Case Study

IMPACT OF DIRECT SEEDED RICE TECHNOLOGY ON RICE FARMERS' EARNINGS: A CASE STUDY

B.L. Dhaka* and R.K. Bairwa
Krishi Vigyan Kendra, Post Box No. - 4, Bundi-323001, Rajasthan, INDIA
**Corresponding author's E-mail: bldhaka@gmail.com*

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ABSTRACT

The study was conducted to evaluate the impact of direct rice-sowing technology on rice farmers' earnings during Kharif season of 2017. The adoption of direct seeded rice has resulted in reduction in cost of cultivation by Rs. 11, 580.00 per hectare. The study revealed that the farmers could save on various inputs like fuel, irrigation, human and machine labour, but had to spend more on herbicides in direct seeded rice. This may be mainly because of the severe weed problem associated with DSR. From the results of the above study, it can be concluded that DSR is economically viable and highly profitable in comparison with the transplanting method.

INTRODUCTION

Rice is the major Kharif crop of Bundi district of Rajasthan covering 30 thousand ha area. Traditionally, paddy is grown as transplanted system of cultivation. However, this system is labour-water-energy-intensive and is becoming less profitable as these resources are continuously declining and expensive (Soriano *et al*., 2016). Therefore, the farmers are increasingly shifting from transplanted rice to direct seeded rice system. Direct seeded rice is a system of cultivating rice where seeds are directly sown in dry and non-puddled (aerobic) fields. Direct seeded rice methods have several advantages over transplanted rice (Naresh *et al*., 2010). Compared to transplanted rice, direct seeded rice was reported to produce the same yield in several field experiments while saving irrigation water (Bouman and Tuong, 2001; Yadav *et al*., 2011), labour (Bhushan *et al*., 2007), cost of production with higher net returns (Lee *et al*., 2002; Singh *et al*., 2006). Direct seeded rice is an emerging rice production system due to comparable yield, lesser cost of production and higher net returns compared to TPR system. In addition to higher economic returns, direct seeded rice crops are faster and easier to plant, less labour intensive and consume less water (Jehangir *et al.,* 2005). The need to increase productivity against rising labour costs for transplanting has led to a considerable increase in direct seeding in recent decades (Johnson *et al*., 2003). The main motivating factor for shift in rice establishment method from transplanting to direct seeding in India is response to labour scarcity (Balasubramanian, 2002).

With the ardent intent that all farmers should get the advantage of science led innovations and with the intention of economic, social and environment sustainability, Krishi Vigyan Kendra, Bundi has created awareness amongst farmers about the direct seeded rice technology through various extension activities including Trainings, Kisan Gosthies, farmer scientist interaction meets and demonstrations. In this background, the present study was conducted to study the impact of direct seeded rice on yield, costs and profitability to the farmers.

METHODOLOGY

The study was conducted in Bundi district representing south eastern humid plain agro-climatic zone of Rajasthan. The direct seeded rice technology, to be compared with traditional practices demonstrated, tested and evaluated under a given set of socio-economic and biophysical condition in form of frontline demonstration. In all, 32 demonstrations were carried out at farmers' field during Kharif 2017 involving farmers with their resources as active participants. All the participating farmers were trained on all aspects of direct seeded rice. Rice sowing was done by Seed cum ferti drill at a seed rate of 30 kg/ha. Weeds are the major threat in direct seeded rice therefore, pendimethaline at 1 kg a .i. /ha was applied next day after sowing, it was

followed by application of bispyribac sodium at 0.03 kg a.i. /ha in 500 liter of water to control broad leaf weeds and sedges at 25 DAS. One manual weeding was also done at 35 DAS to eliminate some of the escaped weed. Other cultural operation were similar to transplanted paddy except application of butachlore @ 1.25 kg a.i./ha at 2 days after in transplanted paddy. The impact of direct rice sowing technology was estimated on rice crops yield, water, weedicide and labour demand.

