Original Research Article

AN ALTERNATIVE TO CONVENTIONAL RICE: DIRECT SOWING WITH DRUM SEEDER

Abstract:

Objective: The current study is to compare the economics of rice cultivation by Conventional method (CR) versus Direct sowing with drum seeder (DSR) and to rank the constraints faced by DSR adopted farmers.

Method: Cost concepts were used for comparative economic analysis and Garrett ranking technique was used for analysing the constraints faced by the DSR adopted farmers. The present study was conducted in Nalgonda district of Telangana with sample of 80 farmers.

Findings: Direct sowing with drum seeder was proved to be cost effective and profitable compared to conventional rice cultivation. Cost C2 of DSR (81518.9 Rs./ha) was lower than Cost C2 of CR (87535.4 Rs./ha). Net returns of DSR (44839.2 Rs./ha) was higher when compared to CR (41784 Rs./ha).

Conclusion: It is evident from the results of the economic analysis and the feedback received from the farmers that, direct sowing of rice with drum seeder with proper weed management was feasible and most practical alternative for the farmers to go for rice cultivation in the event of uncertain monsoon, increased cost of cultivation and labour shortage besides resource optimization in Telangana state. Therefore, DSR is considered to be the best alternative for rice cultivation addressing the issues of conventional system.

Keywords: *Cost concepts, Constraints, Conventional rice, Direct sowing.*

1. INTRODUCTION

Rice is a staple food for more than half of the world population and plays a vital role in national food security and is the backbone of livelihood for billions of households. It accounts for 161 million ha of land with an annual production of about 678.7 million tonnes [11]. Agriculture accounts for the majority of the freshwater use and more than 50 percent is utilized to irrigate rice. In India, 49.5 percent (22 million ha) of the rice grown area is irrigated while 13.5 percent (6 million ha) is upland, and 32.4 percent (14.4 million ha) is rainfed lowland. A considerable portion of the rice

supply comes from irrigated land [10]. In Telangana, rice is grown in 2.01 million ha, with a production level of 7.34 million tonnes and productivity of 3649 kg/ha during 2019-2020 [1]. With the rising population, demand for food has also increased. Further, it is estimated to increase food production by 70 percent to meet the global food demand by 2050 [4].

Telangana state had come long way by emerging as 'rice bowl of India.' The most prominent cultivation practice in Telangana is transplanting and there are other methods like direct seeding methods. Transplanting is done either manually or mechanically. Mechanical transplanting of rice has been considered as the most promising option, as it ensures timely transplanting [7]. However, with declining labour and water availability day by day and increasing population, food security in challenged and threatened [10]. And also, with the difficulties faced in raising the nursery, late onset as well as uncertainty in receipt of rains coupled with high labour costs, looming water scarcity have forced to search for the alternative crop establishments from conventional transplanting. Also, increasing the food production by improving the productivity is the need of the hour rather than by horizontal expansion which involves increased competition for varied resources. One such method is DSR.

Direct sowing of rice with Drum seeder (DSR) refers to the process of establishing a rice crop from seeds sown in the field using drum seeder rather than by transplanting rice (TPR) seedlings from the nursery. To meet the food requirement of the growing population, the rice production has to be enhanced with good management practices with shrinking availability of land, labour and water resources. DSR is most effective method of reducing cost, labour, saving time and water input. It often yields higher compared to conventional transplanting in well managed situations.

2. MATERIALS AND METHODS:

2.1 Study area:

Multistage proportionate random sampling technique was used for the present study. In the first stage, one of the districts with highest production of rice was selected from Telangana state. Accordingly Nalgonda district which is 2nd highest in area and production of rice cultivation, was purposively selected for the study. Further,

Duggepally and Mukundapuram villages of Nidamanoor mandal, Cheruvupally and Gacharam villages of Madgulapally mandal were selected randomly. Farmers practicing conventional rice and direct sowing with drum seeder were selected randomly. Thus, the sample framed with one district, two mandals, four villages (two villages from each mandal) and 80 rice farmers (40 farmers under each method). The data of the selected rice farmers were obtained through personal interview method with the help of pre-structured questionnaire which includes socio-economic features, cost details of CR and DSR and also constraints faced by DSR adopted farmers.

2.2 Methodology

Cost concepts

Cost concepts were used for economic analysis and Garrett ranking was used for constraint analysis.

These cost concepts include Cost A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2 and Cost C3.

