



Effect of mechanical weeding in System of Rice Intensification and its adoption

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Rice is the staple food crop of India and the demand for rice is growing every year. To sustain the food self sufficiency and to meet the future demand, rice production should be increased. At present non-availability of labour, escalating input cost coupled with water shortage leads to non-economic of rice cultivation. System of Rice Intensification (SRI) is a modern and alternative method of rice cultivation for reduced usage of seed, water and labour and to realize higher productivity. The concept of SRI includes transplanting young seedlings, carefully, singly and widely spaced with soil kept well aerated by mechanical weeding. Adoption of rotary or cono weeder use in SRI plays a significant role in improving growth, yield and also economics of rice. It also decides the number of labour needed, cost of weeding and rate of increase in yield. SRI was recently introduced and successfully demonstrated in different sub basins of Tamil Nadu. Alternate wetting and drying in SRI may provide conducive to excess weed growth which if not controlled in time may cause immense loss of grain yield. Therefore, an attempt was made to study the performance of SRI with conventional method of rice cultivation and also to analyze the effect of rotary weeding in the Manimuthar sub basin area of Tamil Nadu State.

Eighteen on-farm demonstrations on System of Rice Intensification were carried out in ten hectares of farmers fields in Nagavayal, Kallupatti, Karungalakudi, Vanjipatti, Kamboor, Alangampatti in Sivagangai and Madurai districts of Tamil Nadu from October 2010 to February 2011 under Tamil Nadu-Irrigated Agriculture Modernization and Water Bodies Restoration and Management Project (TN-IAMWARM) to study the effect and adoption level of rotary weeding on yield of rice under SRI. Two methods of rice cultivation, viz. SRI and conventional planting were compared. In SRI, the concepts, viz. lesser seed rate of 7.5 kg/ha raised in 100/m² mat nursery,

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transplanting of 14 days old seedlings at 25 x 25 cm spacing, irrigating 2.5 cm depth of water after hair line crack formation up to panicle initiation and after that one day after disappearance of ponded water with 5.0 cm water and weeding using rotary weeder at 10, 20, 30 and 40 days after transplanting (DAT) were followed. In conventional method of rice cultivation, use of a seed rate of 30-60 kg/ha in 800 m² nursery area, seedling age 21-30 days with a spacing of 15 x 10 to 20 x 10 cm, irrigation to 5 cm depth one day after disappearance of ponded water and manual weeding twice at 20 and 40 DAT were practiced. Fertilizer applications were followed as per the blanket recommendation of 150: 50:5 0 NPK kg/ha. The information on number of rotary weeding carried out by each farmers was collected and documented. The biometric observation on yield attributes and grain yield were recorded and economics were also worked out.

The grain yield of rice was substantially influenced by methods of rice cultivation (Table.1). System of Rice Intensification registered a mean grain yield of 6.063 t/ha, where as conventional method recorded only 5.42 t/ha. Thus, averaging over locations, SRI out yielded 11.06% than conventional method of rice cultivation. The average yield increment by four times, thrice and twice rotary weeding under SRI over conventional method were 24.1, 15.4 and 8.5%, respectively. The higher yield under SRI might be due to the rotary weeding which favoured better aeration, cut the older roots and formation of newer roots which might have absorbed more nutrients in turn leads to higher nutrient uptake. Veeraputhiran *et al.* (2008) also obtained 23.1% yield improvement under SRI than farmers practice in Tamirabarani Command areas in Thirunelveli district of Southern Tamil Nadu. At Mandya of Karnataka state, four time cono weeding recorded significantly higher grain yield than twice cono weeding (Ramachandra *et al.* 2012). Similarly, Kavitha and Raja (2012) also found significantly higher grain yield with thrice cono weeding than once cono weeding. Chaudhary *et al.* (2012) observed comparable grain yield with thrice and twice cono weed-

ing of rice under SRI at PUSA, Bihar. The higher yield under rotary weeding was also due to improving the growth and functioning of root systems and enhanced diversity of soil biota that contributed to crop health and productivity as reported by Stoop *et al.* (2002).

The total cost of weeding by the SRI and conventional method of rice cultivation is given (Table 1). Increasing the number of rotary weeding increased the cost of weeding in SRI. Irrespective of the time of weeding, the cost of weeding under SRI was lesser than that of conventional method of rice cultivation. Adoption of SRI drastically reduced the cost of weeding by ₹ 2,534 /ha than that of conventional method of rice cultivation.

