13276	+26.56	28170	22755	+18.52

Impact on yield and economics: The yield data in Table-3 revealed that the performance of IR-30864 was substantially higher compared to local check in all the three years. Though the increase in the yield during first year was only 5.26 per cent, in the subsequent years it increased to an extent of 8.3 and 22.4 per cent compared to FP. This reveals that the adoption of soil reclamation strategies and salt tolerant variety helped the farmers to harvest sustainable increased yield.

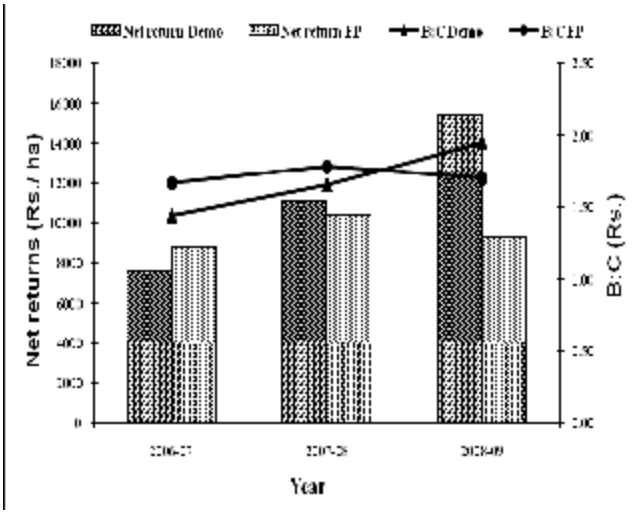

Fig. 1: Impact of saline soil management on net returns and benefit to cost ratio (B:C)

The economic analysis (Table 3) revealed that in the first year the cost involved in adoption of FLD was higher compared to FP and in the later years it decreased substantially. This is because the agronomic practices (land levelling, opening drainage *etc*.) followed in the initial period demands higher labour and cost. While, in the later years additional cost involved was only for few critical inputs *viz.*, seed cost of green manure, gypsum & bio-fertilizer. The gross return increased substantially from 11.37 per cent to 28.53 per cent from 2006-07 to 2008-09 respectively compared to FP. This indicates saline soil management has long term economic benefit *(Herath, 1985)* as against decreasing gross returns noticed in FP.

The net returns from FLD in first year was low compared to FP (Fig.1) and gradually increased recording net return of Rs.15, 432.00 in the third year over Rs. 9, 282.00 in FP. This is because of high cost involved in adoption of saline management strategies in the initial years and increased yield in the later years. The benefit out of each rupee invested in FLD increased from 1:1.44 to 1:1.99 in three years.

CONCLUSION

The impact study of FLD on saline soil management for successive three years showed that, the FLD helped in reclaiming saline soil by decreasing the pH and EC and improving soil fertility. The increased paddy yield to 28.76 per cent over FP at the end of third year is self explanatory on the positive impact of the technological intervention on saline soil management. The FLD had economic benefit over FP in the later years, which indicates that by adopting saline management practices, farmers can have sustainable productivity in terms of yield and net returns as against the decreasing profit in FP. Farmers opined that this technology helped them in harvesting higher yield in concurrent years and expressed that the fellow farmers of neighbouring villages visited their field, were impressed and have adopted the technology. Now the technology has spread to 153 hectares in three years.

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