



International Research Journal of Plant Science (ISSN: 2141-5447)
Vol. 13(1) pp. 01-5, February, 2022
DOI: <http://dx.doi.org/10.14303/irjps.2022.003>
Available online @ <https://www.interestjournals.org/plant-science.html>
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Research Article

A comparative study on conventional and Sri Methods of paddy cultivation in Hazaribag district, Jharkhand

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Abstract

To alleviate hunger and poverty, India initiated green revolution in 1960s by introducing high yielding varieties of rice and wheat. Most of the Indian states produce rice as major crop. For the first 20-30 years there was bumper rice production using new seeds, fertilizers, pesticides and mechanical aids in conventional paddy cultivation methodology. Excessive use of chemicals decreases the productivity of land areas resulting decreases in the income of farmers. A farming methodology which is amalgamation of multiple beneficial practices aimed at increasing the yield of rice is called system of rice intensification (SRI) world over. The farmers of Hazaribag district in Jharkhand state are continuously encouraged to adopt SRI method for rice production. To show the benefits of SRI over conventional paddy cultivation, a case study has been presented in this paper which reveals that rural employment as well as income of farmers could be maximized using SRI techniques.

Keywords: Conventional paddy cultivation, Input costs, Reduction in the cost, SRI methods.

INTRODUCTION

Rice is the most key foods all over the world. In India also rice is the important crop of North, South and North East states. Similar is the case of Hazaribag district in state of Jharkhand. Paddy cultivation in the District of Hzaribag is done mainly through the Conventional method and the result is that both the production quantity and productivity rates are low. The new concept known as System of Rice Intensification (SRI) came to India in 2003-2004 first at Andhra Pradesh. It is seen as a revolutionary method, improving limited resources farmers' profits. It is a combination of several agronomical practices dependent on plant physiological and bio-ecological factors. Prudent management of the various factors of paddy cultivation are being experimental within all the different stages of production process.

Hazaribag District comprising of 1,324 villages, supporting a population of 1,734,495, spread over 4,313 square kilometres has cultivated land area of 152395 hectares. The production recorded was 1, 13,969 tonnes as annual yield. Since time immemorial farmers of Hazaribag District have been growing paddy in conventional method. We all have known that the mountainous plateau of Chotanagpur has high and low lying lands. Because of this phenomenon assured irrigation facilities for paddy cultivation in Hazaribag District is not easily feasible. In the absence of assured irrigation, the limited resource farmers, depending upon conventional farming practices have suffered economical losses due to low production, low productivity rates, higher costs of production, misconceptions regarding irrigation and water needs, quantity of seeds requirement, dependency on fertilizers and pesticides. Most farmers in Hazaribag District

Received: 02-Feb-2022, Manuscript No. IRJPS-22-67840; **Editor assigned:** 03-Feb-2022, PreQC No. IRJPS-22-67840(PQ); **Reviewed:** 17-Feb-2022, QC No. IRJPS-22-67840; **Revised:** 21-Feb-2022, Manuscript No. IRJPS-22-67840(R); **Published:** 28-Feb-2022

Citation: Mehta S & Dwivedi RK. (2022). A comparative study on conventional and Sri Methods of paddy cultivation in Hazaribag district, Jharkhand. IRJPS. 13: 003.

are marginal farmers having 1 to 2 acres of land. These limited resources farmers of Hazaribag District have come to know about SRI, that is, the system of rice intensification method. The system was initiated and developed by Father Henri de Laulanie, in the fields of Madagascar, during the 1980s and 1990s (Shukla et al., 2016; Kirar et al., 2018). This method of SRI has been modified to be adapted and adopted in various geographical areas around the world. Dr Norman Uphoff has been instrumental in advertising it, promoting it, explaining about its efficacy so that paddy producing farmers adopt it with advantage (Stoop et al., 2002). Many of the traditional paddy cultivation practices have been replaced at various stages of cultivation by SRI method (Agarwal & Kumar, 2017).

