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Extent of Adoption of System of Rice Intensification (SRI) Technology by the Farmers of Tripura

B. Debberma, D. Ram*, M.K. Singh and M. Deepa Devi

College of Agriculture, Central Agricultural University, Imphal-795004, Manipur, India

**Corresponding author*

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A B S T R A C T

The present study was carried out in Tripura during 2014-15. A Sample of System of Rice Intensification (SRI) Technology of farmers comprising 150 respondents was selected on stratified random sampling with proportional allocation method. The primary data was collected using pre-tested structured interview schedule. Majority of the respondents 60 per cent had medium in extent of adoption of SRI technology followed by high level of adoption 26.67 per cent and low 13.33 per cent level of adoption. The study reveals that education, annual income, operational land holding, risk orientation, mass media exposure, social participation, source of information, innovation proneness and economic motivation were found to be positively significant at 0.01 level of probability and cropping intensity is found at 0.05 level of probability with their extent of adoption of SRI technology. This indicates that majority of the farmers were in medium and high level of adoption due to having good knowledge and aware of high production in SRI technology as compare to traditional rice cultivation practices.

Introduction

The system of Rice Intensification (SRI) is a methodology aimed at increasing the yield of rice under a different production system. The technology is a civil society innovation occurred outside the formal research system that was first developed accidentally in Madagascar by Father Henri de Laulanié, who combined field observations of rice plant performance with a series of experiments over a decade (Laulanié, 1993). The new set of practices greatly improved the growing environment for rice plants, evoking more productive phenotypes from all rice genotypes with a host of improved practices under specific recommendations *viz*., minimum water use, single transplantation of young seedling in a square pattern of spacing (25cm x 25cm) through efficient soil and nutrient management rather than use of new or purchased external inputs. It is being observed that System of Rice Intensification (SRI) practices result in a sharp decrease of inputs such as seeds, chemical fertilizers and water supply which directly affect.

Production costs. Today, India stands as one of the largest numbers of System of Rice Intensification (SRI) farmers in the world (Johnson and Vijayaragavan, 2011). In Tripura, the smallest one in terms of

geographical area still the second largest producer of rice after Assam among the north-eastern states, rice is the principle cereal crop and food security strictly depends there on rice production as no other cereals are grown by the farmers of that state due to both food habits and agro-climatic situations. In the face of demographic pressure and shrinkage in the cultivable area, especially rice, the State Department of Agriculture put forward strategic efforts to promote System of Rice Intensification (SRI) method of rice cultivation for enhancement of rice productivity and thereby to attain food self-sufficiency in the coming days. Tripura was the 1st N-E state to take up SRI assessment and promotion in 1999. Later on it came under the scheme of "Macro Management in Agriculture" sponsored by GOI, first trial was done in the Bagafa sub-division of south district in the year 2001. Through the adoption of the System of Rice Intensification (SRI) technology in paddy cultivation could increase productivity of rice from 2.5 t/ha to about 3.5 t/ha as on to 1 day with a quantum jump of 3.4 per cent amelioration in the state. This has been a slogan among the State farmers for their increased output with lesser production inputs resulting to alleviation of income with less expenditure. On the other hand a substantially large proportion of the rice areas in that state are yet to take off from traditional rice cultivation practices. Since many farmers still continue with their old cultivation practices. In view of above facts and notions the present study was carried out with the specific objective viz. to extend of adoption of System of Rice Intensification (SRI) Technology by the farmers in the Tripura.

Materials and Methods

The present study was carried out in Tripura during 2014-15. Out of total eight districts in the state, Dhalai District was selected keeping in view of highest population, population density and highest rice growers. Dhalai District of Tripura was selected purposively for present study. Ex-post facto research design was employed. There are seven blocks under Dhalai district. One (Durgachawmuhani) block was selected randomly for present study, since majority of the farmers was cultivating rice crops. Three villages were selected randomly in the block for present study. A Sample of System of Rice Intensification (SRI) Technology of farmers comprising 150 respondents was selected on stratified random sampling with proportional allocation method. The primary data was collected using pre-tested structured interview schedule. Analysis of primary data was carried out using multidimensional scaling technique of SPSS-16 besides conventional correlation analysis as part of exploratory approach of data analysis.

