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Upscaling SRI in Agniyar Sub-basin, Thanjavur District, Tamil Nadu under TN-IAMWARM Project

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Experiments were conducted to popularize System of Rice Intensification (SRI) in Agniyar sub basin through demonstrations in 285 hectares covering the villages of 8 blocks comprising Thanjavur and Pudukkottai district, Tamil Nadu during November 2009-February 2010 under World Bank sponsored TN– IAMWARM Project. SRI method of rice cultivation was compared with conventional method in all the villages of demonstrations. The results showed that adoption of SRI favourably influenced the yield attributing parameters of rice *viz.,* number of productive tillers m^{-2}, length of panicle and numbers of grains $panicle^{-1}$. The superiority of SRI was proved in terms of grain yield as evidenced by an over all increase of 37.6 per cent (5886 kg ha^{-1}) in yield over conventional system in the sub basin. Higher net profit and B: C were also associated with SRI over conventional method of rice cultivation in all the locations of demonstrations. SRI recorded an average additional net profit of Rs.15480 ha^{-1} and B:C ratio of 2:29.

Key words: SRI, Rice, yield parameters, grain yield, economics

System of Rice Intensification (SRI) refers to a set of critical management practices adopted originally in Madagascar in early eighties to overcome the soil problem viz., acidity and follows a comprehensive approach comprising of various management practices simultaneously which resulted in promising outcome (Uphoff, 2001). Efforts were revived in many countries including India to popularize SRI since 2003. SRI emphasises mainly on utilizing early growth vigour of seedlings, facilitates less competition for light and nutrients, enhances resource use efficiency (seeds, water, fertilizer and pesticides) and brings down over dependence on chemical fertilizers and promotes better root growth and enhanced soil microbial activity (Satyanarayana *etal.,*2006).

The set of six simple practices such as planting young seedlings (14- 15 days), planting seedlings at wider spacing (25 x 25 cm), alternate wetting and drying upto vegetative phase to keep soil moist, applying organic manures, employing cono weeding upto 40 DAT at 10 days interval starting from 10-15 DAT and incorporating the weed biomass, N management through LCC are emphasized. Tamil Nadu irrigated Agriculture Modernization and Water bodies Restoration and Management (TN-IAMWARM) is a unique World Bank funded multi-disciplinary project implemented in Tamil Nadu in 63 selected sub basins of which, Agniyar is one of the sub basin. The prime objective of the project is to maximize the water productivity and enhancing the farmers income. Considering the cropping pattern of the sub basin, SRI was taken as the focal theme of the project, since it offers a significant scope to fulfil the objective of the project. With this background multi location demonstrations were carried out in the 8 blocks of Agniyar sub basin in 285 ha during 2009-2010.

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Materials and Methods

Demonstrations on SRI (285 locations) were conducted covering 8 blocks of Agniyar sub basin during samba 2009-10 to popularize the performance of SRI in the Agniyar sub basin. The details of the demonstration locations are enlisted in Table 1. The ruling varieties of the sub basin viz., CR 1009, BPT-5204, ADT36, ADT39, ADT43 and ADT45 were utilized to carryout the demonstrations as per the farmer's preference. The essential components of SRI., viz., 14 days old single seedling, square planting with a spacing 25 x 25 cm, cono weeding and intermittent irrigation were taken care off. The crops were raised as per the package recommended for SRI. The soil types in the demonstrations areas ranged from sandy loam to loam, which was mostly poor in its inherent fertility. All the demonstrations were conducted as per the package recommended for SRI and compared with neighbouring conventional method of rice cultivation in every location. The biometric observations, yield data were recorded on whole plot basis and economics were worked out.

While beginning the popularization of SRI in the sub basin, the rice farmers were taken for exposure visit to successful farmers of nearby areas to get first hand information on SRI and subsequently imparted with adequate training on SRI. All the demonstrations were carried out under the assistances of scheme SRF's, besides field level demonstrations were also organized for all the vital operations of SRI in every village. Field days were organised during critical crop growth stage to highlight the superiority of SRI to the neighbouring farmers as a means for up-scaling the technology. The rural women self help group were also trained on square planting and various planting groups were formed in several villages of the sub basins. The scope of SRI the sub basin mainly relies upon strict adherence of main principles of SRI. The adoption of SRI perhaps was full-filled by some farmers and partial by others based on the prevailing field condition, other climatic conditions and this ultimately reflected in the performance of SRI. Since the seed requirement is meagre, the farmers motivated to go for quality seeds. The concept of community nursery was practiced in some of the villages as a means to promote SRI since it reduces labour and maintenance cost of nursery rising.

