RESEARCH ARTICLE :

An economic analysis of SRI and non-SRI paddy cultivation in Vellore district of Tamil Nadu

■ **R. LOGANATHAN, S. NANDHAKUMAR AND G. MARIAPPAN**

SUMMARY : Rice commends recognition, as a supreme commodity to mankind, because rice is truly life, culture, a tradition and a means of livelihood to millions.Major objectives are to analyse the socio economic impact of SRI and traditional rice cultivation and to estimate the cost and returns of paddy in SRI and their comparison with those in conventional methodin Vellore district of Tamil Nadu.Two major paddy growing blocks were selected. From each block, six major paddy growing villages was selected. Totally ten farmers were selected from each village comprising five farmers for SRI method and five farmers for traditional method of rice cultivation and the total sample size was 120.Descriptive statistical analysis, Garrett's Ranking Technique,etc was used the tools of analysis in research.About 55 per cent of the sample farmers had more than 20 years of experience in rice farming and only about 14 per cent of the sample farmers had less than 15 years of experience. The per hectare cost of cultivation (Rs.83,842.80) for SRI paddy was less when compared to that (Rs.87,742.88) of traditional paddy. The amount of fixed cost was Rs.8,868.90 and Rs.11,421.90 for traditional and SRI paddy farmers.The yield per hectare realized in traditional method was 6.07 tonnes. The paddy yield realized by SRI paddy farmers was 7 tonnes per hectare.High labour requirement was the major constraint in practicing SRI method.

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BACKGROUND AND OBJECTIVES

Rice commends recognition, as a supreme commodity to mankind, because rice is truly life, culture, a tradition and a means of livelihood to millions.Rice is the staple food for about 50 per cent of the world's population that resides in Asia, where 90 per cent 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 per cent of the global rice area (*www.indiastat.com*).

But, the yield levels in India were low at 2.05 tonnes per ha compared to other major rice producing countries *viz.,* Japan (6.52 t/ha), China (6.24 t/ha) and Indonesia (4.25 t/ha).

Objective:
-To analyse the socio-economic impact of SRI and traditional rice cultivation in Vellore district of Tamil Nadu

Table A: Yield of different rice production countries		
Sr.No.	Rice production countries	Yield(t/ha)
1.	India	2.05
2.	Japan	6.52
3.	China	6.24
4.	Indonesia	4.25

Source: www.indiastat.com.

-To estimate the cost and returns of paddy in SRI and their comparison with those in conventional method

Nearly, 60% of state population depend on agriculture and 13% of state income is contributed by agriculture. The net sown area is 62.59 lakh ha, which accounts for 37.5% of the geographical area. Nearly 85-90% of the farming community, in terms of numbers and area, are marginal and small farmers. The area under paddy is 20 lakh ha with average yield of 2,777 kg/ha. (www.tn.nic.in).

Nasurudeen and Mahesh (2004) compared the economics of rice cultivation in Karaikal region of Pondicherry (UT). They found that total cost per hectare was Rs. 15,040 and Rs. 19735 for direct sown paddy and transplanted paddy, respectively. The yield level was found to be more in the case of transplanted paddy (4185 kg/ha) than that in the direct sown paddy (3590 kg/ha). However, net returns were more for direct sown paddy (Rs. 6500/ha) than for the transplanted paddy (Rs. 5375/ha). In spite of the low yield level direct sown paddy proved to be more profitable as it reduced the requirement of resource and cost of cultivation.

Pouchepparadjou et al. (2005) examined the economics of paddy cultivation of IPM adopted and non-adopted farms of Union Territory of Pondicherry. It was observed that the IPM adopted farms generated net returns worth of Rs. 5,208 per acre as against Rs. 4,147 per acre net returns of non-adopted farms, which was 26 per cent higher than the non-adopted farms. Pouchepparadjou et al. (2005) analyzed the technical efficiency of IPM adopted and non-adopted rice farms of Pondicherry. They found that non-adopted farms were operating at high technical efficiency (0.37), allocative efficiency (0.88) and economic efficiency (0.32) as compared to the technical efficiency of 0.35, allocative efficiency of 0.27 and economic efficiency of 0.09 for IPM adopted farms. These results clearly showed that IPM adopted farms have greater potential to boost output through the use of best practice technologies of IPM.

In the present study, the cost and returns, gross return from crop enterprises referred to the total value of main and by- products of rice and various crops raised and the net crop return wasestimated by excluding all costs incurred from the gross income realized from rice and various crops cultivated separately worked out.

Design of the study:
Random sampling procedure was adopted for the study. In Vellore district, K.V. Kuppam and Arcot blocks were purposively selected according to the total area under rice cultivation.

