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Economic Benefits Of System Of Rice Intensification (Sri) In Kendrapara District Of Odisha

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ABSTRACT

Rice is the staple food of about 50% of the world's population that reside in Asia, where 90 per cent of the world's Rice is grown and consumed. The yield level of Rice in India has been low and uncertain. The operational holding–size is shrinking, and land and water resources are being degraded. Therefore, some innovative rice production practice like SRI is needed to meet the demand of growing population. The present study attempts (i) to evaluate the economic and ecological advantages of System of Rice Intensification (SRI) in relation to conventional practices for Rice cultivation in Kendrapara district of Odisha (ii) To identify factors influencing adoption of SRI .A stratified random sampling technique was adopted for selection of sample village and farmers. The study revealed that SRI farmers received higher net income (Rs 20330)per acre than traditional farmers (Rs 8870). Benefit –cost (B-C) ratio was calculated to evaluate the effectiveness of farming methods (SRI vs. Traditional method). It was found that SRI had more B-C ratio (2.18) as compared to traditional method (1.44). Logistic regression analysis concluded that land holding and level of education had positive effect whereas age and family size had no effect on adoption of SRI method of cultivation.

Key Words: Break-even, Economic, Kendrapada, Logistic, SRI.

I. INTRODUCTION

Rice is one of the prominent cereal crops in India. It is an important staple food of 50 % of the world's population that resides in Asia, where 90 % of the world's rice is grown and consumed. In Asia, India has the largest area under rice (41.66 million ha) accounting for 29.4 % of the global rice area. India ranked first in area under paddy(41.66 million ha) and second in terms of production (85.31 million tonnes) and it stood next only to China in the world with respect to rice production. (www.indiastat.com)

But the yield levels in India were low compared to other major rice producing countries viz., Japan China Indonesia. About 67 % of the area under paddy in India is under high yielding varieties. Due to excessive use of chemicals, fertilizers and other inputs the cost of cultivation has escalated. The spectacular increase in production of paddy was restricted to irrigated belts of the country. The skewed distribution of green revolution results an increased costs of cultivation have given alarming signals to the future needs of food security.

At this juncture the System of Rice Intensification ("SRI") came into light. This system seems to be promising to overcome the shortage of water in irrigated rice. In this method synergic interaction

leads to much higher yields. It offers increased land, labour and water productivity. In fact, it is a less water consuming method of rice cultivation, which is suitable to poor farmers who have relatively more labour force than land and capital**.**

Under these circumstances present study entitled "Ecological and Economical benefit of System of Rice intensification: -A diagnostic Study in Kendrapara District of Odisha''. is formulated.

OBJECTIVES

1. To evaluate the economic and ecological advantages of System of Rice intensification (SRI) in relation to conventional practices for Rice cultivation in Odisha.
2. To identify factors influencing adoption of SRI .

II. METHODOLOGY

The present research had been taken up in Pattamundai block of Kendrapara district of Odisha during 2014. A stratified random sampling technique was adopted for selection of sample village and farmers. To study the Economic impact of SRI paddy on farming community, paddy growing farmers community were divided into two groups and were identified based on the criteria that whether they were following SRI method or not. Details of sample size and survey are has been presented in Table1.

Table 1. Details of villages and farmers selected for survey

Sl. No.	Number of SRI farmers selected	Number of Traditional farmers selected	Name of the village	District
1	25	20	Badamohanpur	Kendrapara
2	17	27	Napanga	Kendrapara
3	18	13	Nayakot	Kendrapara
Total	**60**	**60**		

Cost of cultivation, benefit- cost ratio, break even analysis was carried out. Logistic regression was used to determine farmer's preference to SRI cultivation of paddy.

