



Research Article

ECONOMIC ANALYSIS OF COST AND RETURN STRUCTURE OF PADDY CULTIVATION UNDER TRADITIONAL AND SRI METHOD: A COMPARATIVE STUDY

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Abstract- Agriculture is the backbone of Indian economy. It provides employment to 52 percent of the total labourforce and contributed approximately 14 percent of the Indian GDP. Rice is one of the three most important food crops in the world. Rice belongs to the genus *Oryza* and family *Gramineae*. It is one of the few crop species endowed with richest genetic diversity. India is the second largest rice growing country after China. Besides, this nation has a large range of area under rice cultivation, as it is one of the important nutrient staple crops. It is indeed the predominant product of the nation as well as Jharkhand. The present study was conducted in Geswe, Gutru, Katangdiri, Korabar and Surid villages of Burmu block of Ranchi district, Jharkhand. In this study the main objective is to estimate the cost and return structure of paddy cultivation under SRI and traditional method, but the major issue with the traditional system of paddy cultivation is that the area where paddy is grown, water demand increasing day by day, so the only option is to follow any strategy like SRI that could produce higher rice with low cost. The study concluded that traditional method was somewhat more expensive (Rs. 14014.54 per acre) than SRI method (Rs. 12154.63 per acre). The yield realized in traditional method was 1560.06 kg per acre, while it was 1821.17 kg per acre in the SRI method of paddy cultivation. The B: C ratio is higher in SRI method of paddy cultivation.

Keywords- Cost and Return, Benefit Cost ratio, System of Rice intensification, Cost of production, Cost of Cultivation

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Introduction

India is the second largest rice growing country after China. Besides, this nation has a large range of area under rice cultivation, as it is one of the important nutrient staple crops. It is indeed the predominant product of the nation as well as Jharkhand. Jharkhand is primarily an agricultural state, and nearly 78 percent of the population residing in 32620 villages depend mainly on agriculture and allied activities for their livelihood. Jharkhand has 1.4 million ha area under rice cultivation, which is mostly in rain-fed shallow and upland zones. Rice is a major crop of the state during kharif with about 75-80 percent of the net cultivated area under rice. A large area of about 14.8 lakh ha Vacated by kharif rice is left fallow in Rabi season in Jharkhand, which is typically called rice fallow. Recent studies on paddy cultivation shows that demand of water for paddy cultivation is continue increasing in present Indian context, especially in the eastern part, any strategy that would produce higher rice yield with less water and less expenditure is the need of the day. The cultivation of paddy crop under the conventional method (inundation method or flood method) has been facing several constraints. First, since paddy is a water-intensive crop, its cultivation and water availability are closely linked. It is well known that about 70-80 percent of freshwater withdrawals at global level are used for the agricultural purpose and rice accounts for about 85 percent of it. Paddy being an important water intensive crop (consumes 3000-5000 litres to produce one kg of rice as against the requirement of only 900 litres for wheat), irrigation water supply is essential to increase the productivity. But, the fast decline of irrigation water potential and increased demand for water from various sectors has been reducing the availability of water for agricultural sector, which is causing a serious impact on the productivity of paddy in many parts of the country. Under such circumstances the system of rice intensification (SRI) method of paddy cultivation emerged as a best option for farmers [1].

SRI method differs from the conventional method of rice cultivation as given below.

1. Nursery Management: Firstly, raised seed bed prepared by a well mixture of FYM and soil either on polythene covers, banana sheaths etc. or on soil itself. Secondly, seed rate five kg per hectare is sufficient as against 50 to 62.5 kg in conventional method. Thirdly 8 to 12 days aged seedlings transplantation with two small leaves, and seed attached to the plant as against 25 days and above in conventional method of rice cultivation.

2. Transplanting to main field: Seedlings should be removed carefully from the nursery without disturbing the roots of the plant along with seed and single seedling should be transplanted per spot in the main field. Water in the main field should be drained out before transplanting.

