

## Extent of Adoption of System of Rice Intensification (SRI) Practice in India

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### ABSTRACT

The present paper explores the extent of adoption of System of Rice Intensification (SRI) practice in India. The extent of adoption is measured as the percentage of actual practice to recommended SRI practice. The present research was undertaken in Andhra Pradesh and Tamil Nadu states where SRI was introduced first in our country. A total of 100 respondents (50 from each state) were selected through proportionate random sampling technique. An ex-post-facto research design was used. Data collection was done through interview method. The overall extent of area of adoption of recommended SRI practice by the respondents was 70.6 per cent. Around one-third of respondents in Tamil Nadu and one-fourth of the respondents in Andhra Pradesh state adopted recommended SRI practice in 81 to 100 per cent area to total area under cultivation. Nearly one-third of the respondents in both Tamil Nadu and Andhra Pradesh adopted 71-80 per cent of recommended SRI practice. Only 15 per cent of respondents adopted 91-100 per cent of recommended SRI practice. Practice wise analysis revealed that nursery area and seed rate were found to be over adopted. Majority of respondents transplanted 8-15 days old seedlings and placed the root at 1-2cm depths. Almost all respondents adopted wider spacing in square patterns. Nearly three-fourth of the respondents transplanted one seedling per hill. Little above half of the respondents adopted levelling the field, marking on the field at 25cm interval with a marker and cono-weeding. Half of the respondents adopted application of more organic manure and less of fertilizer and agro-chemicals. Only 40 per cent of the respondents adopted alternate wetting and drying practice for water management. The most important factors which influenced respondents for adoption of SRI practice were a lower seed rate, high grain and straw yield, less cost of cultivation and to obtain subsidies. Other factors were motivation by extension official and friends and neighbours and water requirement are less.

**Key words:** SRI, Adoption, Extent of adoption, Extent of area of adoption, Practice wise extent of adoption

### INTRODUCTION

System of Rice Intensification (SRI) has received considerable attention both within and outside of Madagascar, where the method originated. Merely by changing a few interrelated agronomic practices, SRI has repeatedly generated dramatic increases in crop yields (Stoop, *et.al.*, 2002). The SRI therefore, seems ideally suited to the needs of small farmers in a country where rice productivity is extremely low and most farmers are unable to grow enough rice to feed their families (Barrett and Dorosh, 1996). But like many promising agricultural technologies in the developing world, its adoption has been disappointing; adoption rates have been low, non-adoption rates have been high, and the method has largely failed to spread spontaneously beyond the communities into which it has been introduced. Keeping this in view, the present paper explores the extent of adoption of SRI practice in India.

### METHODOLOGY

Adoption has been conceptually defined as, "a decision to continue full use of an innovation" (Rogers and Shoemaker, 1971). For the purpose of this study,

adoption was operationalized as full use of recommended SRI practices.

Perusal of literature and consultation with scientists, developmental workers and farmers' indicate that 12 practices have been identified as recommended practice in SRI.

Extent of adoption was measured based on the formula used by Kumar (2005) :

$$\text{Extent of adoption} = \frac{\text{Actual Practice}}{\text{Recommended practice}} \times 100$$

Among 12 practices, 2 practices *viz.*, nursery area and seed rate, whatever adopted by the respondents were taken directly as actual practice. Whereas for other practices, only if the recommended SRI practice adopted fully, it was considered as actual practice, otherwise it was considered as non-adoption. The extent of adoption is measured as the percentage of actual practice to recommended SRI practice.

Similarly, extent of area of adoption of SRI practice was measured as:

$$\text{Extent of area of adoption} = \frac{\text{Area under SRI cultivation}}{\text{Total land holding}} \times 100$$

Research was undertaken in Andhra Pradesh and Tamil Nadu states where SRI was introduced first in our country. Two districts, namely Guntur and Vizianagaram, from Andhra Pradesh and Thanjavur district from Tamil Nadu were selected purposively based on the area under SRI. The *taluks* now *mandals* or villages from these districts were selected through random sampling technique. A total of 100 respondents (50 from each state) were selected through proportionate random sampling technique. An *ex-post-facto* research design was used. Data collection was done through interview method. Data were subjected to suitable statistical analysis like percentage analysis, Garret ranking and chi-square test.

**RESULTS AND DISCUSSION**

**Overall extent of area of adoption**

The overall extent of area of adoption of recommended SRI practice by the respondents was 70.6 per cent. The overall extent of area of adoption by the respondents was slightly higher in Tamil Nadu state (72.4%) than Andhra Pradesh state (68.8%).

