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Direct Seeded Rice: A Climate Smart Village Technology

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Abstract

Growing rice in the transplanted condition is a common practice across the globe in general and in India particularly. Since ages it is a traditional practice as it offers certain advantages like ease of transplanting, avoiding weeds and reducing deep percolation losses of water. Of late due to the increased cost of cultivation associated with traditional rice cultivation and with growing environmentally conscious, countries like India with the highest rice growing area are pointed out at global summits for their puddling activity and are blamed for environmental deterioration with release of methane and oxides of nitrogen. One of the recent advances happened in rice cultivation methodology is the introduction of direct-seeded rice (DSR), wherein rice is sown in unpuddled fields or uplands. Recent studies happening across the globe have reported its worthiness' over puddled systems. With the aim of evaluating its potential in comparison to traditional transplanting, a comparative study was taken in three successive Kharif seasons from 2018 to 2020 at a farmers' field in Khammam dist. of Telangana, India. Though numerically higher rice yield (60 q/ha) was recorded with the transplanting system it was statistically on par with DSR (57.2 q/ha). Whereas DSR system recorded higher monetary returns (Rs. 59835/ha), Benefit-cost ratio (B:C) (2.38) and productive tillers per meter (70.63) in comparison to the transplanted system where net returns, B:C ratio and productive tiller per meter are Rs. 52750/ha, 1.95 & 45.90 respectively.

Keywords: *Rice, Transplanting, Puddling, Labour, Scarcity, Broadcasting, Direct seeding.*

Introduction

One of the most significant food crops worldwide is rice (*Oryza sativa*), which provides more than 50% of the world's population with their primary source of nutrition. India, contributed about 45768.69 thousand hectares of area and 124368.32 thousand tonnes of production with a productivity of 2717 kg /ha during 2020-21. One of the main staple foods in India is rice, which provides more than two-thirds of the country's population with 43 percent of their daily calorie needs. Typically, the *kharif* season is when rice is grown. One of the ancient methods of rice cultivation used in rice-growing regions of India is repeated puddling and transplanting. The largest amount of labor and water are required in this procedure. Water scarcity at the crucial growth stage may have an impact on rice harvest. Additionally, it influences the establishment and development of subsequent crops. It was important to find an alternate rice-growing technique that was more cost-effective, required less labor, and used less irrigation water. Direct seed rice (DSR) is used to cultivate rice in places with sparse irrigation infrastructure. In poor nations, it has been a fundamental tenet of crop establishment since the 1950s. [1] reported that DSR method saved 14 person-day/ha and 18-20% irrigation water as compared to the puddle transplanting method. DSR is gaining popularity even in poor farmer who has less land because of low input and more output, saves

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labour cost, less drudgery, early crop maturing, low methane emission, and helps in improving soil health condition. Additionally, it helps lower production risks in conditions where drought could occur and when planting time rainfall is inconsistently high as reported by [6].

The present study was therefore conducted at a farmers' field to compare the results of two methods of rice cultivation i.e., DSR and puddled transplanting.

Material And Methods

Professor Jayashankar Telangana State Agricultural University with Krishi Vigyan Kendra, Wyra conducted the study on farmers' farms in Telangana's Khammam district during the course of three succeeding *Kharif* seasons, from 2018 to 2020. The study was conducted on a 0.4 hectare area with direct seeding and transplanting methods on ten farmers from five villages.

DSR method

The second week of July saw broadcast sowing on puddled and leveled fields, followed by a single light irrigation. 30 kg of seeds were applied per hectare. By soaking the seeds, seeds were treated with carbendazim at 1g per litre of water.

Puddled transplanting method

For one hectare of planting, 62 kg of seed were used in the nursery. In fields with standing water, transplanting was carried out in the second week of July using seedlings that were 25 to 28 days old. Soaking the seeds in carbendazim at 1g per litre of water treated the seeds.