3. Wide spacing: Wider spacing of 25 x 25 cm in square pattern should be maintained for better aeration and for easy intercultural operations due to line plantation with the help of rotavator as against 50 to 60 hills per square meter in conventional method.

4. Weeding: Naturally weed growth is more in SRI fields because there is no stagnated water. Weeding should be done with rotary weeder/ conoweeder for at least four times with an interval of 10 days starting from tenth day after planting. It churns the soil and the weeds are incorporated in the soil, which in turn serves as organic manure. It helps in increased soil aeration and soli health.

5. Water management: The soil should be kept moist but not to break the soil also not saturated by providing alternating wetting and drying.

6. Manure and fertilizer: Application of more of organic manures *i.e.*, 8 tonnes per ha should be used and apply fertilizer based on soil test results [2]

Table-1 Per Acre Input Used Pattern in Traditional and SRI Method of Paddy Cultivation

Sr.No	Particulars	SRI		TRADITIONAL	
		EXPENDITURE %		EXPENDITURE %	
A	Variables				
1	Seed	78.02	0.64	1165.68	8.32
2	Fertilizer				
a	Nitrogen	390.32	3.21	377.85	2.7
b	Phosphorus	729.84	6	731.84	5.22
c	Pottash	0	0	0	
3	Farm Yard Manure	775.71	6.38	459.12	3.28
4	Plant Protection Chemical	63.21	0.52	50.02	0.36
5	Human Labour	3721.95	30.62	5198.37	37.09
6	Bullock Labour	2108.03	17.34	1352.69	9.65
7	Machinery Labour	653.23	5.37	630.75	4.5
8	Irrigation	166.23	1.37	954.72	6.81
9	Interest on Working Capital @ 8%	173.73	1.43	218.42	1.56
	Sub Total	8860.26	72.9	11139.47	79.49
B	Fixed Capital				
1	Land Revenue	2.5	0.02	2.5	0.02
2	Rent Value of Own Land	1250	10.28	1250	8.92
3	Depreciation	852.69	7.02	286.95	2.05
4	Interest on Fixed Capital @12%	84.21	0.69	61.58	0.44
	Sub Total	2189.4	18.01	1601.03	11.42
	Managerial Cost	1104.97	9.09	1274.05	9.09
	Total Cost of Cultivation	12154.63	100	14014.54	100

Source: Field Survey

Table-4 Prioritization of constraints in SRI method of paddy cultivation

SRI					
Sl. No.	Problems	Percent position	Garret value	Mean value	Rank
1	Management practices	5	82	63.84	I
2	Lack of water availability	15	70	55.96	II
3	Lack of getting skilled labour	25	63	51.8	III
4	Non-availability of machines and tools	35	57	51.76	IV
5	Disease and pest attack	45	52	48.5	VI
6	Lack of guidance from govt. officials	55	47	44.18	VIII
7	Lack of confidence in taking new technology	65	42	45.7	VII
8	Non-availability of pesticides or other chemicals	75	36	40.52	X
9	Non-availability of cash or credit	85	29	43.08	IX
10	Non-availability of quality seed	95	18	51.38	V

Source: Field Survey

Objectives of study

To work out the cost and return structure of paddy cultivation under traditional and SRI methods.

To analyze the major constraints confronted by the farmers under SRI method of paddy cultivation.

Research Methodology

The study was based on the input and output data obtained from the respondents in Burmu block of Ranchi district. For selection of respondent's multistage sampling design was employed. In this procedure, at first stage Ranchi district selected purposively. From Ranchi district Burmu (paddy growing) blocks following both traditional and SRI method of paddy cultivation were purposively selected.

The block was selected purposively because of the earlier experience of work in the same block. Then on the third stage, five major paddy growing villages (Geswe, Gutru, Katangdiri, Korabar, Surid) were selected from Burmu block. At last, 20 farmers (10 SRI and 10 traditional System followed) were selected randomly from each village. Thus, the total sample size was 100.

Nature of Data

For the present study, necessary primary data were obtained from the respondents through personal interview with the help of pretested and well-structured survey schedule and observation methods. The data so collected pertained to the kharif season of the agricultural year 2015-16.

