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System of Rice Intensification: A Partial budget analysis

Nirmala Bandumula, R.Mahender Kumar, Amtul waris and P.Muthuraman
ICAR-Indian Institute of Rice Research
Hyderabad-500030, India
bnirmaladrr@gmail.com

ABSTRACT

Rice is the staple food in Telangana and is grown in an area of 1.05 Mha with a production of 3.05 Mt and productivity of 2.9 t/ha. Transplanting is the most widely adopted method of rice establishment and requires large amount of water. Water is going to be most critical input in the future for agriculture in general and rice in particular. System of Rice Intensification (SRI) method of cultivation produces higher yields with less water. The objectives of this paper were to conduct a partial budgeting analysis of SRI and also to study the perception of farmers towards System of Rice Intensification. A field survey was carried out in Nalgonda district of Telangana in 2015. Eighty four farmers from twelve villages of Nalgonda distirct were selected randomly. They were interviewed personally based on semi-structured questionnaire to know about the input and output details and their perception towards System of Rice Intensification. Farmers perceived SRI as a yield enhancing, cost saving and less water requiring technology. The major constraints perceived by the farmers were skill requirement in transplanting, drudgery in using cono-weeder and difficulty in nursery management and non-availability of adequate organic manure to apply in SRI fields. The partial budgeting analysis revealed that SRI adoption would bring net gain to the tune of Rs.19420/- per ha. The B:C ratio of SRI (1.75) was found to be higher than transplanting method (1.3). Therefore, to save water, seed and labour costs and to make rice cultivation remunerative, SRI could be promoted by addressing the constraints perceived by the farmers.
Key words: System of Rice Intensification, Economics, Partial budgeting, Constraints, Telangana

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INTRODUCTION

Water is going to be most critical input in the future for agriculture in general and rice in particular. As of now, irrigation sector consumes about 80% of the total water use which may reduce to about 70% by 2050 due to competing demands from other sectors (Central Water Commission, Government of India, 2014). Of all the crops, rice uses more than 60 % of all irrigation water in India. Also, there is a notion that higher yields in rice come with high investments on seed, irrigation, high doses of fertilizers and more use of pesticides. This practice not only results in higher cost of cultivation but also may not give the desired results in the long run in a sustainable way.

Contrary to this popular view, System of Rice Intensification (SRI) method of cultivation produces higher yields with less seed and less water. SRI also emphasizes on the need to shift from chemical fertilizers to organic manures. In overall, SRI method of cultivation can considerably help in attaining the targets with the limited availability of natural resources and there is an urgent need to promote cultivation methods such as System of Rice intensification (SRI) in rice to economize the use of water and other critical inputs without affecting yield. Indian enthusiasm for SRI implies a level of dissatisfaction with conventional approaches to rice intensification and a demand for new methods that can address the perceived problems and challenges of agriculture in the future (Dominic 2011).

Rice is the staple food in Telangana and is grown in an area of 1.05 Mha with a production of 3.05 Mt and productivity of 2.9 t/ha. With depleting ground water table and erratic monsoon, Telangana is facing water crisis. In this backdrop, the present study was conducted in Nalgonda district of Telangana, with the objectives of carrying out a partial budgeting analysis of System of Rice Intensification (SRI) and also to study the perception of farmers towards System of Rice Intensification.

METHODOLOGY

The NGO, 'BLESS' has implemented SRI programme in Nalgonda district of Telangana, with the technical inputs from ICAR-IIRR, in *Kharif*, 2014 and *Kharif*, 2015. Data were collected from SRI farmers from 12 villages of Nalgonda district of Telangana in 2015. Purposive random sampling was followed in selection of the sample farmers. Seven farmers who cultivated rice through System of Rice intensification method and transplanting method on the same piece of land were selected from each village and were interviewed. Total sample size was 84. The farmers were interviewed and data on the input and output of rice cultivated through System of Rice Intensification and transplanted methods were obtained. The perceptions of farmers regarding the constraints in adoption of SRI were also recorded.

