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EVALUATION OF WATER SAVING SYSTEM OF RICE INTENSIFICATION UNDER TANKFED SYSTEM

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ABSTRACT

The performance of water saving method of rice cultivation, system of rice intensification, was studied in rice cultivating fields of farmers in different mandals of Visakhapatnam District under well and tank irrigated red clayey loams. System of Rice Intensification (SRI) recorded more tillers (44.2 m^{-2}), higher number of grains per panicle (252.2) and higher grain yield (6540.7 kg ha^{-1}) compared to other farmers practicing flood irrigation, where the number of productive tillers were 22.4 m^{-2}, grains per panicle were 195.0 and the yield recorded was 5420.3 $kgha^{-1}$. On account of water saving too, SRI consumed less water (977.0 mm) compared to farmers practice (1332.0 mm). These advantages were reflected in B-C ratio which was higher in SRI (2.05) compared to farmers practice of rice cultivated under flood irrigation (1.72). Consistent results at different locations over a period of three years proved the advantage of SRI method over flood irrigation in terms of water saving as well as yield.

Keywords: Rice, System of Rice Intensification, (SRI), water saving, Productive Tillers grains per panicle and Grain yield

INTRODUCTION

In Visakhapatnam District rice is majorly grown under wells and tanks. The levels of water in those wells and tanks mostly depend upon the quantum of rainfall before and during the crop season and it is a normal pattern that the crop suffers due to insufficient water especially at critical stages. On this back drop, the present study was undertaken to evaluate the comparative advantages of SRI method over conventional practice of flood irrigation in rice.

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MATERIALS AND METHODS

Nine on-farm trials were conducted in the fields of various farmers of Munagapaka, Yelamanchili, Achyutapuram, Parwada, Bheemili and Chodavaram Mandals of Visakhapatnam Distirct, Andhra Pradesh during *Kharif* 2007, 2008 and 2009. The soils were red clayey loams with a pH of 6.5-8.0, low in Nitrogen, with Phosphorus being low to medium and medium to high in available Potassium. At each experimental location two treatments, one being SRI method and the other being farmers practice of flood irrigation in rice cultivation. The cultivated area of each treatment was 2000 m^2 and the total experimental area was 4000m^2 at each location. At all the experimental locations, the variety of rice that was cultivated was RGL2537.

In SRI, raised bed nursery was sown on with seed rate of 5 kg ha^{-1}. Pre-germinated seeds were broadcasted uniformly on nursery beds. After broadcasting the seed, mixture of soil and FYM (1:1) was spread as a thin layer of one centimeter to cover the seed. The beds were irrigated with a rose can twice a day in the morning and evening. Twelve day old seedlings were carefully transplanted in the main field in square pattern with spacing of 25 x 25 cm with single seedling per hill.

In farmers practice, seed was broadcasted in a normal flat bed nursery at a rate of 50 kg ha^{-1} and transplanted at 30 days age at a spacing of 15X15 cm with approximately three to four seedlings per hill.

In both the treatments, the main field was prepared by ploughing twice followed by thorough puddling. The fertilizers, N, P_2O_5 and K_2O @ 180:60:40 kg ha^{-1} were applied. The entire phosphorous and half of the recommended potassium was applied as basal dose during transplanting and another half of recommended potassium was applied during panicle initiation stage. Nitrogen was applied in three equal splits as basal, at active tillering and at panicle initiation stage.

In SRI, field was irrigated just enough to saturate the soil with moisture. Subsequent irrigations were given when fine cracks were seen in the field during vegetative phase. From panicle initiation to grain hardening, a thin film of water was maintained continuously by frequent irrigations. Whereas in farmers practice of flood irrigation, standing water of 2cm was maintained up to maximum tillering and 5cm from panicle initiation to grain hardening. Irrigation water was measured by parshall flumes. Pre emergence herbicide Oxadiargyl (90 gm ha^{-1}) mixed with sand was applied immediately three days after transplanting in farmers practice of flood irrigation. Whereas in SRI, starting from fifteen days after transplantation, conoweeder was operated thrice at a fifteen day interval. Plant protection was done as per the requirement.

