



Factors Affecting the Adoption of System of Rice Intensification in Tripura: A Logit Analysis

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ABSTRACT

A field study was conducted in Tripura, a northeastern state of India during the winter season (2016-17) to identify the factors affecting the adoption of the System of Rice Intensification (SRI) in rice cultivation. The data were collected from 120 farmers were selected using multistage random sampling technique. A logit regression model was used to identify the factors and simple ranking techniques to rank the problems in adoption of SRI method. The results indicated that factors like literacy level and extension contact helped in the adoption of SRI. Though the coefficients associated with the age of respondents and landholdings were negative, none of them found significant. The constraints encountered by the respondents were unavailability of skilled labours (mean score 64.32), high cost of labour (61.11), high cost of paddy seed (58.40), non-availability of seeds of different varieties in proper time (57.76), difficulties in handling very young seedling for transplanting (55.32) and non-availability of inputs at proper time (53.16). The cultivation of rice with the SRI method ensured a higher yield than the conventional method. This calls for the removal of constraints impeding the adopting proper strategies like suitable training and demonstration programmes, subsidy on inputs as well as machinery, etc. This, in turn, would encourage the farmers for extensive adoption of SRI in rice cultivation.

Keywords

Adoption factors, constraints in adoption, logit model, SRI.

JEL Codes

C59, C83, Q16, Q18.

INTRODUCTION

Rice is the major staple food crop in the entire north-eastern region of India and Tripura is the second highest producer of rice among eight north-eastern states, next to Assam. More than 75 per cent of the state's total labour force, directly or indirectly, depends on agriculture for their livelihood. The area under paddy in Tripura state to the total cropped area was 75 per cent with major rice-growing seasons being April to June (*Aus*), July to November (*Aman*) and December to March (*Boro*) (Das, Jain, & Nath, 2016). The SRI is an alternate wetting and drying method of paddy cultivation, with a suitable available package of practices. During the 1980s, Fr. Henry De Laulanie, developed the System of Rice Intensification (SRI) cultivation practices in Madagascar. Rice cultivation through SRI technique was initiated in the state on an experimental basis with just 44 farmers and during 2006, it was started on a large scale with 1,000 farmers and it gained popularity in the state, and the number increased to 70,000 in just two years. During

2015-16, around 1.10 lakh hectares of cultivable land in the state was covered under SRI techniques benefiting more than 3.50 lakh farmers and also the SRI techniques covered 42 per cent of the total Paddy area excluding Jhum Paddy in the state (The Government of Tripura, 2017). The rapid spread of these techniques was lies in the reality that it augments yields significantly without the need for additional inputs such as seed, inorganic fertilizers or extra inputs (Devi & Ponnarasi, 2009). The SRI method focuses on improving the growing environment of rice plants, above and below ground, by improving the management of plants, soil, water and nutrients, to stimulate the growth of bigger and better root systems and the number and activity of beneficial soil organisms. The seed and water requirement in SRI method was less and the incidence of pests and diseases were also quite lower than the conventional method.

Despite many advantages of SRI technology, the extent of its spread remains insignificant in the state, due to high input costs and labour expenses. Das, Jain, and

Nath(2016) researched adoption behaviour of rice farmers in Tripura and revealed that the majority of the rice farmers ranged between high to medium (41 to 39 per cent) as a favourable category of adoption for SRI method. Farmers experienced high labour cost since the SRI method required more labour per hectare than the conventional method. Water requirement for rice cultivation is very high, likewise, to combat water scarcity problem, the SRI technique is an alternate approach, which is appropriate and followed by large groups of farmers. However, in the adoption of SRI technique, the farmers face some problems. So, with the proper identification of the problem and removing them, would be fruitful and rice cultivation could be profitable for farmers through increased productivity per unit area (Agarwal & Kumar, 2017). The factors which influence its adoption also need to be identified for devising a policy to promote the SRI cultivation in the state. Keeping this in view, the present study was conducted to support the policy for increasing the area under SRI cultivation practices for the ultimate enhancement of income and food security in the fragile northeastern region of India.

METHODOLOGY

Sample and Data

A multi-stage sampling technique was used to select the respondents for the study. At the first stage, Sepahijala district was purposively selected as this district covered the highest area under rice cultivation through SRI technique in Tripura state. At the second stage, four blocks namely Nalchar, Bishalgarh, Boxanagar, and Melaghar were selected randomly. At the third stage, two villages were selected randomly from each block and finally, 15 farmers practicing both SRI and conventional methods in rice cultivation were chosen from each village randomly making a total of 120 sample respondents for the study. The primary data on various aspects of rice cultivation was collected from the selected farmers in a pre-tested interview schedule through personal interview of respondents. The reference year of the study was 2016-17.

Analytical Methods

Logit regression model

This study used a logit regression model through empirical observation to quantify the influence of various factors in the decision of the respondents to adopt SRI technique. Through discussion with key informants and literature review, five variables viz., age of the respondents, literacy level, farm size, extension contact and primary occupation were hypothesized to influence the adoption choice of the SRI techniques (L_i). The adoption choice is considered to be a dichotomous variable indicating whether or not a farmer is practicing SRI technique or not and expressed as a logistic performs of the independent variables. The logit regression model was specified as the following equation:

$$L_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + u_i$$

Where,

L_i = Farmers' adoption decision of SRI technique for

rice cultivation (1, if adopted and 0, otherwise)

β_0 = Intercept

X_1 = Age of the respondents (years)

X_2 = Size of landholding (ha)

X_3 = Literacy level (years)

X_4 = Contact with extension agencies (1, if contact exist; 0, otherwise)

X_5 = Primary occupation (1, if agriculture & allied activities; 0, otherwise)

u_i = Error term.