Partial Budgeting technique was employed to analyze the economics and profitability of SRI *vs.* Transplanting method. Partial budgeting is a planning and decision-making technique used widely, to compare the costs and benefits of various alternative methods of production. It helps to evaluate the economic effect of changes in production methods. It is based on the principle that these changes will have effects on one or all of the following: Increase in income, reduction of costs, increase in costs and reduction of income. The effect of change in production method is measured as the difference between sum of positive economic effects minus the sum of negative economic effects. If the difference is positive it indicates that farm income will increase due to the change in production method and if the difference is negative it indicates that the change will result in reduction in income.

The constraints in adoption of System of rice intensification method as perceived by the farmers were prioritized by using Garrett's ranking technique.

Per cent position = $\frac{100(Rij-0.5)}{Nij}$

where,

R_{ij} is the rank given for i^{th} item by j^{th} individual

N_{ij} is the number of items ranked by the j^{th} individual

The percent position of each rank was converted into scores using Garrett's table. For each constraint, scores of individual respondents were added together and were divided by total number of respondents for whom scores were added. Thus mean score for each constraint was ranked by arranging them in descending order.

RESULTS and Discussion

A comparative analysis of expenditure incurred on various inputs in SRI and transplanting method of rice cultivation are presented in Fig. 1. The cost incurred on seed in SRI was Rs.131/ha, whereas it was Rs.1810/ha in case of transplanted method. This is mainly because of less seed recommended (5kg/ha) in SRI method. There was not much difference in costs incurred on fertilisers in both the methods of crop establishment. The cost incurred on human labour was reduced by 15 per cent in SRI and this reduction was mainly because of the less number of days required for nursery management and also less mandays for weeding, as weeding is done through cono-weeder in SRI. The total variable costs were Rs. 43,420 per hectare in SRI, whereas Rs. 49,229/- per hectare in conventional transplanting method (Fig. 2).