Results and Discussion

The results showed that there was an overall increase of 37.6 per cent in rice yields due to adoption of SRI over conventional system of rice cultivation in the sub basin as a whole. This implied that rice yield could be enhanced to the tune of 37.6 per cent by the adoption of SRI and the performance of SRI was quite encouraging in all the locations of demonstrations. The performance of SRI varied from location to location, based on soil type, soil fertility, farmer's involvement, indicating that response of SRI is location specific. The mean grain yield under SRI varied from 5000 to 6650 kg ha^{-1} irrespective of soil type, location across the sub basin. In Thanjavur District, the highest yield of 6100 kg ha^{-1} (40 per cent) was recorded in Ennanivayal of Pattukkottai block (Table 2) while in Pudukkottai district, the yield was the highest (36 per cent) 6650 kg ha^{-1} in Neduvasal village of Karambakudi block in Pudukkottai District. Out of 285 ha of demonstrations conducted during 2009-10, the average yield under SRI was 5886 kg ha^{-1}, while in conventional system it was only 3636 kg ha^{-1}. The yield increase under SRI was mainly due to higher leaf area index (LAI), greater leaf size and vigorous root system due to wider spacing and periodical cono- weeding. Planting young seedlings make it possible to allow more duration under vegetative phase in the main field leading to completion of more phyllochrons at early stage. This phenomenon resulted in more number of effective tillers $hill^{-1}$. Whereas, rice grown under conventional system due to preferential root growth in limited soil volume degenerate under continuous submergence and looses major portion of roots before it enter into reproductive phase (Pandian, 2010). In contrast alternate wetting and drying combined with periodical mechanical weeding (cono weeding) practiced under SRI creates better soil aeration, root respiration which leads to enhanced foraging ability of rice roots under SRI. Superiority of SRI over conventional of system of rice cultivation was proved in various soil types and locations (Surya Prabha *et al.,* 2011). The cost of cultivation, net return and B: C was worked out for all the 285 ha of SRI demonstrations and conventional method of rice cultivation in every location. Highest net return (Rs. 27000 ha^{-1}) was recorded at Pudupatti of Karmbakudi block in Pudukkottai District (2.28), while the highest B: C was associated with Koodalivayal of Peravurani block in Thanjavur District of the sub basin as a whole. Hugar *et al.* (2009) also reported that SRI method also recorded higher B: C ratio of 2.03 and he reported that among the different rice establishment methods tried, SRI method was

Table 1. SRI demonstration details in Agniyar sub basins

District	Block	Village (no of demos)
Thanjavur	Pattukottai	Manavayal (8), Karugavayal (22), Ennainivayal (11), Sendakottai (12), Kattathi (2)
	Sethubavachathiram	Pallathur (14), Chokanathapuram (10), Maruthangavayal (15), Kollukadu (5)
	Peravurani	Koodalivayal (4)
Pudukottai	Pudukottai	Varappur (3), Pulavankadu (6), Perungalur (7)
	Thiruvonam	Nambivayal(15), Unjaividuthi (3), Akkaraivattam(3), Chinnammankudi (2)
	Annavasal	Annavasal (6)
	Karambakudi	Thombarampatti (3), Pallavarayampathai (6), Pudupatti (1), Iaikadividuthi (6), Karambaviduthi (11), Karambakudi (2), Kulanthiranpattu (4), Mullankurichi (1), Neduvasal (3), KK Patti (8)
	Kunnandarkovil	Odukkur (21), Kulathur (13)
	Gandarvakottai	Sundampatti (4), Mattangal (15), Pisanthur (8), Kattunaval(1), Athankaraividuthi (19), Raghunathapuram (12)

Table 2. Comparative performance of SRI over conventional method of rice cultivation