The study was based on the input-output data obtained from sample farmers in Vellore districts. For selection of farmers, multi-stage sampling design was employed. In this procedure, at first stage, two major paddy growing blocks following both traditional and SRI method of rice cultivation were purposively selected. From each block, six major paddy growing villages following both the methods of rice cultivation were selected at second stage. In the final stage, ten farmers were selected from each village comprising five farmers for SRI method and five farmers for traditional method of rice cultivation. Thus, the total sample size was 120.

Descriptive statistical analysis:
Descriptive statistical analysis such as mean, percentages, range, standard deviation were used to study the socio-economics characteristic like age, education, experience, size of holding, family size, cropping pattern, awareness about SRI rice, etc.

Garrett's ranking technique :
Garrett ranking technique is widely used to rank the qualitative judgments and opinions about a phenomenon. This technique was used to rank the sources of information on SRI rice, the reasons for cultivation of SRI rice, and problems faced by the farmers in SRI rice cultivation.

In the Garrett's rank scoring technique, the respondents were asked to rank the factors or problems and these ranks were converted in to percent position by using the following formula:

$$\text{Per cent posititi on} = \frac{100\,(R_{ij} > 0.5)}{N_j}$$

where,
R_{ij}= Rank given to the i^{th}attribute by the jth

individual

N_j = Number of attributes ranked by the jth individual.

By referring to the Garrett's table, the estimated per cent positions were converted into scores. Thus, for each factor, the scores of the various respondents were added and the mean scorewas estimated. The means thus, obtained for each of the attributes were arranged in a descending order.

Production functional analysis :

Production function analysis was employed to analyze the yield differences between SRI and non-SRI rice in a more systematic manner. It is also useful to estimate the yield responses of SRI and non-SRI rice to various factors of production. Due to its wide usage in the analysis of agricultural production systems and the simple and straight forward manner in which the elasticities of production could be obtained, the Cobb-Douglas type of production function has been used in this study. The particular form of the estimated equation is given below:

$$Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 D_1 + \beta_7 D_2 + error$$

Where,

Y = Rice yield (kg/ha)

$\beta_0, \beta_{1....}\beta_7$ = Regression co-efficients to be estimated

X_1 = Human labour used (mandays/ha)

X_2 = Machine hours used (hours/ha)

X_3 = Quantity of fertilizer used (kg/ha)

X_4 = Plant protection chemicals used (litres/ha)

X_5 = Number of irrigations.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Descriptive statistical analysis

The number of years of experience in rice cultivation may have an important bearing on the adoption and analysis of SRI level. Therefore, number of years of experience of sample farmers in rice cultivation was examined.

About 55 per cent of the sample farmers had more than 20 years of experience in rice farming and only about 14 per cent of the sample farmers had less than 15 years of experience. However, there is no discernible pattern or relationship between the SRI adoption and the experience in rice farming.

The average family size of farm households was around 5.00 without significant variations across different categories. The sex composition of the households and the children and adult members were almost equally distributed across households. However, the average number of adult male was higher in SRI farm households than the non-SRI farm households.

Cost and returns of paddy in SRI and their comparison with those in conventional method:

The profitability aspect of both the methods of paddy cultivation in the study area has been analysed by computing per hectare cost and returns. A glance at the table indicated that farmers of traditional paddy were found to use more of seeds (65 kg), 'N' fertilizer (120 kg), 'P' fertilizer (40 kg), 'K' fertilizer (40 kg) and plant protection chemicals (1500 ml) as against 5.31 kg of seeds, 120 kg of N fertilizer, 40 kg of P fertilizer, 40 kg of K fertilizer and 800 ml of plant protection chemicals by SRI paddy farmers. However, SRI paddy farmers used 185.66 man-days of human labour, 4.5 pair days of bullock labour, 80 hours of machine labour and 8.4 tonnes of farmyard manure, which were more against 141 man-days of human labour, 4 pair days of bullock labour, 84

Sr. No.	Experience	SRI	Non- SRI	Overall
1.	Less than 15 years	10 (13.16)	7 (15.90)	17 (14.16)
2.	16-20 years	25(32.89)	12 (27.27)	37 (30.83)
3.	21-30 years	28 (36.84)	19 (43.18)	47 (39.16)
4.	More than 30 years	13 (17.11)	6 (13.64)	19 (15.83)
	Total	76 (100.00)	44 (100.00)	120 (100.00)

Table 1 : Experience in rice cultivation among sample farmers

(Figures in parentheses indicate percentage to total)

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Table 2 : Average family size of farm households