The adoption of rotary weeder by the individual farmer under SRI method of cultivation is furnished (Table 1). Of the total 18 farmers, 8 farmers practiced rotary weeding thrice, 6 twice and 2 once. The percentage of adoption of thrice and twice rotary weeding was 44.5 and 33.3% of farmers. The lowest of only 2 farmers which is equal to 11.1% farmers carried out four times as per recommendation and once rotary weeding each. The differential pattern of using rotary weeder among the farmers was due to their attitude, education level, adoption behavior *etc.*

The economic feasibility of two methods of rice cultivation (Table 2) revealed that the cost of cultivation was comparatively lesser in SRI than that of farmers' practice. The mean cost of cultivation under SRI

Table 1. Adoption level, cost of weeding and grain yield under SRI and conventional rice cultivation

Number of rotary weeding	Number of farmers adopted	% of farmers adopted	Cost of weeding (x10 ³ ₹/ha)		Grain yield (t/ha)	
			SRI	Conventional	SRI	Conventional
Four times (recommended)	2	11.1	4.30	5.95	7.05	5.68
Thrice	8	44.5	3.24	5.57	6.39	5.53
Twice	6	33.3	2.82	5.47	5.72	5.27
Once	2	11.1	1.60	5.10	5.09	5.35
Total /Mean	18	100	2.99	5.52	6.06	5.42

Table 2. Comparison of economics of SRI and times of rotary weeding with conventional method of rice cultivation

Particulars	Four times rotary weeding		Thrice rotary weeding		Twice rotary weeding		Once rotary weeding		Mean	
	SRI	Conv.	SRI	Conv.	SRI	Conv.	SRI	Conv.	SRI	Conv.
Cost of cultivation (x10 ³ ₹/ha)	27.40	29.25	26.57	28.52	26.38	28.73	25.31	27.90	26.40	28.60
Gross income (x10 ³ ₹/ha)	70.50	56.60	63.90	55.45	57.22	52.72	50.90	53.50	60.63	54.57
Net income (x10 ³ ₹/ha)	43.10	27.35	37.39	26.92	30.83	23.98	25.59	25.60	34.23	25.96
Additional net income by SRI (x10 ³ ₹/ha)	15.75	-	10.46	-	6.85	-	-	-	11.02	-
Benefit – cost ratio	2.56	1.93	2.32	1.93	2.10	1.83	2.01	1.91	2.25	1.90

was ₹ 26,398/ha as against ₹ 28,602 /ha under conventional method and thus adoption of SRI was found to reduce the cost of cultivation by ₹ 2,204 /ha. In addition, higher gross income and net income were also associated with SRI than conventional method of rice cultivation. Averaging over locations, SRI registered a mean net income of ₹ 34,230 /ha as compared to ₹ 25,964 /ha only under conventional method. Higher BC ratio was also associated with SRI (2.25) than conventional method (1.90). Lesser cost of cultivation coupled with higher gross and net income under SRI resulted additional economic benefit over farmers practice. Adoption of SRI gained an additional net profit of ₹ 11,021/ha as compared to conventional method of rice cultivation. The economic superiority of SRI as compared to farmers practice of rice cultivation was documented by Veeraputhiran *et al.* (2010).

The rate of increase in income benefits were higher with increasing the number of rotary weeding. The average increment of net income by four, thrice and twice times rotary weeding under SRI over conventional method of rice cultivation were ₹ 15,750/ha, 10,463/ha and 6,850/ha respectively. However, in one case rotary weeding was found uneconomical.

It can be concluded that adoption of SRI resulted 11.06 per cent higher yield, reduced weed management cost and better economic benefits which will pave way for sustainable rice production and higher standard of living of the farming community of the Manimuthar sub basin study area. In addition, weeding either by rotary or cono weeder by minimum three times is essential for getting higher rice productivity under SRI.

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SUMMARY

Eighteen on-farm demonstrations on System of Rice Intensification (SRI) were carried out in ten hectares of farmers fields in Sivagangai and Madurai districts of Tamil Nadu from October 2010 to February 2011 under Tamil Nadu-Irrigated Agriculture Modernization and Water Bodies Restoration and Management Project (TN–IAMWARM) to study the effect and adoption level of rotary weeding on yield of rice under SRI. The results revealed that SRI registered a mean grain yield of 6.06 t/ha against 54.2 t/ha under conventional method of rice cultivation. SRI yielded 11.06 per cent higher grain yield than conventional method. The number of rotary weeding also decides the rate of yield increase in SRI. The average yield increment by four, thrice and twice rotary weeding under SRI over conventional method were 24.1, 15.4 and 8.5 per cent, respectively. Among the total farmers, only 11.1 per cent farmers perfectly carried out four times rotary weeding as per recommendation. The percentage of farmers adopted thrice, twice and single rotary weeding were 44.5, 33.3 and 11.1 per cent, respectively. Adoption of SRI drastically reduced the cost of weeding as evident due to ₹ 2,534/ha lesser weed management cost under SRI (₹ 2989/ha) than conventional method of rice cultivation (₹ 5,523/ha). The cost of cultivation was comparatively lesser in SRI which resulted in gaining an additional net profit of ₹ 11,021/ha as compared to conventional method of rice cultivation.

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