District / Block/ village	Yield attributes							Yield (kg ha^{-1})					Economics			
	No. of demo	Productive tillers plant^{-1}		Panicle length (cm)		Grains panicle^{-1}		SRI			Conv.	%	Net return (Rs ha^{-1})		B:C ratio	
		SRI	Con.	SRI	Con.	SRI	Con.	Max	Min	Mean	Mean	increase	SRI	Con.	SRI	Con.
Thanjavur district (Pattukkottai Block)																
Manavayal	08	25	9	22.8	19.2	256	164	6,800	4,800	5,575	4,070	37	19,406	10673	2.25	1.51
Kargavayal	22	28	12	22.5	19.1	247	186	6,700	4,900	5,877	4,243	39	19,500	9945	2.25	1.42
Ennanivayal	11	24	15	22.8	19.3	254	161	6,800	5,100	6,100	4,345	40	20,841	12505	2.31	1.53
Sendakottai	12	21	9	22.4	19.1	236	154	6,600	4,800	5,808	3,983	46	18,833	8475	2.20	1.60
Kattathi	02	24	16	21.1	19.3	234	141	5,500	4,500	5,000	4,200	19	11,000	6720	2.00	1.30
Nambivayal	15	26	9	23.8	19.6	183	123	6,900	4,700	5,886	4,736	24	19,679	11780	2.29	1.55
Peravurani block																
Koodalivayal	04	28	14	22.6	19.2	236	152	6,700	5,600	6,100	4,070	50	19,625	11775	2.28	1.53
Sethubhavachatiram block																
Pallathur	14	23	14	21.5	19.3	248	181	6,000	4,700	5,385	3,900	38	13,000	7200	2.19	1.37
Chokkanathapuram	10	24	19	22.3	19.3	249	182	6300	4,900	5,770	3,730	54	13,000	7200	2.12	1.36
Maruthangavayal	15	24	10	24.3	19.4	252	161	8,600	4,500	6,300	4,100	53	13,000	7200	2.15	1.44
Kollukadu	05	22	9	21.2	19.2	258	162	5,600	4,800	5,800	3,850	50	13,000	7200	2.10	1.32
Pudukkottai District (Pudukkottai block)																
Varrappur	03	21	9	23.7	19.1	280	191	6,900	5,900	6,366	3,566	63	13,000	7200	2.13	1.38
Pulavankadu	06	20	14	22.5	19.5	281	169	6,700	5,800	6,250	4,450	40	13,000	7200	2.14	1.40
Perungalur	07	27	12	21.5	18.8	214	164	6,000	4,900	5,207	3,878	34	13,000	7200	2.17	1.39
Karambakudi block																
Neduvasal	03	28	12	22.8	19.6	296	194	6,800	6,500	6,650	4,866	36	13,000	7200	2.18	1.42
KK Patti	08	22	9	21.7	19.6	223	161	6,400	5,400	5,719	4,613	24	18,688	10278	2.25	1.52
Thombaranpatti	03	20	12	21.7	19.5	207	131	6,500	5,800	6,133	4,500	36	21,667	12566	2.25	1.40
Pallavarayanpathai	06	19	9	22.7	19.4	183	134	6,800	5,500	5,800	4,116	41	19,214	10650	2.26	1.46
Puduppatti	01	25	13	21.2	19.3	235	140	5,300	5,300	5,300	4,000	33	27,000	12150	2.30	1.54
Iaikadividuthi	06	26	9	22.6	19.2	198	101	6,700	5,000	5,767	4,000	44	15,300	8262	2.20	1.42
Karambaviduthi	11	21	10	22.6	19.4	168	121	6,700	4,200	5,945	4,132	44	18,050	9205	2.30	1.57
Karambakudi	02	24	11	21.5	19.3	172	130	6,000	5,700	5,850	4,150	46	20,333	12606	2.32	1.57
Kulanthiranpattu	04	20	9	21.9	19.3	207	129	5,900	4,500	5,200	4,075	28	14,500	7525	2.3	1.56
Mullankurichi	01	26	14	22.6	18.7	183	139	6,500	5,500	6,500	3,568	55	13,000	7200	2.12	1.38
Gandarvakkottai block																
Ragunathapuram	12	23	13	22.6	19.6	199	132	6,700	5,500	5,975	4,858	23	20,458	12400	2.30	1.59
Sundampatti	04	24	15	21.3	19.3	198	104	5,750	5,200	5,400	4,087	32	13,000	7200	2.10	1.31
Mattangal	15	25	9	21.5	19.3	170	132	6,000	5,100	5,483	4,230	29	13,000	7200	2.13	1.35
Pisanathur	08	27	12	22.2	18.8	209	114	6,100	5,200	5,500	3,,850	42	13,000	7200	2.14	1.39
Kattunaval	01	23	14	21.8	19.5	190	103	5,800	5,800	5,800	4,500	28	13,000	7200	2.11	1.32
Athankaraividuthi	19	25	11	21.4	19.1	214	112	5,700	4,150	5,272	4,057	29	13,000	7200	2.19	1.44
Thiruvonam Block																
Unjaividuthi	03	28	13	21.2	19.4	229	140	6,100	5,450	5,283	4,333	21	21,375	11543	2.27	1.50
Akkaraivattam	03	23	10	21.1	19.5	195	102	5,950	4,600	5,816	4,583	27	21,750	10650	2.26	1.47
Chinnammankudi	02	25	11	22.6	19.4	234	143	6,600	4,600	5,600	4,650	20	20,500	11275	2.27	1.53
Annavasal block																
Annavasal	06	23	11	21.8	19.2	243	171	5,800	4,800	4,958	3,925	26	16,417	7223	2.3	1.51
Kunnandarkovil block																
Odukkur	21	25	12	22.7	18.9	215	159	6,500	6,500	5,619	3,957	42	14,905	7155	2.43	1.65
Kulathur	13	27	13	22.6	18.5	284	182	6,700	5,200	5,850	3,600	62	13,154	7760	2.39	1.60

Conv- Conventional

more productive, economical and sustainable and it enhances rice yield and fetches higher returns

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