III. RESULTS AND DISCUSSION

Comparison of Yield and Cost of cultivation between SRI and Traditional farmers:

The yield differences were quite high in case of SRI as compared to traditional paddy cultivation methods. While the farmer following SRI method could get 27.80 q of rice per acre, the farmer practicing the Traditional method of paddy cultivation could get only 21.14 q of rice. Therefore profit gain was more in SRI method than traditional method. The details cost of cultivation including all the cost (cost A1, costB, costC) of SRI paddy and Traditional paddy cultivation of sample farmers are given in the Table 5.2. Five types of income were calculated such as gross income farm business income, family labour income, net income and farm investment income.

Table 2: Comparison of Cost of cultivation of SRI and traditional method

Particulars	SRI	Traditional
Nursery and sowing	732(6.07)	1039(7.13)
Main field	2095(17.39)	2854(19.59)
Manure and Fertilizer	1695(14.06)	1668(11.45)
Transplanting	1535(12.74)	2459(16.88)

Harvesting	1894(15.72)	2059(19.63)
Threshing	2487(20.64)	2479(17.02)
Weeding	325(2.69)	481(3.30)
Plant protection	413(3.42)	534(3.66)
Miscellaneous	874(7.25)	495(3.39)
Total operational cost(costA1)	12047(100)	14563(100)
Cost B	16050	18562
Cost C	17239	19700
Gross Income	37620	28597
Farm business income	25573	14033
Family Labour Income	21554	10033
Net income	20330	8870
Farm investment income	24331	12717
Yield in quintal per acre	27.70	21.14

Note: Figures in parenthesis are percentages to total operational cost

From table 2 it was also observed that there were major differences between the SRI paddy and Traditional paddy in nursery management and method of transplanting. While the SRI paddy cultivation needed 2-4 kgs of seed per acre for nursery management, the Traditional cultivation needed 26-28 kgs of seed per acre for nursery management. The cost of the nursery management in SRI paddy cultivation was 732 rupees per acre whereas, for the Traditional paddy nursery management it was 1039 rupees per acre. Therefore, the farmers gained Rs 307 per acre due to SRI cultivation at nursery stage. The method of transplanting in SRI cultivation needed 5-8 no's of labour per acre, while the Traditional paddy cultivation needed 15-17 no's of labour. The plant to plant and row to row spacing in SRI was (25*25) cm2 which was wider than traditional method (20*15) cm^2.Therefore, the cost of transplanting incurred in SRI paddy was 1535 rupees per acre, whereas, in Traditional paddy the cost was 2559 rupees per acre resulting a gain of Rs 1024 per acre for transplantation only due to SRI method of cultivation. The findings are in line with Barah (2009) and Basavaraja *et al*.(2008).

Benefit-Cost Ratio (B-C ratio):

The B-C ratio was worked out to compare the effectiveness of SRI and traditional rice (Table 3). It clearly implied that B-C ratio of SRI method was more effective than traditional method. In the simple term it means in case of SRI if we invest one rupee, total return would be Rs 2.18. Whereas in case of traditional paddy the figure would be Rs. 1.45. It clearly indicated that SRI method of paddy cultivation is quite benefiting as compared to traditional one.

Table 3: Comparison of B-C ratio of SRI and Traditional paddy

Types	Gross Income (In Rupees)	Total Cost (In Rupees)	B-C Ratio
Sri method	37620	17239	2.18
Traditional method	28597	19700	1.45

Break-even analysis

From break-even analysis return to fixed cost was found to be Rs. 14,034/ indicating that the challenging crop i.e. paddy under SRI must meet Rs. 14,037 or exceed it to bid land away from the

defender i.e. paddy under traditional method. The break-even price was found to be Rs. 941.55/ quintal indicating that paddy under SRI method must generate Rs. 941.55/ quintal to obtain the same return to fixed costs as would be generated by the defender i.e. paddy under traditional method. The break-even yield was found to be 20.37 quintal /acre indicating the yield needed by the challenger to match the net returns to fixed costs generated by the defender (Table 4).