Cost A1 = All actual expenses in cash and kind incurred in production

Cost A2 = Cost A1 + rent paid for leased-in-land

Cost B1 = Cost A1 + interest on value of owned capital assets

Cost B2 = Cost B1 + rental value of owned land and rent paid for leased-in land

Cost C1 = Cost B1 + imputed value of family labor

Cost C2 = Cost B2 + imputed value of family labor

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

Garrett ranking technique

Garrett ranking technique was used to analyse the constraints faced by the individual farmers who adopted DSR. Respondents were asked to rank the listed constraints, rank one means most important, and last rank means least important. Then, the rank assigned to each constraint by each individual farmer will be converted into percent position using the following formula.

$$\text{Percent position} = \frac{100 \times (R_{ij} - 0.50)}{N_j}$$

Where, R^{ij} stands for rank given for the i^{th} constraint (i= 1, 2……n) by the j^{th} individual (j = 1, 2….. n) and N_j stands for the number of constraints ranked by j^{th} individual.

3. RESULTS AND DISCUSSION

3.1 Economics of CR and DSR

Cost of cultivation of both the methods was estimated taking into account the cost of seed, fertilizers, pesticides, herbicides and hiring charges of human and machine labor. There existed a higher cost of cultivation in conventional method (87510 Rs./ha) compared to direct sowing with drum seeder (81647 Rs./ha). The additional cost incurred in conventional rice was that of human labor cost which is 39.92% of total variable cost (64978.76 Rs./ha) which is 35.9% of total variable cost (63212.26 Rs./ha). By which it is identified that direct sowing with drum seeder is labor saving. The share of costs of seed, fertilizer and pesticides were not of considerable difference in both the methods. Cost of herbicides was more in direct sowing with drum seeder compared to conventional rice as weed infestation was major hurdle in DSR. Rental value of land plays a major role in fixed costs (25.7% and 22.5% of total costs in CR and DSR respectively). The net returns was higher in DSR (47610.5 Rs./ha) than CR (40911.5 Rs./ha) due to higher gross returns (129129.38 Rs./ha) in DSR. This indicates that direct sowing with drum seeder is higher yielding technology besides being cost-effective.

List 1: Cost of cultivation of Rice crop (CR)

A	Variable costs	% of total variable costs
1	Seed cost	3.91
2	Fertilizers	10.55
3	Pesticides	14.18
4	Herbicides	3.13
5	Irrigation	0.38

6	Owned labor	17.31
7	Hired labor	22.61
8	Machinery labor	21.34
9	Interest on working capital	6.54
10	Total variable costs (%)	100
	Total variable costs in Rs./ha	**64978.76**
B	**Fixed costs (Rs./ha)**	**22531.62**
C	**Gross costs (Rs./ha)**	**87510.38**

List 2: Cost of cultivation of Rice crop (DSR)

A	Variable costs	% of total variable costs
1	Seed cost	3.78
2	Fertilizers	11.12
3	Pesticides	14.21
4	Herbicides	7.7
5	Irrigation	0.47
6	Owned labour	22.145
7	Hired labour	13.77
8	Machinery labour	20.25
9	Interest on working capital	6.54
10	Total variable costs (%)	100
	Total variable costs in Rs./ha	**63212.26**
B	**Fixed costs (Rs./ha)**	**18434.75**
C	**Gross costs (Rs./ha)**	**81647**

List 3: Various cost concepts in rice cultivation (CR)