In the District of Hazaribag, the limited resources farmers are excessively dependent upon natural rain for irrigation during paddy cultivation season. The comparative study between conventional paddy cultivation and SRI method is incorporated here. So far irrigation is concerned; SRI method requires assured irrigation facilities, in relatively small quantity, but intermittently. In conventional paddy cultivation the roots of the paddy crop are inundated from 2" to 5" inches requiring large amount of water. In SRI, this requirement of water is minimal only 1" of water suffices (Reddy et al., 2005). It's only to keep the roots moist. Alternate wetting and drying of the paddy crop roots, enhances the productivity ratio. Only this alternate wetting of roots to about 1" water level requires assured irrigation facilities spread over the paddy season. Where in labour intensive conventional paddy cultivation during transplantation seedlings at 15cm*20cm spacing distance and also during weeding raises the input costs, these are remarkably reduced in SRI practices cultivation with 25cm*25cm distance, thereby increasing profit margin ratio. Organic compost use cuts fertiliser costs. Chemical pesticides are not needed as in the SRI cultivation plants are insects resistant. Depending on hybrid seed, nearly 20kg per acre in conventional paddy cultivation is replaced by home grown seeds of 2kg per acre only.

METHODOLOGY

A comparative study was made in the District of Hazaribag, selecting 8 plots, in different blocks of the District namely at Katkamsandi, Katkamdag and Ichak. Both the conventional paddy cultivation practices and the SRI alternative method were put to test. Close monitoring of the cost of production, time required to produce, use of quantity of water, pesticides, insecticides, fungicides, seeds, labourers were recorded. That's record were maintained after the passage of 25, 55, 95 days after transplanting of seedlings. Close supervision under experts were made and written records maintained. Growth of plants height, number of tillers arising and ultimately flowering and fructifying too were noted.

That the average size of the family engaged in traditional and SRI form of cultivation was taken into account. The comparative study made a note of the age groups opting for the type of cultivation. It was observed that the younger group, (90%) better educated, ready to accept new challenges, ready to learn new skills, ready to face risks to learn new skills, ready to face risks opted for SRI mode of paddy cultivation. The elderly group preferred status quo and opted for conventional paddy cultivation.

With the difference in results the quantum of grain produced in conventional paddy cultivation for Jharkhand State is 1895 kg/hectares calculated for 1527.103 (hectare) areas. The total production was 2894.101 tonnes only (https://sameti.org/default1_1sprof.htm). The comparative yield chart for India stands at 2659 kg/hectares, calculated for 43.79 million hectares with total production at the rate of 116.42 million tonnes (Agricultural Statistics at a glance 2019).

THE Measure Characteristics of SRI

Seeds: Hazaribag District farmers have been using nearly 20kg of paddy seeds per acre of paddy cultivation. This requirement in SRI method is drastically reduced to be only 10%, that is, 2 kg per acre of land. That conventional cultivation cost of 20kg seeds, that too of hybrid quality is very high. In SRI method, the requirement of seeds is only 2 kg and that too, home grown paddy is used as seeds. This is the basic reason why the cost of production of paddy crop is greatly reduced, adding to the profit margin ultimately.

Fertilizer: With constant use of fertilizer during paddy cultivation, year after year, the productivity quality of the soil is considerably reduced. The limited resource farmers, of necessity, have to apply higher doses of fertilizers in successive years. This adds to the cost of production in the conventional paddy cultivation. Even infertile soils are relatively better suited for higher yields in SRI. This lowering of the input cost on fertilizers reflects in higher profits of the farmers.

Pesticides: The traditional paddy cultivation requires large quantity of pesticides, insecticides and fungicides as the hybrid seeds are relatively weak and so dependent on their support. In SRI method, the home grown seeds are relatively stronger. They can endure pests, insects and fungus much easily. As a good amount of money is required to purchase insecticides, fungicides and pesticides in conventional paddy cultivation, it adds to the cost of production of paddy. This increased cost of production automatically reduces the margin of ultimate profit of these farmers.