Table 4: Break-even analysis:

Particulars	Amount (In Rupees)
Total variable cost of defender crop (i.e. paddy under traditional method.)	14563
Gross income of defender crop	28597
Return to fixed cost	14034
Total variable cost of challenger crop(i.e. paddy under SRI)	12047
Total imputed cost of challenger crop	26081
Break-even price	941.55/quintal
Break-even yield	20.37 quintal/ acre

Determinants of Farmer's Preference to SRI cultivation of paddy

The estimated logistic probability model for farmer is

$$L = 1.715 - 0.031X_1 + 0.484X_2 + 0.184X_3 - 0.840X_4$$

Where,

L = the logit i.e. logarithm of odds ratio

X1 = age of the farmer

X2 = land holding

X3 =education level of the producer

X4 = family size

The factors influencing adoption of SRI method of cultivation were analysed using logistic regression (Table 5). The dependent variable is binary choice, getting a value of one if the farmers choose to follow SRI method and zero if producers choose to follow conventional method of cultivation.

The results of the logit regression analysis indicated that log of the odds in favour of selecting SRI method of cultivation was positively associated with land holding and education but negatively associated with age and family size.

The probability of the Wald statistics for the variable age was 0.062 which was significant at 5 % level. The variable age was negatively related to the logit value as β coefficient was -0.039 and this indicates that older producers are not likely to follow SRI method. Exp (β) was 0.968 which implies that one unit increase in age decreases the odd by 0.968 units.

Table 6: Logistic regression coefficients of determinants of adoption of SRI

Variable	B	S.E	Wald	df	Sig	R	Exp(B)
Age	-0.031	.0170	3.5306	1	.0602*	-.0959	.9686
Land holding	0.4841	.1192	16.4848	1	.0000**	.2951	1.6227
Education	0.1844	0.0643	8.2208	1	.0041**	.1934	1.2025
Family size	-0.0209	0.1038	0.0407	1	.8401NS	.0000	.9793
Constant	1.7151	1.10948	2.4543	1	.1172*		
Correctly predicted case	76.67%						
-2 Log Likelihood	123.388						
Goodness of Fit	111.970						
Cox & Snell - R^2	.301						

*Significant at 5 % level ** significant at 1% level

The probability of the Wald statistics for the variable land holding was 0.000 which was highly significant at 1 % level. The variable land holding was positively related to the logit value as B coefficient was 0.484 and this indicated that producers with large land holding are more likely to follow SRI method. Exp (β) was 1.622 which implies that one unit increase in land holding increased the odd by 1.622 units.

The probability of the Wald statistics for the variable education was 0.004 which was significant at 1 % level. The variable education was positively related to the logit value as β coefficient was 0.184 and this indicates that educated producers are more likely to follow SRI method of rice cultivation. Exp (β) was 1.202 which implies that one unit increase in education level increased the odd by 1.202 units.

The variable family size was negatively related to the logit value as B coefficient was -0.029 and this indicated that large family size were not likely to follow SRI method of cultivation. Exp (**β**) was 0.979 which implies that one unit increase in family size decreases the odd by 0.979 units. The model correctly predicted 76.67 % of the cases, which means the explanatory variables, explained the probability that the farmers would follow SRI method of cultivation 76.67 % of the cases. The findings are in line with Haldar *et al*.(2012).

IV. CONCLUSION

It can be concluded that besides the less resource use, the profitability (return per rupee) in SRI rice cultivation is higher vis-a-vis conventional method. Hence the farmers have to be educated and empowered through training and demonstrations. Logit regression analysis indicated that, educational level, land holding increases the probability of adopting the SRI method. From the above findings it has been suggested that Machine transplanting can be introduced in all regions using the concept of wider spacing, young seedling and one to two seedlings per hill. Focused field based training should be given to farmers on those SRI components which are important to their regions is important. Beside these there is a need of Capacity-building of farmers, tenant farmers, extension staff, NGOs, and labourers.

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