Results and Discussion

Extent of adoption of SRI technology practices by the farmers

An investigation was carried out on the adoption of selected recommended SRI technology practices followed by the farmers. In total, twenty selected cultivation practices of SRI technology were studied in terms of the number of adopters as well as the extent and nature of adoption of each individual practice.

Selection of land

It was found that all the respondents accounted 100 per cent in adopted category in selection of land in SRI technology practices.

Land preparation

Table 1 reveals that all the respondents accounted cent percent in adopted category in land preparation in SRI technology practices. The main field is prepared and levelled with

little standing water a day before planting for grid marking. Provision should be made for 30 cm wide channels at 2 meters interval. Perfect levelling is the pre-requisite for proper water management and good crop stand Kumar *et al.,* (2007).

Use of local seeds/ HYV seeds

Majority of the respondents 84.00 per cent were found in full adoption and followed by 16.00 per cent were found in partial adoption. It has been a universal observation that any variety, whether high yielding or land race, shows a higher response under SRI. The genetic potential of any variety or cultivar is expressed better in SRI because of the changed growing environment. Even though hybrids seem to fair well when compared to other cultivars Adhikari *et al.,* (2010).

Seed treatment

Table 1 reveals that majority of the respondents 80.00 per cent were found in full adoption and followed by 20.00 per cent in partial adoption. The important reason for seed treatment is that it plays an important role in protecting the seeds and seedlings from seed and soil borne diseases and insect pests affecting crop emergence and its growth. The adoption of this practice by the farmers across the country requires effective extension strategies making the appropriate chemical pesticides/bio-pesticides and equipments available to the farmers at their door steps beside making them aware of methods of seed treatment, post treatment handling of seeds and planting materials (Adhikari *et al.,* 2010).

Seed rate / ha

It shows that all the respondents accounted cent percent in adopted category. In SRI cultivation 2 kg of seeds (5 kg / ha) is required to transplant in one acre of land. Seed should be thinly spread to avoid crowding of seedlings. Care should be taken that no two seeds should touch each other.

Time of nursery rising

Table 1 reveals that all the respondents accounted cent percent in adopted category in nursery raising in SRI technology practices (Adhikari *et al.,* 2010).

Fertilizer use in nursery

Majority of the respondents 52.66 per cent showed full adoption of recommended fertilizer use in nursery and followed by 47.33 per cent of partial adoption.

Plant protection in nursery

The data presented in table 1 showed that majority of the respondents 72.66 per cent were found in full adoption and 27.33 per cent were found in partial adoption. The reason is that to avoid the insect pests attack and disease attack to the nursery crop.

Age of seedling (8-12 days old)

Table 1 also reveals that all the respondents accounted cent percent in adopted category in using the age of seedling in SRI technology. The reason for using the younger seedlings of 8-12 days old is for profuse tillering in SRI is the use of younger seedlings and to have a potential for producing a large number of tillers and roots simultaneously.

Transplanting spacing (25x25 cm)

Table 1 also reveals that all the respondents accounted cent percent in adopted category in maintaining of transplanting spacing in SRI technology. The reason for using wider spacing is to obtaining the optimum number of tillers/ panicles for maximum yield.

Table.1 Distribution of respondents based on extent of adoption of SRI technology among the farmers

(N=150)

Sl. No.	Package of practices	Extent of adoption			
		Full Adopted		Partial adopted	
		F	%	F	%
1	Selection of land (irrigated land)	150	100	0	0.00
2	Land preparation	150	100	0	0.00
3	Use of local seed/HYV seeds	126	84.00	24	16.00
4	Seed treatment	120	80.00	30	20.00
5	Seed rate/ha	150	100	0	0.00
6	Time of nursery raising	150	100	0	0.00
7	Fertilizer use in nursery	79	52.66	71	47.33
8	Plant protection in nursery	109	72.66	41	27.33
9	Age of seedling	150	100	0	0.00
10	Transplanting spacing	150	100	0	0.00
11	Number of seedlings/hill	150	100	0	0.00
12	Time of transplantation	130	86.67	20	13.33
13	Nitrogen fertilizer use	116	77.33	34	22.66
14	Phosphorus fertilizer use	106	70.66	44	29.33
15	Potash fertilizer use	110	73.33	40	26.66
16	Organic manure use	150	100	0	0.00
17	Weed management	150	100	0	0.00
18	Plant protection of transplanted crop	130	86.67	20	13.33
19	Water stagnation in the furrow up to panicle initiation stage	150	100	0	0.00
20	Water level after 45 days of transplanting	102	68.00	48	32.00