Analytical Approach

Estimation of Costs and Returns

The farm management, cost concept approach is widely used in India for evaluating crop profitability in production. The cost concepts in brief, are Cost A1, A2, B1, B2, C 1, C2, and cost C3

COST A1: This gives the total cash expenses incurred by the owner or operator. It included the following terms of costs.

- 1- Value of hired human labour.
- 2- Value of bullock labour.
- 3- Value of machinery charges (except depreciation).
- 4- Value of fertilizers and manures.
- 5- Value of seeds.
- 6- Value of insecticides, pesticides and weedicide
- 7- Irrigation charges.
- 8- Depreciation on farm implements
- 9- Interest on working capital.
- 10- Land revenue paid to government.

Cost A2 = Cost A1+ Rent paid for leased in land, if any

Cost B1 = Cost A1+ Interest on value of owned fixed capital assets.

Cost B2 = Cost B1+ Rental value of owned land less land revenue + rent paid for leased in land.

Cost C1 = Cost B1+ Imputed value of family labour.

Cost C2 = Cost B2+ Imputed value of family labour.

Cost C3 = Cost C2+10% of Cost C2 on account of managerial functions performed by the farmer.

In the present study, the rent paid for leased in land was zero, as none of the sample farmers took land on lease. Hence, cost A1 and cost A2 are similar.

Rates of Returns over Different Cost Concepts

Gross Income: Yield of main product (in kg/acre) x their prices (Rs.) + Yield of by product (in kg/acre) and their prices (Rs.)

Net Income: Gross Income – Cost C.

Farm Business Income: Gross Income – Cost A2

Farm Investment Income: Farm business income- wages of family labour

Family Labour Income: Gross Income – Cost B

For achieving the second objective simply Garret's ranking technique was used Garret's ranking technique

$$Percent\ position = \frac{100(R_{ij}-0.50)}{N_{ij}} \quad [3]$$

Where, Rij is the rank given for ith item by the Jth individual

Nij is the number of items ranked by the Jth individual.

The percent position of each rank was converted in to scores using Garret 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, the mean score for each constraint was ranked by arranging them in descending order.

Result and Discussion

The productivity and income from the crop production can be judged in better way, if we analyse it with respect to the different costs incurred during cultivation of a particular crop. The cost of cultivation and cost of production of any crop is the most important aspect of the farm economy both at micro and macro level point of views; it provides guideline to the government in promulgating the price policy both for factors of production and the produce. Input wise cost was worked out in two broad heads namely variable cost and fixed cost. The variable cost includes cost of human labour (family and hired), machinery labour, seeds, manures, fertilizers, pesticides, herbicides, and interest on working capital. On the other hand, fixed cost involves land revenues, rental value of owned land and depreciation [4]. The study revealed that SRI method has been found to be considerably more profitable than traditional method in study area due to low input expenditure. The total cost of cultivation was higher in traditional method (Rs 14014.54./acre) than SRI method (Rs 12154.63 per acre) in paddy cultivation. Average variable cost was observed Rs. 8860.26 under SRI method while in