Nursery preparation: With the above requirements and changes known, the limited resource farmers are resorting to alternative SRI method of paddy cultivation. For that the nursery bed is prepared with FYM mixture banana sheaths

polythene covers and composts. Only 2 kg of seeds are sown. The tender seedlings are uprooted only after 8-10 days in SRI method. In the traditional paddy cultivation system the seedlings are left for 25 days to mature. Thus, the roots thicken and branch laterally when transplanted in clusters, these over grown roots compete amongst themselves for oxygen and nitrogen dissolved in water. Many stems get weak and ultimately die. In SRI form of cultivation these seedlings are delicately uprooted with the original grain intact, as only 8-10 days old. They are carefully transplanted in moist soil, only 1-2 cm deep, with the help of index finger and the thumb. These seedlings easily get fixed into the moistened soil. With little competition for oxygen and nitrogen amongst sparsely planted seedling roots, its growth is healthier. The stronger stem grows. The early tillers arise from the main culms and multiply to as many as 30 to 50 on the average. The culms or jointed stem of rice is made up of a series of nodes and internodes. In SRI method the stem of rice popularly known as the haulm or the culms, is predominantly erect, cylindrical, solid at the nodes and hollow at the internodes, In comparison to the conventional paddy cultivation where roots are inundated up to 2"-5" inches, that is deep water, these deep water varieties and or in the floating types, the culms have generally very long internodes, but the numbers are reduced. Each tiller is an independent plant. The primary tillers originate from the lower most nodes. They in turn give rise to secondary tillers which further produce tertiary tillers. Thus the strong plants in SRI method have more tillers, more grain, less of chaff, higher yield, thereby raise quantity of production, ratio of productivity rises and so does the profit of the limited resource farmers (Figure 1 & 2).

Spacing in Transplantation: The labour intensive conventional seedling paddy transplantation requires some 10 to 15 number of labourers per acre of land. It is because the seedlings were transplanted in a line at 15*20 cm apart. The cluster of seedlings 25 days old, were thrust 3 to 5cm deep into the heavily irrigated soil. Some 20kg of seeds were grown in the nursery for 1 acre of land. With



Figure 1: Farmer preparing paddy's farm by plough.



Figure 2: Farmer preparing paddy's farm by tractor.

the alternate SRI method only 2kgs of seeds for seedlings, and spacing distance increased to 25*25cms apart, and that too in squares of 3mtrs, the number of labour requirements have reduced 5 to 8 numbers. So, calculating average labour wages for the day to be Rs300 per labour, the payment cost in SRI for labours totals up to Rs1500-2400 for 1 acre seedlings transplantation. The labour intensive conventional paddy transplanting of seedlings operation will require minimum of 10 labours. The cost as wages will be Rs3000 for 1 acre. Thus, the minimal initial cost of production will higher by Rs1500 for the conventional farmer (Figure 3 & 4).

Weeding: Weeding paddy cultivation is a necessity. As the seedlings are transplanted closely, at 15cms to 20cms spacing distance, weeding operation has to be taken up by human factors, that is, labours. Tools and machines use is not feasible. Thus nearly 15 to 20 labourers are required for weeding out the unwanted weeds. But in SRI cultivation, as the spacing of seedlings are 25cms*25cms apart, there is enough distance between two plants for weeding tools to be operated in between without damaging the roots of the paddy plants. This tools and machines operated efforts saves labour man days. Only 5 labours can easily do this necessary wedding in one acre of land. Again a saving of 10 labours daily wages amount up to Rs1500 per acre. Such savings in cost of production also accrue to real profit calculation of the SRI limited resource farmers.

Method of Harvesting: The traditional paddy harvesting operation is done after 125 days of transplantation of the paddy seedlings similar is the case. SRI method is performed. Incidentally, the cost of harvesting in both the methods is almost the same, that is, nearly Rs 5000 per acre.