Table.2 Distribution of respondents based on their extent of overall adoption scores on recommended package of practices of SRI technology

N=150

Sl. No.	Category	Frequency	Percentage
1	Low	20	13.33
2	Medium	90	60.00
3	High	40	26.67
Total		**150**	**100**

Table.3 Correlation of personal, socio-psychological and communication characteristics with the extent of adoption of SRI technology

Sl. No	Characteristics	Correlation coefficient (r)
X_1	Age	0.582**
X_2	Family size	0.146 (NS)
X_3	Education	0.759**
X_4	Annual income	0.258**
X_5	Operational land holding	0.228**
X_6	Cropping intensity	0.197*
X_7	Risk orientation	0.245**
X_8	Mass media exposure	0.199*
X_9	Social participation	0.649**
X_{10}	Source of information	0.527**
X_{11}	Innovation proneness	0.292**
X_{12}	Economic motivation	0.535**

** Significant at 0.01 level; * Significant at 0.05 level; NS= Non-significant

Table.4 Regression co-efficient personal, socio-psychological and communication characteristics with the adoption of SRI technology practices

Sl. No.	Characteristics	Beta co-efficient a	Regression co-efficient(b)	Standard error (S.E) 'b'	't' value of 'b'
X_1	Age	0.066	0.058	0.076	0.759
X_2	Family size	0.053	0.355	0.375	0.947
X_3	Education	0.668	4.351	0.746	5.832**
X_4	Annual income	0.041	0.026	0.053	0.494
X_5	Operational land holding	-0.095	-0.966	0.940	-1.027
X_6	Cropping intensity	-0.148	-0.028	0.016	-1.790
X_7	Risk orientation	0.009	0.025	0.164	0.153
X_8	Mass media exposure	0.197	0.295	0.130	2.262**
X_9	Social participation	0.173	2.003	1.031	1.943*
X_{10}	Source of information	-0.020	-0.034	0.144	-0.234
X_{11}	Innovation proneness	-0.059	-0.328	0.354	-0.927
X_{12}	Economic motivation	-0.015	-0.024	0.139	-1.171

R^2 =0.635; F=19.890; **Significant at 0.01 level; *Significant at 0.05 level.

Number of seedlings/hill (1 Seedlings/hill)

It observed that all the respondents accounted cent percent in adopted category in using the number of seedling/hill. In SRI, only one seedling has to be planted per hill. The reason is that to avoid minimum trauma to the roots and to avoid root competition and to obtaining the optimum number of tillers/ panicles for maximum yield.

Time of transplantation

The data presented in Table 1 showed that majority of the respondents 86.67 percent were found in full adoption and followed by 13.33 per cent were found in partial adoption. The reason is that in SRI technology rice plant seedlings should be transplanted very young (usually just 8-12 days old) with just two small leaves and transplanted very carefully and quickly to inflict minimum trauma to the roots and to avoid root competition.

N-used

Majority of the respondents 77.33 per cent showed full adoption of recommended N-fertilizer used and followed by 22.66 per cent in partial adoption and none of the farmers are in nil adoption. It may be concluded that majority of the farmers had used nitrogenous fertilizer on their crops fully or partially. This might be due to the fact that they could visualize the pronounced effect of nitrogenous fertilizer in the rice crop Singh (2003) & Singh (2004).

P-used

Table 1 reveals that majority of the respondents 70.66 per cent are in full adoption followed by 29.33 per cent in partial adoption in phosphate fertilizer used. It may be concluded that majority of the farmers had used phosphate fertilizer on their rice crop fully or partially.

K-used

Majority of the respondents 73.33 per cent were found in full adoption followed by 26.66 per cent in partial adoption and 20. It might be concluded that majority of the farmers had used potasic fertilizer on their rice crop fully or partially (Singh 2003) & (Singh 2004).