**Table 1: Overall extent of area of adoption of recommended SRI practice**

Items	Tamil Nadu (n=50)	Andhra Pradesh (n=50)	Total (N=100)
	(%)	(%)	(%)
Area	72.40	68.80	70.60

**Distribution of respondents according to their overall extent of area of adoption**

Distribution of respondents according to their overall extent of area of adoption on recommended SRI practice are presented in following table.

**Table 2: Distribution of respondents according to their overall extent of area of adoption on recommended SRI practices**

Overall extent of area of adoption (in per cent)	Tamil Nadu (n=50)		Andhra Pradesh (n=50)		Total (N=100)	
	No.	%	No.	%	No.	%
41-60	14	28	19	38	33	33
61-80	20	40	18	36	38	38
81-100	16	32	13	26	29	29

$2 = 1.172^{NS}$

NS, Non-significant

The findings indicated that more than one-third of the respondents in both Tamil Nadu and Andhra Pradesh state

adopted recommended SRI practice in 61 to 80 per cent areas to their total land holdings. (Table 2). Around one-third of respondents in Tamil Nadu and one-fourth of the respondents in Andhra Pradesh adopted recommended SRI practice in 81 to 100 per cent areas. Overall 38 per cent of respondents adopted recommended SRI practice in 81 to 100 per cent areas and exactly one-third of the respondents adopted recommended SRI practice in 41 to 60 per cent areas.

Non-significant chi-square value implied that there was no significant difference between Tamil Nadu and Andhra Pradesh respondents with respect to overall extent of area of adoption on recommended SRI practice. Thus similar trend was observed in both Tamil Nadu and Andhra Pradesh state for overall extent of area of adoption on recommended SRI practice.

**Overall extent of adoption**

Distribution of respondents according to their overall extent of adoption on recommended SRI practice revealed that nearly one-third of the respondents in both Tamil Nadu and Andhra Pradesh adopted 71-80 per cent of recommended SRI practice. Little above one-third of the respondents in both Tamil Nadu and Andhra Pradesh adopted 81-100 per cent of recommended SRI practice. Very few respondents in Tamil Nadu (12%) and Andhra Pradesh (18%) adopted 51-60 per cent of recommended SRI practice.

Overall 30 per cent of respondents adopted 71-80 per cent of recommended SRI practice. It was followed by 21 per cent of respondents adopted 61-70 per cent of recommended SRI practice. Only 15 per cent of respondents adopted 91-100 per cent of recommended SRI practice.

The chi-square value was non-significant, which implied that there was no significant difference between Tamil Nadu and Andhra Pradesh respondents with respect to overall extent of adoption on recommended SRI practice. The results showed that similar trend was observed in both Tamil Nadu and Andhra Pradesh state with respect to overall extent of adoption.

**Table 3: Distribution of respondents according to their overall extent of adoption on recommended SRI practices**

Overall extent of adoption (in per cent)	Tamil Nadu (n=50)		Andhra Pradesh (n=50)		Total (N=100)	
	No.	%	No.	%	No.	%
51-60	6	12	9	18	15	15
61-70	10	20	11	22	21	21
71-80	16	32	14	28	30	30
81-90	10	20	9	18	19	19
91-100	8	16	7	14	15	15

$2 = 0.90^{NS}$

NS, Non-significant

### Practice-wise extent of adoption

The practice-wise the extent of adoption of recommended SRI practice was presented in Table 4.

**Table 4: Practice wise extent of adoption of SRI practice**

Items	Recommended practice	Tamil Nadu (n=50)	Andhra Pradesh (n=50)	Total (N=100)
		(%)	(%)	(%)
Nursery	Area: 2Kg seed in 1 cent Raised beds of 5-6 inches	105	104	104.5
Seed rate	2-3 Kg/acre	101	104	102.5
Main field preparation	Basal application of FYM Levelling and marking lines on the surface at 25cm interval	58	63	60.5
Transplanting	8-15 days old seedling Seedlings are treated gently by scooping, no pulling, no washing, no stocking and no bundling Place the root horizontally just below the surface (1-2cm in moist soil)	84 100	78 100	81.0 100.0
No. of seedlings per hill	One seedling	76	72	74.0
Wider spacing	22.5 X22.5 cm or 25X25 cm upto 45X45 cm Square	92	100	96.0
Planting pattern		92	100	96.0
Water management	Alternate wetting & Drying upto panicle initiation stage. From panicle initiation stage 1-2 cm of standing water	42	38	40.0
Weed management	Use of mechanical rotary weeder every 10-12 days of interval for 3 to 4 times	58	52	55.0
Nutrient and Pest & Disease management	Little or no use of fertilizers and agro-chemicals More use of organic manure	59	44	51.5
<b>Total</b>		78.25	76.92	77.59
		$\chi^2 = 4.013^{NS}$		

From the analysis of total respondents, it could be seen that two practices, viz. nursery area (104.5) and seed rate (102.5) have been over adopted. Handling the seedlings for transplanting gently was fully adopted by the respondents. Almost all respondents adopted wider spacing in square patterns. Transplanting 8-15 days old seedlings were adopted by 81 per cent of respondents. Nearly three-fourths of the respondents transplanted one seedling per hill. Majority of respondents (70%) placed the root at 1-2cm depths. Little above half of the respondents adopted leveling the field, marking on the field at a 25cm interval with a marker and cono-weeding. Half of the respondents adopted application of more organic manure and less of fertilizer and agro-chemicals. Only 40 per cent of the respondents adopted alternate wetting and drying practice for water management.