Yield and Cost of Cultivation: The total yield from 1 acre of the land through SRI method of paddy cultivation was recorded as 15 to 26 unit bags of rice. For the same land area (one acre) of land, the yield obtained through conventional



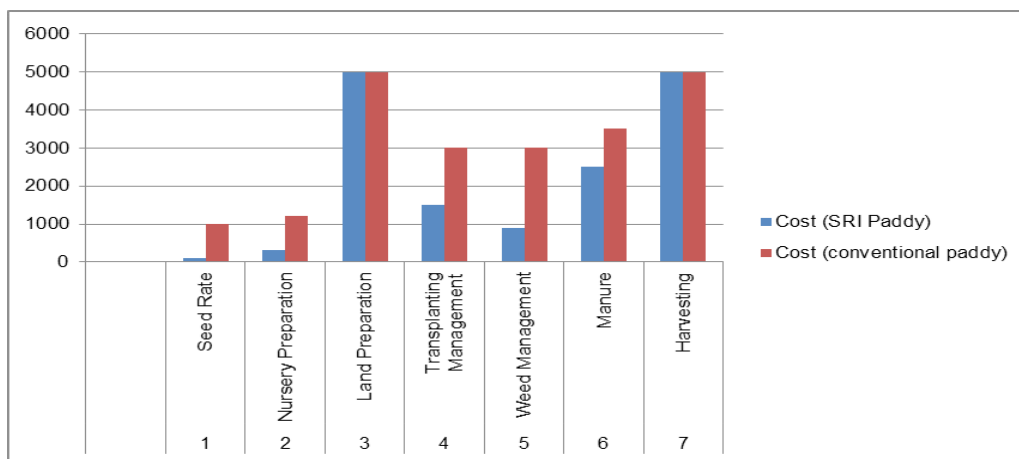
Figure 3: Transplanting of paddy by SRI method.



Figure 4: Transplanting of Paddy by conventional method.

Table1: Costs comparison of conventional and SRI method of paddy in 1 acre land.

S.N.	Cultivation Practices	Cost (SRI Paddy)	Cost (Conventional Paddy)
1	Seed Rate	100	1,000
2	Nursery Preparation	300	1200
3	Land Preparation	5000	5000
4	Transplanting Management	1500	3000
5	Weed Management	900	3000
6	Manure	2500	3500
7	Harvesting	5000	5000
	Total	Rs 14,300	21,700



Graph 1: Cost comparison Graph

paddy cultivation was only 16-18 units’ bags of rice. Thus difference in the quantity of yield per acre was 9 to 10 units’ bags of rice. When lower cost of production of paddy through SRI method is compared with the conventional paddy cultivation method and the difference in yield is converted into monetary units, definite economical advantage in favour of SRI cultivation method is found.

RESULT

Table 1 and Graph 1 show a cost comparison of conventional and SRI paddy methods on one acre of land, as well as a cost comparison graph. It was clear from the table that cost expenditure of conventional method (Rs 21,700 /acre) than SRI method (Rs 14,300/acre) in paddy cultivation.

CONCLUSION

The demonstrational experimentation of conducting paddy cultivation using both conventional method and SRI method simultaneously in the different blocks of Hazaribag District is concluded as here under mentioned. The economic analysis reveals that besides consuming less time, resources and labour, the profitability margin (return per rupee) in SRI Rice cultivation in comparison with conventional cultivation is much higher. The comparative expenditure table-1so above is indicative of less expenditure incurred in SRI Rice cultivation. The most important area of discrepancy is in the quantity of seeds needed to sow (2kg: 20kg). Nursery management, Transplanting management, Weed management and Manure/Fertilizer application areas also have definite comparative advantages in SRI method of rice cultivation. At the same time certain natural phenomenon, such as lack of water availability during the season, lack of sufficient number of skilled and educated labour force made SRI method of cultivation a little difficult. Thus for larger adaptation of SRI Rice cultivation appropriate governmental

support like training and demonstrations on larger scales, in more number of villages, with proper guidance from extension personnel's is suggested.

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