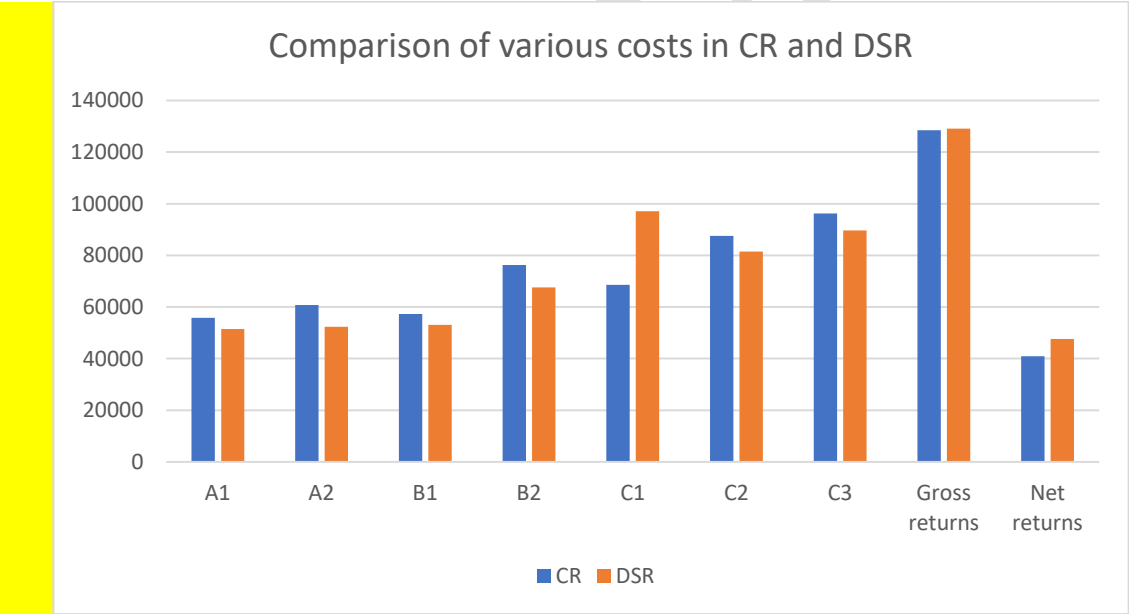
Cost concepts	**Rs./ha (CR)**	**Rs./ha (DSR)**
A1	55743.9	51462.31
A2	60755.1	52293.6

B1	57336.6	53062.6
B2	76285.4	67519
C1	68586.6	97062.6
C2	87535.4	81518.9
C3	96288.9	89670.9

List 4: Net returns of Rice cultivation by CR and DSR

Particulars	DSR	CR
Gross returns	129129.38	128447
Cost (Cost C2)	81518.9	87535.4
Net returns	47610.5	40911.5

List 5: Comparison of various cost concepts in rice cultivation (CR and DSR)



3.2 Constraints faced by DSR adopted farmers

There were many constraints faced by DSR adopted farmers which may lead to discontinuance of direct seeding in rice. Based on farmers opinion, ranking the constraints was done. Using garrett ranking technique, their response was analysed. The results revealed that weed infestation was the major bottleneck in DSR.

Secondly, damage due to birds at the time of germination was challenging the adoption of DSR as they face difficulty in good plant growth. Uneven crop stand was ranked as third major constraint by the respondents. Lack of proper awareness among farmers about new herbicides, herbicide application technique and about DSR technology has become one more hurdle in DSR. Land or soil suitability also plays major role due to which most of the farmers were not willing to adopt DSR. Lack of extension activities was ranked in sixth position as farmers feel that those activities help them gain knowledge and awareness about new techniques, herbicides etc. Crop lodging was mentioned as one of the constraint as it causes yield reduction due to self-shading and also makes it difficult to harvest the crop. Lack of machinery which causes additional investment, rains during germination, lack of interest to avoid risk or to adopt new techniques were few other constraints challenging in DSR. Yield is same or more than the transplanted rice, hence ranked last by the respondents as there is no yield loss.

Table 1: Garrett score

Constraints	**Garrett score**	**Rank**
High weed infestation	78.25	1
Bird damage at the time of germination	65.2	2
Uneven crop stand	61.93	3
Lack of proper awareness	58.4	4
Land/soil suitability problems	56.02	5
Lack of extension activities	46.3	6
Crop lodging	42.07	7
Lack of Drum seeder	40.27	8
Rains at the time of germination	33.37	9
Lack of interest/not risk taking	32.57	10
Yield loss	32.27	11

4. Conclusion

The most predominant method of rice cultivation is transplanting. This method requires more labor, time, and water and is cumbersome. To overcome these challenges farmers are now cultivating direct sowing with drum seeder. This transition substantially reduced labor and water requirement, facilitates the early establishment of crops, low production cost and higher returns. As this shift increases weed infestation, proper weed management techniques must be identified which if not taken care, may lead to crop failure. Lodging is another challenge that need attention. Despite controversies, as DSR is cost effective and resource conservative, if properly managed, higher returns can be expected from DSR compared to conventional rice.

Consent

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

Recommendations:

- ❖ Rice varieties suitable for DSR which have ability to suppress weeds and yield high should be developed.
- ❖ A study on needs of extension works like trainings, demonstrations and workshops regarding new production methods can be undertaken.

6. References

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