Practice-wise analysis revealed the following findings:

**1. Preparation of nursery:** In Tamil Nadu (105%) and Andhra Pradesh (104%) for nursery preparation, instead of one cent area, respondents adopted two to three cent's areas. This resulted in over adoption.

**2. Seed rate:** In Tamil Nadu (101%) and Andhra Pradesh (104%) instead of a recommended seed rate (2-3kg per

acre), some respondents' adopted higher seeds rate. This resulting in over-adoption

**3. Main field preparation:** More than half of the respondents in Tamil Nadu (58%) and Andhra Pradesh (63%) adopted the basal application of farm-yard manure, leveling the field and marking the field with the marker at a 25cm interval.

**4. Early transplanting:** Transplanting young seedling is the unique feature of SRI. Majority of respondents in Tamil Nadu (84%) and Andhra Pradesh (78%) transplanted 15 days old seedlings. While transplanting the seedling, cent per cent of the respondents in Tamil Nadu and Andhra Pradesh handled the seedlings gently, without causing damage to the roots. Placing the roots horizontally, just below the surface at 1-2cm depth was adopted by 72 per cent and 68 per cent of Tamil Nadu and Andhra Pradesh respondents respectively.

**5. Number of seedlings per hill:** Nearly three-fourths of the respondents in Tamil Nadu and Andhra Pradesh transplanted one seedling per hill.

**6. Wider spacing:** Hundred of respondents in Andhra Pradesh and 92 per cent of respondents in Tamil Nadu transplanted the seedlings at wider spacing (plant-to-plant and row-to-row spacing is 25cm).

**7. Planting pattern:** A total of 100 per cent of respondents in Andhra Pradesh and 92 per cent of respondents in Tamil Nadu adopted a square planting pattern.

**8. Water management:** Only 42 per cent of respondents in Tamil Nadu and 38 per cent of respondents in Andhra Pradesh adopted alternate wetting and drying up to panicle initiation stage and from panicle initiation stage 1-2cm of standing water is maintained till 10 days before harvesting.

**9. Weed management:** More than half of the respondents in Tamil Nadu (58%) and Andhra Pradesh (52%) used mechanical rotary weeder (cono weeder) for weed management at every 10-12 days of interval for maximum three to four times.

**10. Nutrient and pest and disease management:** More than half of the respondents in Tamil Nadu (58%) and little less than half of the respondents (44%) in Andhra Pradesh adopted application of more organic manure and less of fertilizer and agro-chemicals.

Chi square test was applied to study the relationship between respondents of the two states with respect to practice-wise extent of adoption of recommended SRI

practices. Chi square value was non-significant. Though there was some difference in extent of adoption between two categories of respondents, the difference was not statistically significant.

### Factors influencing adoption of SRI practice

Factor influencing adoption of SRI practice was studied and presented in Table 5. Respondents were asked to rank the factors which influenced them for adoption of SRI practice and then this rank was converted into mean score with the help of Garrett's Ranking Technique. These mean scores were arranged in descending order, ranks were given and most important factors were identified.

Overall analysis revealed that the most important factors which influenced respondents for adoption of SRI practice were a lower seed rate (75.25), high grain and straw yield (63.35), less cost of cultivation (61.21) and to obtain the subsidy (54.28). Other factors were motivation by extension official (40.91) and friends and neighbours (29.26) and water requirement was less (35.01).

The most important factor which influenced Tamil Nadu (71.33) and Andhra Pradesh (77.60) respondents for adoption of SRI practice was lower seed rate. Other important factors which influenced respondents in Tamil Nadu for adoption of SRI practice were: less cost of cultivation (69.90), high grain and straw yield (61.28) and to obtain the subsidy (57.94). Similarly, other important factors which affected respondents in Andhra Pradesh for adoption of SRI practice were, high grain and straw yield (65.42), less cost of cultivation (52.52), and to obtain the subsidy (51.30). In Tamil Nadu and Andhra Pradesh motivation by extension official and friends and neighbours played an important role in adoption of SRI practice.