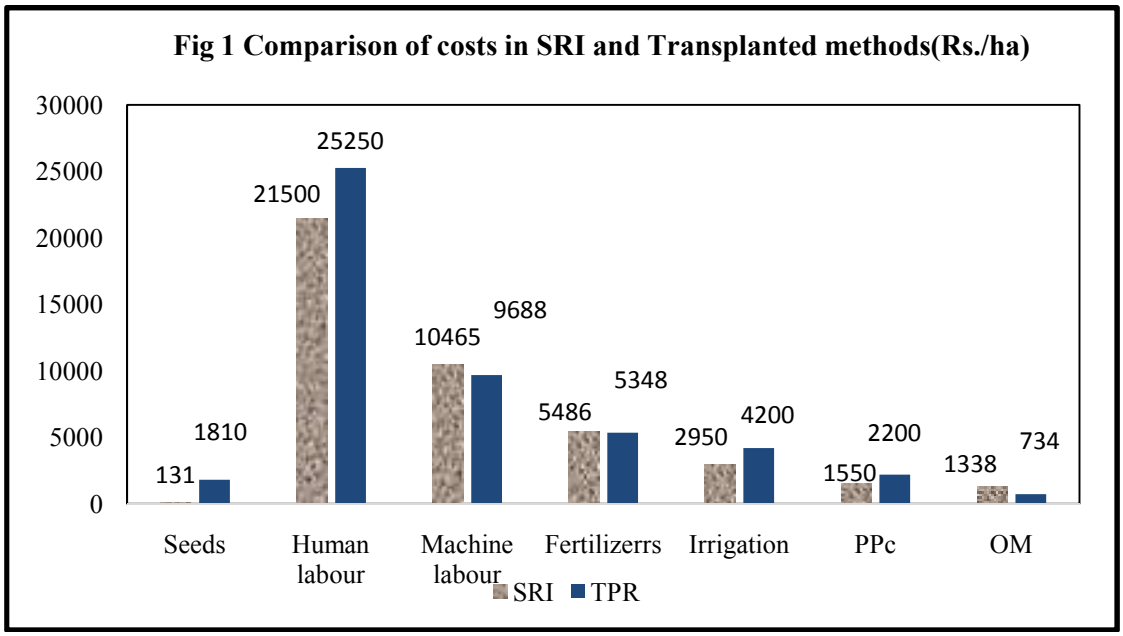
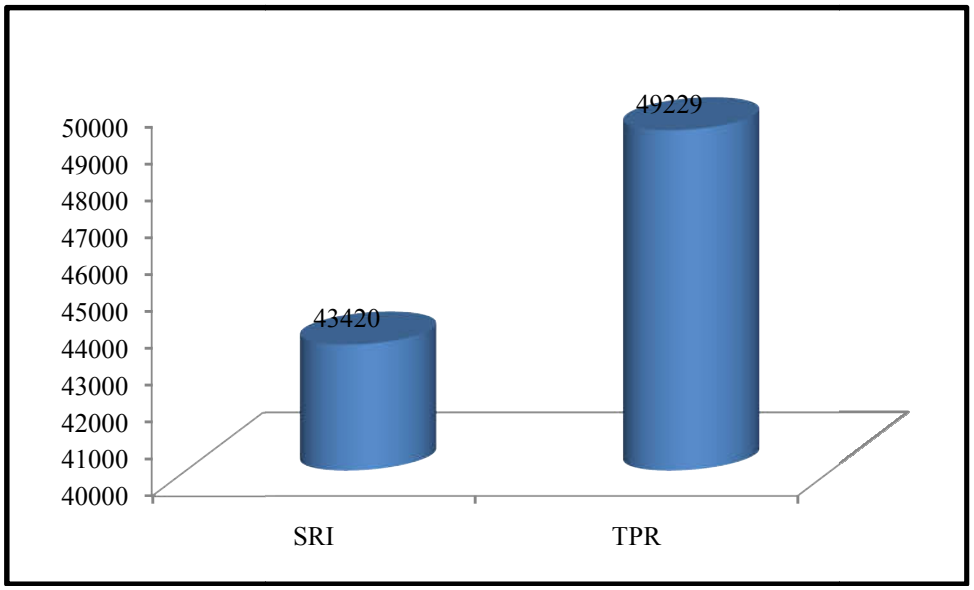


Fig 2 Comparison of Total Variable Costs SRI *vs* Transplanted method (Rs./ha)



The adoption of SRI has resulted in higher yield of 5.25 t/ha over the transplanting method (4.31 t/ha) on an average (Table 1). The yield obtained by adoption of SRI method was 0.94 t/ha (22%) higher than that of transplanting method. The advantage of SRI method was seen in case of reduction in cost of cultivation, higher yields obtained per acre and lesser duration for harvesting the crop. The results are in line with the findings of Palanisami *et al* who conducted a study during 2010-11 in 13 states and covered 2234 sample farmers with SRI & Non-SRI fields and reported that SRI fields have significantly higher yields. The average yield in SRI fields in all states was 8.5 quintals per hectare (0.85 tonnes/ha) which is 22% higher than in non SRI fields. The farm survey conducted in Tamil Nadu has clearly shown that the yield varied from 5 t/ha to 7.5 t/ha under SRI and also the results revealed that the small farmers benefit from increase in the yield under SRI (Barah 2009).

The adoption of SRI has resulted in reduction in the cost of cultivation by Rs.5,809 /ha. A productivity gain of 22 % was found in SRI method of rice cultivation over the conventional transplanting method. The net returns were Rs. 32,600/- per hectare for SRI and Rs13180 per hectare for transplanted rice with a B:C ratio of 1.75 and 1.3 for SRI and TPR methods respectively.