traditional method it was observed Rs. 11139.47 per acre. Expenditure on seed was higher in traditional method due to high quantity of seed used. It was found that, human labour cost was the major variable component in both SRI and traditional method i.e., Rs.3721.95 and Rs.5198.37 per acre respectively. It was calculated on the basis of wage rate prevailing in study area. The percentage expenditure incurred on Irrigation component was more in traditional method i.e., 6.81 percent while in SRI it was 1.37 percent of total cost of cultivation. It is because SRI required less water than traditional method. It also indicates that the water use efficiency pattern followed in SRI method of paddy cultivation. Managerial cost was calculated as a fixed cost component that was 10 percent [Table-1]. It was observed at the time of data collection that there is no rent paid for leased in land in study area. So, Cost A1 and Cost A2 were same in both the SRI and traditional methods. Per acre Cost A, B and C for traditional method were more when compared to traditional method. For example, Cost C3 was more about Rs. 1859.91 per acre for traditional method when compared to that in SRI method. Cost A1, A2, B1, B2, C1, C2, and C3 are given in [Table-2]. The return structure in paddy cultivation in the study area is given in [Table-3]. The yield realized in traditional method was 1560.06 kg per acre, while it was 1821.17 kg per acre in the SRI method of paddy cultivation. The yield differences were mainly because of more number of productive tillers per meter square in SRI and due to spacing maintenance principle followed by SRI cultivators. The gross return was calculated from raw data was Rs. 27661.29 per acre under SRI method and in the traditional method it was Rs. 22365.69 per acre. So, the difference of gross return gained from SRI and the traditional method of Paddy cultivation was Rs.5295.6. Where the net income of SRI method varied about Rs.7342.02 from traditional methods. The net income gained from SRI was almost double as compared to traditional method, the net income was Rs. 15506.66 in SRI method and in traditional it was Rs. 8351.15. It was revealed from the table that the Net Cost was Rs.5130.64 per acre in the SRI method where in the traditional method it was Rs.8873.76 per acre. Net Cost is almost double in the case of traditional method with a comparison to the SRI method of Paddy cultivation. Cost of production, which is the ratio of net cost and output was highest in traditional method Rs.5.69 per kg. as comparison to SRI method Rs 2.82 per kg. The return per rupees investment was around Rs. 2.28 and 1.60 over variable cost under SRI and traditional method respectively.

The farmers were asked to list priority wise ten major constraints they were facing in SRI method of paddy cultivation. All these were sorted, screened and give them a rank according to the Garret method. The study revealed that the constraint 'Management Practices' was the biggest constraint in SRI method of paddy cultivation with the mean score of 63.84, followed by 'Lack of water availability' with the mean score of 55.96. SRI method was new to them, management practices are little different, they could not have carried it out properly. 'Lack of getting skilled labour' was the third major constraint in SRI system with the mean score of 51.8. The other constraints expressed by the sample farmers were Non-availability of machines and tools, 'Non-availability of quality seed, Disease and pest attack, Lack of confidence in taking new technology, Non-availability of cash or credit, etc. The SRI method was optimized with the help of ATMA in study area they gave 'conoweeder', seed, pesticide etc. for promotional purpose [Table-4].

Table-2 Per Acre various cost concepts used in paddy cultivation under SRI and traditional methods.

COST	SRI (Rs/acre)	TRADITIONAL Rs/acre)
A1	7358.42	8986.85
A2	7358.42	8986.85
B1	7442.63	9048.43
B2	8692.63	10298.43
C1	9799.66	11490.49
C2	11049.66	12740.49
C3	12154.63	14014.54

Table-3 Comparison of return structure in SRI and traditional methods of paddy cultivation

Rate of Return Over Different Cost Components		
Particulars	SRI	TRADITIONAL
Gross Return	27661.29	22365.69
Income		
Net Income	15506.66	8351.15
Farm Business Income	20302.87	13378.84
Farm Investment Income	17945.83	10936.78
Farm Labour Income	18968.66	12067.26
Cost of Production		
Net Cost	5130.64	8873.76
Output	1821.17	1560.06
Cost of Production	2.82	5.69
B:C Ratio		
B:C Ratio on Total Cost	2.28	1.6

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Summary and Conclusion

The findings of this study demonstrate the superiority of SRI in terms of yield and returns advantage. However, it is worth mentioning here that the actual adoption rate of SRI among paddy growers is very low, these observation calls for urgent needs of popularising the SRI method such as government, NGOs, and other agencies should take initiative and enhanced the extension services for SRI method. Skilled labour requirement particularly for transplanting and weeding operations was the major constraint in paddy cultivation under SRI method. So, timely guidance to the farmers and Agricultural labours through extension agencies (KVK, NGOs) should be ensured.

Application of Research:

In this study, the author has focused on economic view point and constraints of traditional and SRI method of paddy cultivation so the study is helpful in making SRI method more efficient at field level for policy maker and extension worker related to this.

Research Category: Agriculture Economics

Abbreviations:

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