The model was estimated by maximum likelihood estimation (MLE) method.

Ranking of constraints in adoption of SRI technique

Constraints in terms of difficulties faced by the respondents were explored and a simple ranking technique was employed to identify and rank the difficulties faced by the respondents in practicing SRI method for rice cultivation.

RESULTS AND DISCUSSION

Estimation of factors affecting the adoption of SRI

The maximum likelihood estimate of the coefficients of logit regression is presented in Table 1. The results revealed that the coefficients associated with literacy level and extension contacts were positive and significant, which indicated that with a higher level of education and contact with extension agent, the likelihood of adoption of SRI technique will be higher. Educated respondents with agricultural background tend to have more contact with the extension personnel, hence likely to adopt SRI technique. The age and landholding were found to have a negative impact on adoption decision, though none of them found significant statistically. However, it can be assumed that the farmers of higher age remained conservative in their ideas and wanted no change in their cultivation practices. Similarly, the large farmers might be connected to conventional rice production practices compared to the small farmers due to the high labour requirement, which are scarce nowadays during the crop season. Similar findings were reported by Devi and Ponnarasi(2009) and Durga and Kumar (2016) concerning the factors influencing the adoption of SRI techniques in Tamil Nadu and Kerala, respectively. Karki (2010) revealed that the age of farmer, landholding, irrigation facility, livestock, training facilities and membership into the farmers' association significantly influenced the adoption of SRI method of cultivation. Ravichandran and Prakash (2015) found that the variables like age of the respondents, literacy level, knowledge of farming, knowledge of SRI techniques, information-seeking behaviour, number of training programme attended, extension approaches, economic incentives, risk orientation, market perception, innovativeness and attitude were positively significant with the level of adoption of SRI techniques.

Constraints in adoption of SRI technique in rice cultivation

Various types of problems faced by the rice-growing

farmers related to the SRI rice cultivation practices were explored during the primary survey. The difficulties depicted in the descending order, according to their rank are presented in Table 2. The most important problems identified were non-availability of skilled labours (64.32) and high expenses on labour (61.11). The high rate of paddy seed (58.40) and non-availability of the seed of desired varieties (57.76) at the proper time also possess as major problems in the study area. Similar findings were also reported by Nath and Das (2017) and Agarwal and Kumar (2017) for Tripura and Jharkhand, respectively. Transplanting of very young seedlings (55.32) was another important problem identified as one of the foremost principles of SRI demands the transplantation of 8-12 days old seedlings. At this stage, seedling remained to be very delicate and needed utmost care while transplanting. All farmers were not skilled in providing that much care which resulted in high seedling mortality. Krishnan and Tarnaka (2008) also found that the reasons for non-adoption of SRI techniques were difficulty in handling seedling of 8-12 days old. The non-availability of inputs at the proper time (53.16) was another problem identified in the study area. Similar constraints were also reported in Sri Lanka by Namara, Weligamage, and Barker (2002) in the adoption of SRI in rice cultivation. As such, small and marginal farmers faced problems in buying inputs due to the upward trend and rigidity of input prices. Devi and Ponnarasi (2009) found that lack of trained labour, awareness, training on new technology

and knowledge were impending problems in the adoption of SRI techniques by the rice farmers. The vital reasons for non-adoption of SRI cultivation practices were risk involved in adopting new practices, shortage of agricultural labour at the proper time and psychological worry of losses in terms of profits (Johnson & Vijayaragavan, 2011). Some of the key constraints were also reported such as lack of trained personnel during planting time, poor water management within the rice fields, and unfavourable soil condition, etc. (Palanisami, Karunakaran, Amarasinghe & Ranganathan, 2013).

CONCLUSIONS

Adoption of System of Rice Intensification (SRI) for rice cultivation in Tripura was influenced mainly by five factors viz. age, operational land holding, literacy level, extension contacts and occupations as explored during the survey. However, out of these factors, literacy level and extension contacts found to influence the adoption decision positively and significantly. So, it can be inferred that educating the rural masses and mobilization of extension machinery have the potential to enhance the adoption of SRI techniques for rice cultivation in the state. It is also advisable that the young farmers to be encouraged to adopt this technique through training programmes, awareness camps and inputs subsidy, etc. The large farmers also need to be encouraged to adopt SRI, so that they can reap higher yield than the conventional method, which is possible only when they received more extension services in terms of exposure visits, awareness camps, literature, etc. Various constraints identified could be overcome by adopting proper strategies like suitable training and demonstration programmes and input subsidy to encourage the farmers for extensive adoption of SRI for rice cultivation in the state.

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Table 1. Maximum likelihood estimates of the logit model (n = 120)

Variables	Value	Standard error	Wald χ^2
Age	-0.097 ^{NS}	0.135	0.519
Landholding	-0.199 ^{NS}	0.154	1.668
Literacy level	0.361 [*]	0.146	6.143
Extension contacts	0.703 ^{***}	0.141	24.744
Occupation	0.087 ^{NS}	0.132	0.43

Source: Authors calculation.

*** and * Significant at 1 and 10 per cent, respectively.

NS: Non-significant.

Table 2. Problems in SRI method of rice cultivation

Problems	Mean score	Rank
Unavailability of skilled labours	64.32	I
The high cost of labour	61.11	II
The high cost of paddy seed	58.40	III
Non-availability of seeds of different varieties in time	57.76	IV
Difficulty in handling very young seedling for transplanting	55.32	V
Non-availability of inputs at the proper time	53.16	VI

Source: Authors calculation

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