Sr. No.	Particulars	SRI	Non-SRI	All
1.	Average family size	5.78	5.61	5.65
2.	Average number of male adults	2.07	1.77	1.96
3.	Average number of female adults	1.87	2.00	1.86
4.	Average number of children	1.84	1.84	1.83

Table 3 : Cost of cultivation for traditional rice

Sr. No.	Particulars	Quantity	Value (Rs.)
Variable costs			
1.	Human labour (man days)	141	36,327(53.2)
	Animal labour (pair days)	4	584 (0.87)
	Machine labour (hrs)	84.6	10871(16.2)
	Seed	65	7800 (11.4)
	Fertilizers and manures	156: 68 :82 and 4t fym	8180 (12.1)
	Plant protection charges	1500 (ml)	1788 (2.65)
	Irrigation charges	-	199 (0.25)
	Interest on working capital @7%	-	4602.43(3.9)
Total variable cost			70,351.43(100)
Fixed cost			
1.	Rental value of owned land	-	7385(87.5)
2	Depreciation on fixed investment	-	605(8.0)
3.	Interest on fixed capital @11%	-	878.9(4.5)
Total fixed cost			8,868.9(100)

Total cost =Total fixed cost +Total variable cost =Rs.70,351.43 (88.50) +8,868.9 (11.50) =Rs.79,220.33 (100.00)

Table 4 : Cost of cultivation for SRI rice

Sr. No.	Particulars	Quantity	Value (Rs.)
Variable costs			
1.	Human labour (mandays)	185	34,000(57.9)
	Animal labour	4	584(0.9)
	Machine labour	82.1	9,500(18.1)
	Seed	5	600(1.0)
	Fertilizers and manures	156: 68 :82 and 4t fym	9180(16.6)
	Plant protection charges	1500 (ml)	2288(2.8)
	Irrigation charges	-	299(0.5)
	Interest on working capital @7%	-	3951.57(7.8)
Total variable cost			60,402.57(100)
Fixed cost			
1.	Rental value of owned land	-	8385(75.5)
2	Depreciation on fixed investment	-	905(8.1)
3.	Interest on fixed capital @11%	-	1021.9(16.4)
Total fixed cost			10,311.9(100)

Total cost=Total fixed cost +Total variable cost =Rs. 60,402.57 (84.56)+10,311.9(15.44) =Rs. 70,714.47(100.00)

Table 5 : Cost and returns for traditional and SRI rice

Sr. No.	Particulars	Traditional rice	SRI rice
Yield	Main product	6.05(t/ha)	7.0(t/ha)
	By product	4.50(t/ha)	4.82(t/ha)
Price of output (Rs./kg)		10	10
Gross income (Rs./ha)		1,05,000	1,18,000
Total cost of cultivation (Rs./ha)		79,220.33	70,714.47
Net income (Rs./ha)		25,779.67	47,285.53
Cost of production (Rs./kg)		13.2	10.1
Net income (Rs./kg)		4.2	6.7
BCR		1.3	1.6

hours of machine labour used by traditional paddy farmers. Irrigation charges, rental value of land and interest on fixed capital were found to be more for traditional paddy farmers, whereas interest on working capital and depreciation were found to be more for SRI paddy farmers.

The per hectare cost of cultivation (Rs.83,842.80) for SRI paddy was less when compared to that (Rs.87,742.88) of traditional paddy. The share of human labour in total cost was low for traditional paddy farmers when compared to SRI paddy farmers. The amount of variable cost was (Rs.78,873.98) to the total cost in traditional paddy and Rs.72,420.9in SRI paddy cultivation.The amount of fixed cost was Rs.8,868.90and Rs.11,421.90 for traditional and SRI paddy farmers.

The yield per hectare realized in traditional method was 6.07 tonnes. The paddy yield realized by SRI paddy farmers was 7 tonnes per hectare. There was a glaring difference between the two methods in the paddy straw yield. Traditional paddy farmers obtained 3.25tonnes per hectare and SRI paddy farmers realized 3.8 tonnes per hectare.

Conclusion:

The cost and returns analysis for SRI rice indicated that especially the total cost of cultivation per hectare was Rs.70,714.47 compared to that of Rs.79,220.33 spent in traditional rice cultivation per hectare. Further the gross income obtained by SRI cultivation was Rs.1,18,000 and the traditional was Rs.1,05,000. Finally the net income obtained by SRI farmers were Rs.47,285.53 and the traditional got only Rs.25,779.67 per hectare.

The major results obviously expressed that the technology oriented this SRI Rice farmers will be getting more remuneration compared to traditional rice cultivation

farms.The average family size of farm households was around 5.00 without significant variations across different categories. However, the average number of adult male was higher in SRI farm households than the non-SRI farm households.

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