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Comparative study of system of rice intensification and conventional method of rice cultivation in Madurai district of Tamil Nadu

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ABSTRACT

Twenty two on farm demonstrations on System of Rice cultivation (SRI) were carried out in 12 hectares of farmers fields in Alangampatti and Karungalagudi village, Manimuthar sub basin, Madurai district of Tamil Nadu during November 2008 – February 2009 under Tamil Nadu-Irrigated Agriculture Modernization and Water Bodies Restoration and Management (TN – IAMWARM) Project. Two methods of rice cultivation *viz.*, SRI and conventional were compared. The results revealed that adoption of SRI favorably influenced all the yield attributes of rice *viz.*, number of productive tillers m^{-2}, length of panicle and numbers of grains $panicle^{-1}$. Significant superiority of SRI in terms of grain yield was also evident due to 17.0 per cent yield increment by SRI than conventional method of rice cultivation. Higher grain yield coupled with substantial water saving (24.1 per cent) resulted in higher Water Use Efficiency of rice under SRI method. Higher gross income, net profit and benefit cost ratio were also associated with SRI than conventional method of rice cultivation. The cost of cultivation was comparatively lesser in SRI which resulted in gaining an additional net profit of Rs.11,000 ha^{-1} in SRI as compared to conventional method of rice cultivation.

Key words : SRI, Yield attributes, Grain yield, Water use, Economics

INTRODUCTION

Rice is the most water consuming food crop of India and Tamil Nadu. In Tamil Nadu rice crop alone consumes about 80 per cent of the total water available in the state. The present water status demands for the scientific management of available water efficiently to achieve the twin objectives of higher productivity and better water use efficiency. At present non- availability of labour, escalating input cost coupled with water shortage leads to non economic of rice cultivation. System of Rice cultivation (SRI) is the modern and alternative method of rice cultivation for reduced usage of water and other inputs. The concept of SRI includes transplanting young seedlings early, carefully, singly and widely spaced with soil kept well aerated. The Manimuthar sub basin is one of the sub basins in Tamil Nadu with a drainage area of 16751 ha. This basin comprises of four minor-basins *viz.*, Manimuthar, Virisuliyar, Thirumanimuthar and Palar and spreads over in six taluks in three districts of Tamil Nadu namely Madurai, Sivagangai and Ramanathapuram. The major focus of this basin is to promote water saving technologies, to enhance crop and water productivity and to increase the cropped area by diversification. Therefore, an attempt was made to study the performance of SRI in comparison with the conventional method of rice cultivation in the Manimuthar sub basin area.

MATERIALS AND METHODS

Twenty two on farm demonstrations on System of Rice Intensification (SRI) were carried out in farmer's fields of Alangampatti and Karungalagudi village covering an area of 12 hectares in Manimuthar sub basin of Madurai district during November 2008 – February 2009 under Tamil Nadu-Irrigated Agriculture Modernization and Water Bodies Restoration and Management (TN – IAMWARM) Project. The available soil fertility status of the study area was low in Nitrogen, high in Phosphorus and medium in Potash and sandy clay loam in nature. Two methods of rice cultivation *viz.*, SRI and conventional were compared by using the variety ADT 39. In SRI, the concepts *viz.*, lesser seed rate of 7.5 kg ha^{-1} raised in 100 m^{-2} mat nursery, 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 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^{-1} in 800 m^{-2} nursery area, seedling age 21-30 days with 15 x 10 to 20 x 15 cm, irrigation 5 cm depth one day after disappearance of ponded water and manual weeding twice at 15 and 30 DAT were practiced. The total water use was calculated by adding irrigation water applied and effective rainfall. The biometric observation on yield attributes and grain yield were recorded. Water use and economics were also analyzed.

RESULTS AND DISCUSSION

The results obtained from the present investigation

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as well as relevant discussion have been presented under following sub heads :

Yield attributes :

The results on yield attributes (Table 1) revealed that SRI showed a favorable influence on all the yield attributes of rice. Adoption of SRI recorded 638 number of productive tillers m^{-2} which was significantly higher than that of conventional method of rice cultivation (507). The length of panicle and numbers of grains $panicle^{-1}$ were also significantly higher under SRI than farmer's practice of rice cultivation. SRI registered 218 grains $panicle^{-1}$ and 22.6 cm length of panicle. Similar results of higher yield attributes with SRI than conventional method were reported by Senthil Kumar (2002).

