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Productivity, water use efficiency and economics of system of rice intensification in Sivagangai district of Tamil Nadu

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ABSTRACT

Thirty six demonstrations on system of rice intensification (SRI) were carried out in 25 hectares of farmers fields in Mahibalanpatti village, Manimuthar sub basin, Sivagangai district of Tamil Nadu during north east monsoon season (October 2008 – January 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 22.1 per cent yield increment by SRI than conventional method of rice cultivation. Higher grain yield coupled with substantial water saving (35 per cent) resulted in higher WUE 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.9,980 ha^{-1} in SRI as compared to conventional method of rice cultivation.

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

INTRODUCTION

Water is the most limiting and crucial input in agriculture. 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. System of rice cultivation (SRI) is the new method of rice cultivation and there is ample scope to increase the productivity and saving of water in rice by altering the environmental conditions with ultimately modify micro climate and soil conditions. 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 Mahibalanpatti village of Manimuthar sub basin.

MATERIALS AND METHODS

System of Rice cultivation demonstration trails were carried out in 36 land holdings in Mahibalanpatti village covering an area of 25 hectares in Manimuthar sub basin of Sivagangai district during north east monsoon season (October 2008 – January 2009) under Tamil Nadu-Irrigated Agriculture Modernization and Water Bodies Restoration and Management (TN – IAMWARM) Project. The soil of the study area was sandy clay loam in nature with low in 'nitrogen' high in 'potash' and 'phosphorus'. Two methods of rice cultivation *viz.*, SRI and conventional were compared by the variety ADT 39. In SRI, the concepts *viz.*, lesser seed rate of 7.5 kg ha^{-1} raised in 100 m^{-2} pai nursery, transplanting 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 modified rotary weeder at 10, 20, 30 and 40 DAT were followed. In conventional method of rice cultivation, the agro techniques followed were 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. 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 estimated.

RESULTS AND DISCUSSION

The results obtained from the present investigation

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as well as relevatn discussion have been presented below:

Yield attributes :

SRI favorably influenced all the yield attributes of rice (Table 1). Adoption of SRI recorded 592 number of productive tillers m^{-2} which was significantly higher than that of conventional method of rice cultivation (490). 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 221 grains $panicle^{-1}$ and 20.5 cm length of panicle. Similar results of association of higher yield attributes with SRI than conventional method was 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 5505 kg ha^{-1} which was significantly higher than conventional method of rice cultivation (4510 kg ha^{-1}). Thus significant superiority of SRI in terms of grain yield was evident due to 22.1 per cent yield increment by SRI. Higher yield attributes like number of productive tillers m^{-2}, length of panicle and numbers of grains $panicle^{-1}$ under SRI attributed the higher grain yield of SRI. These results of higher grain yield with SRI was corroborate with the findings of Makarim *et al.* (2002) and Ganeshraja *et al*. (2008). 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. 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. Similarly Rajendran *et al*. (2003) also registered 48 and 35 per cent higher yield under SRI than traditional method of rice cultivation of TRRI, Aduthurai and SWMRI, Thanjavur, respectively.

Water use studies :

The water use studies of both the rice cultivation methods (Table 1) clearly indicated the beneficial effect of SRI in terms of water saving and higher water use efficiency (WUE).Thus, there was a substantial quantity of water saving by 35.0 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 5.28 kg ha^{-1} mm^{-1} and it was only 3.55 kg ha^{-1} mm^{-1} in conventional method. The total water use of rice including effective rainfall was drastically reduced under SRI (1119 mm) due to intermittent and alternate wetting and drying type of irrigation which was lesser than that of farmers practice (1511 mm).Similar water saving and higher water use efficiency in SRI was also observed by Veeraputhiran *et al*. (2008) in Thirunelveli District of Southern Tamil Nadu.

Economic analysis :

The economic analysis revealed that the economic feasibility of SRI than conventional method (Table 1). 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. 17,581 $ha^{-1}$and Rs. 19,687 ha^{-1}. Thus it is obvious that adoption of SRI was found to reduce the cost of cultivation by Rs.2106 ha^{-1}. Higher gross income, net profit and benefit cost ratio were also associated with SRI than conventional method

Table 1 : Influence of SRI on grain, water use and economics (Mean of 36 demonstrations)

Sr.No.	Particulars	System of rice cultivation	Conventional method of rice cultivation	S.E. ±	C.D. (P=0.05)
1.	No. of productive tillers m^{-2}	592	490	32.7	66.4
2.	Panicle length (cm)	20.5	18.3	0.79	1.62
3.	No. of grains $panicle^{-1}$	221	183	16.8	34.0
4.	Yield (kg ha^{-1})	5505	4510	69.3	140.6
5.	Percent yield increase	22.1	-	-	-
6.	Total water use (mm)	1119	1511	-	-
7.	Percent water saving by SRI	35.0	-	-	-
8.	Water use efficiency (kg $ha^{-1}mm^{-1}$)	5.28	3.55	-	-
9.	Cost of cultivation (Rs ha^{-1})	17,581	19,687	-	-
10.	Gross income (Rs ha^{-1})	55,051	45,071	-	-
11.	Net income (Rs ha^{-1})	37,470	27,490	-	-
12.	Additional net income by SRI (Rs ha^{-1})	9980	-	-	-
13.	Benefit - Cost ratio	3.12	2.28	-	-

of rice cultivation. SRI registered a total income and net profit of Rs.55,051 $ha^{-1}$and Rs.37,470 ha^{-1} while conventional method recorded only Rs.45071 $ha^{-1}$and Rs.27490 ha^{-1}, respectively. Regarding BC ratio, it was higher under SRI (3.12) than conventional method (2.28). 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.9,980 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 22.1 per cent higher yield, substantial water saving (35.0 %), higher water use efficiency and better income 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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