

Direct Seeded Rice: An Impact Analysis in Tungabhadra Command Area of Karnataka

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ABSTRACT

The impact of Direct Seeded Rice (DSR) on profitability of farmers of Raichur and Koppal districts of Tungabhadra Command area of Karnataka, India were analyzed for the year 2014-15. Partial Budgeting technique was employed to analyze the profitability of DSR vs. Transplanting method. The study revealed that majority of the farmers had adopted DSR practice as a farmer to farmer spread of technology. The total variable costs were Rs. 37,170 per hectare in DSR, whereas Rs. 50,603/- per hectare in conventional transplanting method. The adoption of DSR has resulted in reduction in cost of cultivation by Rs.13,433/- per hectare. The net returns were Rs. 44,796/- per hectare for DSR and Rs. 25,482/- per hectare for transplanting method. Partial Budgeting technique of DSR vs transplanting method revealed that the farmers could save on various inputs like, seed, irrigation, fertilizer, human and machine labour, but had to spend more on herbicides in DSR. This may be mainly because of the severe weed problem associated with DSR. Partial budgeting technique further revealed that the adoption of DSR has resulted in an additional profit of Rs.19,315/- per hectare. 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.

Key words: Direct-seeded rice (DSR); Water saving; Labor saving;

Rice is the staple food crop in India and occupies highest area among the cereal crops. In India, transplanting is the mostly adopted method of rice establishment. However, depletion of water resources is forcing farmers to shift to Direct Seeded Rice (DSR). The direct seeding of rice refers to the spreading of seeds in fields before or immediately after pre-monsoon showers. The method does not require raising and transplanting of seedlings (Kakumanu, 2011). The need to increase productivity against rising labour costs for transplanting has led to a considerable increase in direct-seeding in recent decades, particularly in South and Southeast Asia (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).

Direct seeded rice, a common practice before green revolution in India, is becoming popular once again because of its potential to save water and labour (Gupta

et al., 2006). Currently, direct seeded rice in Asia occupies about 29 Mha which is approximately 21 per cent of the total rice area in the region (Pandey and Velasco, 2002). Countries like USA and Australia extensively practicing direct seeding of rice are with profitable results as it avoids all the penalties entailed in transplanting. Direct seeded rice under no/reduced tillage is an efficient resource conserving technology (RCT) holding good promise in future.

In irrigated areas in India, DSR refers to both the crop establishment method and water management. The water management for DSR can vary greatly from continuous flooding for most of the growing season to frequent alternate wetting and drying (AWD), to less frequent AWD, to rainfed. The dry seeded rice is not continuously flooded, but is irrigated frequently to avoid yield loss. The soil water content of the root zone (~0-20 cm) is kept between saturation and field capacity much of the time. (IRRI, 2016)

In India, DSR is becoming a popular rice cultivation practice among the farmers of command areas of Tungabhadra (TBP) in Raichur and Koppal districts of Karnataka. The tail end farmers do not get sufficient water at right time. Due to declining resources, farmers of tail end get water once in 20 days in Tungabhadra Project (TBP) forcing farmers to complete transplanting within this period which is not possible with limited labour, machinery etc. Under late onset of monsoon conditions and insufficient water in barrages, canal water may become erratic and untimely leading to delayed transplanting (beyond August). To overcome these problems, Direct Seeded Rice method is widely adopted by the farmers of the region. In this background, the present study was conducted to study the impact of DSR on yield, costs and profitability to the farmers.

METHODOLOGY

To conduct an economic analysis of DSR, a survey was conducted in Tungabhadra Command area of Karnataka during the year 2014-15 by employing multi stage sampling procedure. At the first stage, two districts, Raichur and Koppal were selected. Later, six villages each from Raichur and Koppal districts were selected which had major area under DSR. At the third stage, from each selected village, ten farmers who were practising both DSR and transplanted rice were selected. Thus the total sample size constituted 120 farmers.

Partial Budgeting technique was employed to analyze the economics and profitability of DSR vs. Transplanting method. Partial budgeting is a planning and decision-making technique used widely, to compare the costs and benefits of various alternative methods of production. It helps to evaluate the economic effect of changes in production methods. It is based on the principle that these changes will have effects on one or all of the following: Increase in income, reduction of costs, increase in costs and reduction of income. The effect of change in production method is measured as the difference between sum of positive economic effects minus the sum of negative economic effects. If the difference is positive it indicates that farm income will increase due to the change in production method, and if the difference is negative it indicates that the change will result in reduction in income.

RESULTS AND DISCUSSION

The study revealed that majority of the farmers

had adopted DSR practice as a farmer to farmer spread of technology. A comparative analysis of expenditure incurred on various inputs in DSR and transplanting method of rice cultivation are presented in Fig. 1. The cost incurred on seed in DSR was almost half of that required for transplanting method. There was not much difference in costs incurred on fertilisers in both the methods of crop establishment. The cost incurred on human labour was reduced by 112 per cent in DSR and this reduction was mainly because the DSR obviates the need for expenditure on labour required for nursery raising, uprooting the plantings from nursery and transplanting in the main field. The expenditure incurred on herbicide was 29 per cent higher in DSR than that of transplanting method and this is mainly because of the high weed infestation in DSR. The farmers reported that weed management was the most crucial component in adoption of DSR. The total variable costs were Rs. 37,170 per hectare in DSR, whereas Rs. 50,603/- per hectare in conventional transplanting method (Fig. 2).