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Data on crop yield parameters, yield, rain fall and irrigation water given were recorded. The costs, returns and benefit cost ratio were also calculated.

RESULTS AND DISCUSSION

SRI performed better on all the parameters consistently during the three years of study compared to farmers practice of flood irrigation (Table 1). The number of productive tillers sq.m^{-1} were 44.2 in SRI, which was higher than that recorded in farmers' practice of flood irrigation (22.4 per sq.m^{-1}). Similarly, more number of grains per panicle was recorded in SRI method (252) compared to farmers practice (195). These factors in turn resulted in contributing higher grain yield in SRI (6540.7 kg ha^{-1}) which was 20.7 per cent higher than yield recorded in farmers practice (5420.3 kg per ha^{-1}). Early transplanting in SRI contributes to less transplantation shock and quicker establishment. Wider spacing and running of conoweeder might have lead to better rooting and proper aeration resulting in production of more tillers. These factors in turn contributed more number of filled grains per panicle and thus higher yield over conventional farmers practice. Similar findings have been reported by Abu yamah (2002), Subbarao *et al* (2009) and Lateef Pasha *et al* (2012).

Table 1. Yield parameters and yield in SRI compared to flood irrigation

Production technique	Productive tillers m^{-2}				Number of grains per panicle				Grain yield kg ha^{-1}			
	2007	2008	2009	Mean	2007	2008	2009	Mean	2007	2008	2009	Mean
System of Rice Intensification	48.3	47.3	37.0	44.2	255.6	270.0	231.0	252.2	7187.0	7822.0	4613.0	6540.7
Farmers practice (flood irrigation)	25.6	21.6	20.0	22.4	213.0	216.6	156.0	195.0	5625.0	6463.0	4173.0	5420.3

Utilization of water was also less in SRI (977 mm ha^{-1}) compared to flood irrigation adopted by farmers (1332 mm ha^{-1}). SRI had a better water use efficiency of 6.7 kgha^{-1}mm^{-1} compared to farmers' practice of flood irrigation (4.1 kgha^{-1}mm^{-1}). Water saving in SRI was about 36 per cent. According to Lateef Pasha *et al* (2012), SRI resulted in water saving upto 38 per cent. Similarly, Subbarao *et al* (2009) reported 47 per cent water saving in SRI than farmers practice. (Table 2)

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Table 2. Water use and water use efficiency in SRI compared to flood irrigation

Production technique	Water Use(mm)				Water Use Efficiency(kgha^{-1}mm^{-1})			
	2007	2008	2009	Mean	2007	2008	2009	Mean
System of Rice Intensification	963	996	972	977.0	7.5	7.9	4.7	6.7
Farmers practice (flood irrigation)	1320	1345	1331	1332.0	4.5	4.8	3.1	4.1

A comparison of costs and returns between SRI and conventional method of flood irrigation was also made. The operational costs for SRI were Rs.28100 per ha which is less compared to the cost incurred in farmers practice (Rs.30303 per ha). The higher yield achieved in SRI was reflected in higher returns (Rs.57403per ha) compared to farmers practice (Rs.52011 per ha). The benefit cost ratio recorded for SRI was 2.05 whereas it was 1.72 in farmers practice. Lateef Pasha *et al* (2012) and Rama Rao (2011) too observed similar findings. (Table 3)

Table 3. Economics of SRI compared to flood irrigation

Production technique	Operational costs (Rs)				Total returns (Rs)				B:C Ratio			
	2007	2008	2009	Mean	2007	2008	2009	Mean	2007	2008	2009	Mean
System of Rice Intensification	26450	27350	30500	28100	56075	61540	54594	57403	2.12	2.25	1.79	2.05
Farmers practice (flood irrigation)	28734	29825	32350	30303	54595	55176	46262	52011	1.90	1.84	1.43	1.72

It is evident that there is a three phase advantage of adopting SRI, reduction in operational cost, saving of water as well as higher returns thus manifesting SRI as more viable alternate for conventional method of rice cultivation in Visakhapatnam district.

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