To analyze the perception of respondent farmers about benefits, quantification of data was done by first ranking the benefits of direct seeded rice cultivation system based on the responses obtained from the respondents and then calculating the Rank Based Quotient (RBQ) (Sabarathnam, 1988), which is as follows:

$$R.B.Q. = \frac{\sum fi(n+1-i)}{N \times n} X\ 100$$

Wherein,

fi = Number of respondent reporting a particular benefit under i^{th} rank

N = Number of respondents

n = Number of benefit identified

RESULTS AND DISCUSSION

A comparative analysis of expenditure incurred on various inputs in direct seeded rice and transplanting method of rice cultivation are presented in Table 1. There was not much difference in costs incurred on fertilizers and pesticides in both the methods of crop establishment. The cost incurred on human labour was reduced nearly by 60 per cent in direct seeded rice and this reduction was mainly because the direct seeded rice obviates the need for expenditure on labour required for nursery raising, uprooting the plantings from nursery and transplanting in the main field. Sehrawat *et al.* (2010) also observed 13-16% labour saving in direct seeded rice as compared to manual transplanted rice. The expenditure incurred on herbicide was 70 per cent higher in direct seeded rice than that of transplanting method and this is mainly because of the high weed infestation in direct seeded rice. The farmers reported that weed management was the most crucial component in adoption of direct seeded rice. The adoption of direct seeded rice has resulted in slightly lower average grain yield than that of transplanting method (Table 2). Singh *et al.* (2006) also observed 10% yield loss in direct seeded rice as compared to manual puddled transplanted rice. Bhusan *et al*. (2007) and Ladha *et al*. (2009) also observed that direct seeding on soils with no tillage often resulted in some loss of rice yield. Pathak *et al*. (2011) reported that yields from direct seeded rice are broadly comparable with transplanted rice provided that weed management is effective. If weeds were not controlled effectively, yields in direct-seeded rice were less than that transplanted rice. The total variable costs were Rs. 27820 per hectare in direct seeded rice, whereas Rs. 39400 per hectare in conventional transplanting method (Table 1). The adoption of direct seeded rice has resulted in reduction in cost of cultivation by Rs.11, 580.00 per hectare. The net returns were Rs. 86034 per hectare for direct seeded rice and Rs. 76977 per hectare for transplanting method. This result corroborates the findings of the study of Nirmala *et al.* (2016) and Kumar (2011).

Table 1. Variable cost occurred in direct seeded rice and conventional method

Particular	DSR	Transplanted
Nursery raising	0.00	2200
Puddling	0.00	3500
Transplanting	0.00	7200
Ploughing/sowing	2160	1440
Irrigation	3000	6000
Weed management	4500	900
Harvesting, threshing and input like seed, fertilizers, persticides	18160	18160
Total variable cost	**27820**	**39400**

Table 2. Comparative economics of DSR and conventional method

Particular	DSR	Transplanted
Yield (kg/ha)	3926	4013
Gross cost of cultivation (Rs)	27820	39400
Gross return (Rs)	113854	116377
Net return (Rs)	86034	76977

During the demonstration of direct seeded rice technology it was believed important to convince the farmers about the potential benefits of adopting direct seeded rice. The farmers came to regard the direct seeded rice as an alternative cultivation practice to transplanted rice cultivation that provided many benefits for all (Table 3).

The results presented in the Table 3 revealed that direct seeded rice was emerged as an alternative cultivation practice to cope up with labour shortage during the peak periods and also avoids drudgery in puddling involved in transplanting method. It was reported by majority of the respondent farmers that direct seeded rice saved irrigation water as compared to transplanted rice in puddle. It was reported by the respondent farmers that direct seeded rice avoids repeated puddling, preventing soil degradation and plow-pan formation. As the crop duration is reduced by 10-15 days, it facilitates timely sowing of the next crop on conserved soil moisture without any moisture stress. This result corroborates the findings of the study of Nirmala *et al.* (2016).

Table 3. Perceived Benefits of direct seeded rice

Benefits	R.B.Q	Overall Rank
Savings on water	70.83	II
Solves labour scarcity problem and reduces drudgery	79.16	I
Allows early sowing of next crop	50.00	V
Avoids repeated puddling, preventing soil degradation and plow-pan formation	58.33	III
Saving on input costs	39.58	IV

CONCLUSION

However, the yield of direct seeded rice is comparable with transplanted rice, this is an alternative option to overcome the problem of labour and water shortage. Therefore, its gaining momentum among rice farmers as it is economical than transplanting. The development of early-maturing varieties with early seedling vigour and efficient nutrient management techniques along with integrated weed management would encourage farmers to switch over from transplanted rice to direct seeded rice culture.

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