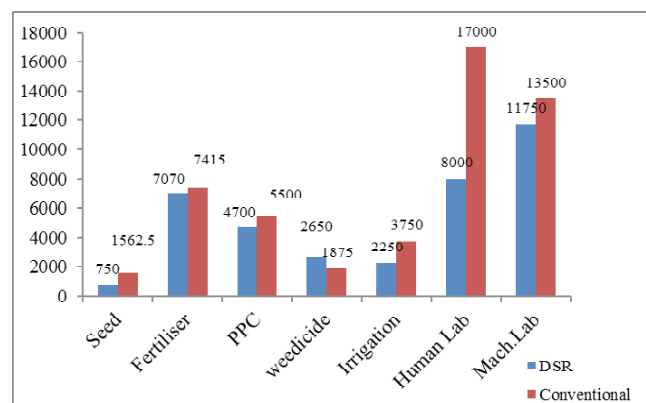


Fig 1 Comparison of costs in DSR and conventional methods (per ha)

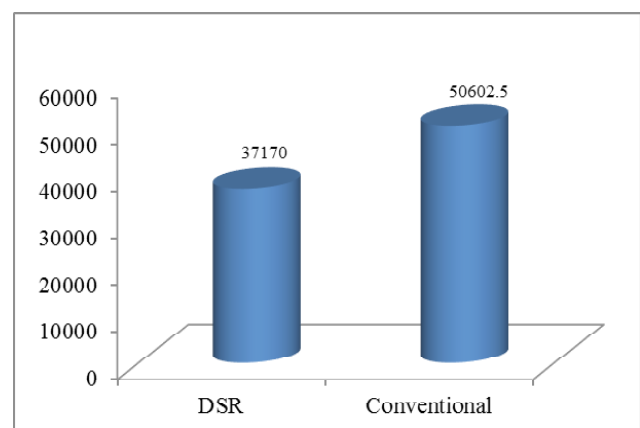


Fig 2 Comparison of Total Variable Costs: DSR vs Conventional method (Rs./ha)

The adoption of Direct Seeded Rice has resulted in an average grain yield of 5.9 t/ha over the transplanting method which was 5.43 t/ha on an average (Table 1). The yield obtained by adoption of direct-seeding method was 470 kg/ha greater than that of transplanting method. This result corroborates the findings of the study of Chandrasekhara Rao *et al* (2013), who reported that the yield of DSR was higher than transplanted rice in Andhra Pradesh. There was no penalty on yield due to adoption of DSR and farmers reported that they obtained slightly higher yield than the transplanting method, through adoption of DSR which may be because of good weed management practices and this concurs with the study of Johnson *et al*. (2003). The yield increase in DSR may also be because of timely sowing of paddy as reported by Neeraj *et al* (2012). The adoption of DSR has resulted in reduction in cost of cultivation by Rs.13,433/- per hectare. The net returns were Rs. 44,796/- per hectare for DSR and Rs. 25,482/- per hectare for transplanting method.

Table 1. Comparative economics of DSR and conventional method

Particulars	DSR method	Conventional method
Yield (qtls/ha)	5.9	5.43
Cost of cultivation (Rs./ha)	37170	50602.5
Cost of production (Rs./qtl)	630	931.91
Gross returns (Rs./ha)	81966.43	76084.357
Net returns (Rs./ha)	44796.43	25481.86

Table 2. Partial Budgeting – DSR vs Conventional method

Debit	Amount (Rs.)	Credit	Amount (Rs.)
<i>Increase costs</i>		<i>Decrease costs</i>	
Herbicide	775	Seed cost	812.5
		Fertiliser	345
		PPC	800
		Irrigation costs	1500
		Human labour cost	9000
		Machine labour costs	1750
Total	775	Total	14207.5
<i>Returns decrease</i>		<i>Returns increase</i>	5882.07
Total debits	775	Total credits	
20089.57			
Profit	19314.57		

Partial Budgeting technique of DSR vs transplanting method revealed that the farmers could save on various inputs like, seed, irrigation, fertilizer,

human and machine labour, but had to spend more on herbicides in DSR (Table 2). This may be mainly because of the severe weed problem associated with DSR. Partial budgeting technique further revealed that the adoption of DSR has resulted in an additional profit of Rs.19,315/- per hectare.

The main reason for adoption of Direct Seeded Rice as reported by the sample farmers was that DSR was adopted by them as a coping measure to overcome the problem of delayed release of canal water (Table 3). Farmers accepted the technology as it is viable and easy to practice. DSR emerged as an alternative cultivation practice to cope up with labour shortage during the peak periods. It also avoids drudgery in puddling which is involved in transplanting method. The farmers also reported that the yields of DSR were on par with the transplanted rice and in many cases slightly higher than the yield obtained through transplanting method of rice cultivation. In the initial years of adoption, the yields reported with DSR were less in comparison with transplanted rice because of weed infestation but over a period of three to four years farmers gained expertise in weed management with timely application of herbicides and hence the yields reported were on par with the transplanted rice. 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.

Table 3. Reasons for adoption of DSR

Advantage	No. (Rank)
As a coping strategy to overcome the problem of delay in release of canal water	94 (I)
Labor shortage	88 (II)
Savings on input costs	82 (III)
Reduces drudgery in puddling	76 (IV)
No loss in yield as compared to conventional method	75 (V)
Allows early sowing of next crop	70 (VI)

CONCLUSION

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. It has reduced the labour requirement for operations like puddling and transplanting. However, weeds are the major problem in DSR, hence there is a need to develop varieties suitable for DSR. Awareness needs

to be created among the farmers about the correct dosage and time of application of herbicides to prevent environmental hazards and also to reduce the cost on herbicides. Due to the continuous depletion of the water

resources, increasing fuel charges and labor scarcity, there is an urgent need to popularize the DSR technology to conserve resources like water, fuel and labor and to enhance the profitability of rice farmers.

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