**Table 5: Factors influencing adoption of SRI practice**

Factors influencing adoption	Tamil Nadu (n=50)		Andhra Pradesh (n=50)		Total (N=100)	
	Mean score	Rank	Mean score	Rank	Mean score	Rank
Lower seed rate	71.33	I	77.60	I	75.25	I
High grain and straw yield	61.28	III	65.42	II	63.35	II
Cost of cultivation is less	69.90	II	52.52	III	61.21	III
To obtain subsidy	57.94	IV	51.30	IV	54.28	IV
Motivation by extension official	47.33	VI	34.20	V	40.91	V
Water requirement is less	49.56	V	20.46	VII	35.01	VI
Motivation by friends and neighbours	30.24	VII	28.88	VI	29.26	VII

The extent of adoption of system of (SRI) was significantly good in Tamil Nadu and Andhra Pradesh because the overall extent of adoption and extent of area of adoption of recommended SRI practice was above 50 per cent.

Around two-thirds of respondents in Tamil Nadu and three-fourths of respondents in Andhra Pradesh state adopted recommended SRI practice in 41 to 80 per cent area to total area under cultivation. This result is because majority of the respondents operational holdings are medium (2-4 ha) to semi-medium (4-10 ha) category, where they are not able to cover entire area under SRI cultivation due to technical and labour constraints. This finding is consistent with Namara *et al.*, (2003).

Nearly two-thirds of respondents in both Tamil Nadu and Andhra Pradesh adopted 51-80 per cent of recommended SRI practice because the extent of adoption was poor for practices like weed, water, nutrient and pest and disease management.

Only 15 per cent of respondents adopted 91-100 per cent of recommended SRI practice. This shows very few respondents completely understood the essential principles of SRI.

Practice-wise analysis indicated over-adoption in two practices, namely, nursery area and seed rate. This is because instead of 1 per cent area, some respondents adopted 2-3 per cent area for nursery preparation, Similarly, instead of a recommended seed rate (2-3 kg per acre); some respondents' adopted higher seeds rate (four to six kilograms per acre).

ICRISAT-WWF project (2008b) reported that "careful transplanting of the young seedling and wider spacing were adopted in full. Planting a young seedling, just 8-12 days old, was also adopted by a majority." Similar findings are reported in this study: majority of respondents transplanted 8-15 days old seedlings and placed the root at 1-2cm depths, careful transplanting of a young seedling was fully adopted by the respondents. Almost all respondents adopted wider spacing in square pattern. Nearly three-fourths of the respondents transplanted one seedling per hill. These findings also derive support from Sinha and Talati (2006) and Rao (2008).

Due to non-availability of conoweeder and marker, majority of respondents not adopted levelling the field, marking on the field at 25 cm intervals with the marker and cono-weeding. Conventionally, farmers used to apply more of inorganic fertilizers and agro-chemicals. Hence, majority of them were finding difficulty to adopt application of less inorganic fertilizer and agrochemical. Only few respondents adopted alternate wetting and drying practice for water management. The main reason behind that was creating drainage channels for alternate wetting and drying was not possible as entire community

is not going for SRI. Moreover, it is very difficult to drain water from paddy fields during rainy seasons and hence water management is difficult in delta areas. These findings derive support from Sinha and Talati (2006), Rao (2008) and ICRISAT-WWF project (2008b) which reported that most farmers have performed poorly in the management of water, fertilizer, hoeing and weeding. Little attention was paid in preparing drainage channels, which are crucial to facilitate alternate wetting and drying.

Overall analysis revealed that the most important factors which influenced respondents for adoption of SRI practice were lower seed rate, high grain and straw yield, less cost of cultivation and to obtain the subsidy. Other factors were motivation by extension official, friends, neighbours and less water requirement. In Tamil Nadu and Andhra Pradesh motivation by extension officials and friends and neighbours played an important role in adoption of SRI practice. These findings are consistent with Krishnan (2008) who mentioned that the main factors for adoption of SRI were concerted institutional support, SRI saved the operational cost involved in nursery raising, uprooting, bundling and lifting to the field, reduced requirements of seeds, higher yield compared to the prevailing cultivation system, proven experience in saving of water and found it as the best option to address water crisis.

### CONCLUSION

Thus SRI is a slow-moving technology worth repeating for years so that beneficiaries continue with the practice gradually after convincing themselves about the real benefits behind the technology. Small and medium sized farmers are showing willingness to adopt new techniques and allocate more area for new technique if it suits the local condition. Developmental workers should give more attention to the factors influencing the adoption of SRI, while disseminating SRI practice. Policy and research interventions are needed to facilitate and support farmers for full adoption of SRI. Thus, synergistic approach among biological scientists, social scientists, and farmers for development of SRI method holistically is the need of the hour.

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