Grain yield :

The grain yield of rice was substantially increased due to adoption of SRI (Table 1). SRI registered a mean grain yield of 6082 kg ha^{-1} which was significantly higher than conventional method of rice cultivation (5223 kg ha^{-1}). Thus significant superiority of SRI in terms of grain yield was evident due to 17.0 per cent yield increment by SRI. Veeraputhiran *et al* (2008) also obtained 23.1 per cent yield improvement by SRI than farmers practice in Tamirabarani Command areas of Southern Tamil Nadu. Higher yield attributes like number of productive tillers m^{-2}, length of panicle and numbers of grains $panicle^{-1}$ attributed the higher grain yield of SRI. These results of higher grain yield with SRI corroborate with the findings of Makarim *et al*. (2002) and Ganeshraja *et al*. (2008). Rajendran *et al*. (2003) also registered 48 and 35 per cent higher yield under SRI than traditional method of rice cultivation at TRRI, Aduthurai and SWMRI, Thanjavur, respectively. Similarly Bommaiasamy (2005) reported that planting 14 days old seedlings at 20 x 20 cm spacing with single seedling was a viable establishment technique for SRI method of rice cultivation which recorded 7.2 per cent higher yield than 21 days old seedlings.

Water use studies :

The water use studies of both the rice cultivation methods (Table 1) clearly indicate the beneficial effect of SRI in terms of water saving and higher Water Use Efficiency (WUE). The total water use of rice including effective rainfall was drastically reduced (1185 mm) due to intermittent and alternate wetting and drying type of irrigation under SRI which was lesser than that of farmers practice (1471 mm).Thus, there was a substantial quantity of water saving by 24.1 per cent was evident due to the adoption of SRI. The higher grain yield coupled with enormous water saving under SRI method resulted in higher WUE of rice in the study area. The mean WUE of SRI was 5.15 kg ha mm^{-1} and it was only 3.54 kg ha^{-1} mm^{-1} in conventional method. Similar water saving and higher water use efficiency under SRI was also observed by Veeraputhiran *et al*. (2008) in Thirunelveli District of Southern Tamil Nadu.

Economic analysis :

The economic feasibility of both the method of rice cultivation (Table 1) revealed that the cost of cultivation was comparatively lesser in SRI than that of conventional method. The mean cost of cultivation for SRI and conventional method was Rs. 20,944 ha $^{-1}$and Rs. 23,111

Table 1 : Comparision of SRI and conventional method on Grain yield, water use and economics of Rice cultivation (Mean of 22 demonstrations)

Sr .No.	Particulars	System of Rice cultivation	Conventional method of rice intensification	S.E. ±	C.D. (P=0.05)
1.	No. of productive tillers m^{-2}	638	507	37.3	77.5
2.	Panicle length (cm)	22.6	19.8	0.73	1.52
3.	No. of grains $panicle^{-1}$	218	184	15.4	33.2
4.	Yield (kg ha^{-1})	6082	5223	49.1	102.1
5.	Percent yield increase	17.0	-	-	-
6.	Total water use (mm)	1185	1471	-	-
7.	Percent water saving by SRI	24.1	-	-	-
8.	Water use efficiency (kg $ha^{-1}mm^{-1}$)	5.15	3.54	-	-
9.	Cost of cultivation (Rs ha^{-1})	20,944	23,111	-	-
10.	Gross income (Rs ha^{-1})	61,000	52,167	-	-
11.	Net income (Rs ha^{-1})	40,056	29,056	-	-
12.	Additional net income by SRI (Rs ha^{-1})	11,000	-	-	-
13.	Benefit - Cost ratio	2.91	2.26	-	-

ha^{-1}, respectively. Thus it is evident that adoption of SRI was found to reduce the cost of cultivation by Rs.2167 ha^{-1}. In addition, higher gross income, net profit and benefit cost ratio were also associated with SRI than conventional method of rice cultivation. SRI registered a total income of Rs.61, 000 $ha^{-1}$and net profit of Rs.40,056 ha^{-1} as compared to Rs.52,167 ha^{-1} and Rs. 29,056 ha^{-1}, respectively under conventional method. Regarding Benefit-Cost ratio (BC ratio), higher BC ratio was also associated with SRI (2.91) than conventional method (2.26). Lesser cost of cultivation coupled with higher gross and net income under SRI resulted additional economic benefit. Adoption of SRI gained an additional net profit of Rs.11, 000 ha^{-1} as compared to conventional method of rice cultivation.

Thus the results of the demonstration on SRI clearly indicated that adoption of SRI leads to 17.0 per cent higher yield, substantial water saving (24.1 %), higher water use efficiency 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.

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