The findings corroborate the results of Rao, 2011 who reported that the net returns per hectare were higher in SRI (Rs.27009) than the conventional method (Rs.14499) method. The cost of production was almost double in the conventional method of paddy cultivation as the productivity of rice was low in this method. The benefit cost ratio was higher in SRI (2.25) than in conventional method (1.56). (Sita and Ponnarasi 2009). The net returns realized was much higher in the SRI (Rs.23,593) than in the non-SRI (Rs.9,7200) per hectare. The returns per rupee spent in traditional method were Rs.1.31 against Rs.1.71 in SRI method.(Basavaraj *et al* 2008)

Table 1: Comparative economics of SRI and Transplanted (TPR) method

Particulars	**SRI method**	**TPR method**
Yield (t/ha)	5.25	4.31
Gross returns (Rs./ha)	76020	62408.8
Cost of cultivation-Variable costs (Rs./ha)	43419.58	49228.77
Net returns (Rs./ha)	32600.42	13180.03
Benefit cost ratio	1.75	1.3

Partial Budgeting technique of SRI *vs* transplanting method revealed that, by adopting SRI method, the farmers could save on various inputs like seed, human labour, irrigation and plant protection chemicals but had to spend more on machine labour and organic manure (Table 2). This may be mainly because of

the organic nature of System of Rice Intensification method of rice cultivation. Partial budgeting technique further revealed that the adoption of SRI has resulted in an additional profit of Rs.19, 420/- per hectare.

Table 2: Partial Budgeting – SRI *vs* Transplanted method

Debit	Amount (Rs.)/ha	Credit	Amount (Rs.)/ha
a. Increase in costs		a. Decrease in costs	
Fertiliser costs	138	Seed cost	1678.4
Machine lab cost	777.5	Human labour cost	3750
Organic manure	604	Irrigation costs	1250
		PPC	650
Total	1519.5	Total	7328.4
b. Decrease in returns		b. Increase in returns	13611.2
Total debits	1519.5	Total credits	20939.64
Profit	19420.14		

Constraints in adoption of SRI

The farmers opined that the skill in transplanting young seedlings was the major constraint in adopting System of Rice Intensification method, followed by difficulty in using conoweeder and nursery management (Table 3). Non-availability of organic manure in adequate quantity and unwillingness of labour to do line sowing were the other constraints, as perceived by the selected farmers.

Table 3 Constraints perceived by the farmers in SRI method

Sl.No	Constraint	Mean Score	Garrette Rank
1.	Skill in transplanting young seedlings	73.4	I
2.	Difficulty in using conoweeder	61.6	II
3.	Nursery management	43.3	III
4.	Non-availability of organic manure	41.8	IV
5.	Unwillingness of labour to do line sowing	26.6	V

CONCLUSIONS

From the various results stated above, it can be concluded that SRI method of rice cultivation has yield advantage of around 22%. Since the benefit cost ratio in SRI method is comparatively more than that of conventional transplanting method of rice cultivation, it can be inferred that SRI is economically viable technology and more profitable than conventional method. SRI is a skill based technology and hence there is a need to focus on imparting training on SRI to farmers through various extension agencies, in order to double farmer income. One of the major constraints in adoption of SRI was drudgery in using weeder, hence, low cost, user friendly weeders and markers have to be made available to the farmers. The designs of the weeder should be diversified and be made amenable to local production. For large scale adoption of SRI, there is a need for convergence of different organizations working on SRI.

It is highly imperative to train farm women in different aspects of SRI technology to build their knowledge and skills to ensure widespread adoption of SRI. There is immense scope of harnessing the potential of training members of Women's Self-Help Groups (SHG) to form a SRI task force which could be easily achieved through providing long-term and comprehensive skill based training in the following specific SRI activities. Training a cadre of women labourers in every village can help spread SRI and also provide good income for the women. Awareness should be generated about SRI through mass media, Krishi Vigyan Kendras, extension departments, etc. SRI offers an opportunity to produce 'Organic Rice', which has significant market potential and paves way for doubling income of the rice farmers.

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