Organic manure use

Table 1 showed that all the respondents accounted cent percent in adopted category in organic manure use in SRI technology. The reason may be that organic manures are recommended in SRI cultivation, since they are found to give better response (Singh 2003) & (Singh 2004).

Weed management

It was found that all the respondents accounted cent percent in adopted category in weed management in SRI technology. It might be concluded that alternate wetting and drying in SRI results in excessive weed growth which if unchecked in time may cause immense loss in yield. In SRI, the weeds are incorporated by operating co no weeder between rows at the right time, which also supply nutrients to the crop as green manures. The first advantage of using the weeder is the control of weeds and also adding organic matter to the soil. This gives the benefits of cultivating a green manure crop (Adhikari *et al.*, 2010).

Plant protection of transplanted crop

Majority of the respondents 86.67 per cent were found in full adoption and 13.33 per cent were found in partial adoption in plant protection of transplanted crop in SRI

cultivation by the farmers. The reason is that to reduce the critical crop weed competition (30-45days) after sowing otherwise yield get reduced to (15-40%).

Water stagnation in the furrow up to panicle initiation stage

Reported that all the respondents accounted cent percent in adopted category in keeping the water stagnation in the furrow up to panicle initiation stage in SRI technology. It is recommended that up to panicle initiation stage, to irrigate the field to 2.5 cm after the previously irrigated water disappears and hairline cracks develop and it is important point to remember that in SRI cultivation rice does not require flood water and it is enough to keep the soil moist(Adhikari *et al.,* 2010).

Water level after 45 days of transplanting

Majority of the respondents 68.00 per cent were found in full adoption and followed by 32.00 per cent of the respondents showed 'Adopted' in using of recommended water level.

Table 2 reveals that majority of the respondents 60 per cent had medium in extent of adoption of SRI technology followed by high level of adoption 26.67 per cent and low 13.33 per cent level of adoption. This indicates that majority of the farmers were in medium and high level of adoption due to having good knowledge and aware of high production in SRI technology as compare to traditional rice cultivation practices.

This section deals with the nature of relationship between selected dependent variables and independent variables. For ascertaining the relationship correlation coefficient was calculated between dependent variable and the twelve independent variables separately for the sample of SRI farmers. The 'r' values are given in Table 3. Correlation coefficients between Age, Education, Annual income, Operational land holding Cropping intensity, Risk orientation, Mass media exposure, Social participation, Sources of information, Innovation-proneness and Economic motivation were found to be positive and significant of personal, psychological and communication characteristics with adoption of SRI cultivation technology of the farmers (Kumar *et al.*, 2014), (Meshram, 2012), (Devi and Ponnarasi 2009), (Karki 2010), (Thatchinamoorthy and Rexlin, 2014), (Ray and Raj, 2014), (Kacharo, 2007), (Singha and Baruah 2011) and (Singha *et al.,* 2012). Whereas family size was found to be negative significance of personal, psychological and communication characteristics with adoption of SRI technology of the farmers.

All the twelve independent variables along with the dependent variable i.e. extent of adoption of SRI technology in rice cultivation were further taken into account for regression analysis. The findings of the analysis are presented in the Table 4 among the twelve independent variables fitted in the regression analysis, it was found that three variables namely education and mass media exposure were found significant at 0.01 level of probability to the prediction of adoption of SRI technology in rice cultivation and social participation was found significant at 0.005 level of probability. These three variables may be termed as the good predictors of adoption behaviors of SRI technology. Education and mass media exposure emerged as the most significant characteristics with the beta value (b) of 0.668 and 0.197 respectively, followed by social participation (b= 0.173). The R^2 value being 0.635, it can be suggested that all the twelve independent variables contributed towards 64 per cent towards the variation in the adoption of SRI technology in rice cultivation practices. The F

value (19.890) was also found to be significant at 0.01 level of probability.

On the basis of the study conducted, it could be concluded that that majority of the farmers (60 %) were in medium followed by high level (26.67 %) and low level (13.33 %) of adoption due to having good knowledge and aware of high production as compare to traditional rice cultivation practices. It was found that the variables Education Mass media exposure and Social participation contributed significantly to prediction of adoption behaviour and therefore is good predictors for the extent of adoption behaviour of SRI cultivation technology practices of rice growers.

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