Fertilizer application

Uniform chemical fertilizer dose of 80:40:20 kg NPK/ha was applied as basal to both treatments through Urea, DAP and MoP respectively. The remaining 40 kg N/ha was applied in two splits as 20kg each at the tillering stage and at the panicle initiation stage. In addition, Zinc Sulphate was broadcasted @ 25 kg/ha per season during last plowing to fulfil the requirement of zinc.

Weed control

Pyrazosulfuron ethyl @ 200 g ha^{-1} has been sprayed on the third day after sowing, followed by a spray of 250 ml of bispyribac sodium ha^{-1} at 20 DAS. Both treatments utilized the same remaining agronomic and other procedures. Utilizing two sample T-tests, data on growth yield and yield-attributing traits were gathered and examined.

Results And Discussion

Table 1 shows the results of two distinct rice cultivation techniques in terms of yield and characteristics related to yield, whereas Table 2 shows the findings in terms of growth parameters. Tables 1 and 2 show that there were no appreciable differences between the two techniques of rice cultivation for plant height, panicle length, grain yield, number of grains per panicle, or grain weight per 1000 grains. However, the conventional transplanted rice method recorded a maximum grain yield of 60 q/ha, which was comparable to the DSR method's 57.20 q/ha. Both [6] and [4] found the same thing: there were no appreciable variations in grain yield between direct seeded and puddle-transplanted rice. [3] also reported that the grain yield of rice was not significantly different due to the direct seeded rice method and conventional transplanting methods of rice cultivation.

In the conventional transplanted rice method and the DSR approach, the maximum plant heights were 97.25 cm and 95.5 cm, the panicle lengths were 24.30 cm and 22.98 cm, the number of grains per panicle was 167.98 and 156.60, and the weight of 1000 seeds was 22.84 g and 22.12 g, respectively. Similar findings were published by [2] who found that there was no discernible difference between the two ways of rice cultivation's growth and yield contributing features. significantly maximum number of plants (412) were recorded in DSR method compared to the conventional rice transplantation method which was 5.10 percent. Although there were more number of tillers per square meter in DSR method than the conventional method, it has not been attributed to the grain yield. [7] also reported that, maximum plant height, number of tillers per square meter and grain yield was recorded by direct seeded rice method among all the methods of rice establishment.

The economics of two methods of rice cultivation and thereby the benefit-cost ratio are presented in Table-3. It is indicated from the table that, there was no significant difference observed in the net monetary return due to the methods of rice

Table 1: Effect of different methods of rice cultivation on yield and yield attributing parameters

Cultivation Method of Rice	Panicle length (cm)		Grain yield (q/ha)		No. of grains/panicle		1000 grain weight (g)	
	Conventional method	Direct seeded Rice	Conventional method	Direct seeded Rice	Conventional method	Direct seeded Rice	Conventional method	Direct seeded Rice
Mean	24.30	22.98	60	57.20	167.98	156.60	22.84	22.12
Number of observations	20	20	20	20	20	20	20	20
P(T<=t) two-tail	NS	NS	NS	NS	NS	NS	NS	NS

Table 2: Effect of different rice cultivation methods on different growth parameters

Cultivation Method ofRice	Plant height (cm)		No of tiller / Square meter	
	Conventional method	Direct seeded Rice	Conventional method	Direct seeded Rice
Mean	97.25	95.5	392	412
Number of observations	20	20	20	20
P(T<=t) two-tail	NS	NS	2.31	2.31

Table 3: Economics of two different methods of rice cultivation

Method of sowing	Cost of cultivation		Gross monetary return (Rs/ha)		Net monetary return (Rs/ha)		BC Ratio	
	Conventionalmethod	Direct seeded Rice	Conventional method	Direct seeded Rice	Conventional method	Direct seeded Rice	Conventional method	Direct seeded Rice
Mean	55250	43125	108000	102960	52750	59835	1.95	2.38
Number of observation	20	20	20	20	20	20	20	20
P(T<=t) two-tail	2.31	2.31	-	-	NS	NS	NS	NS

cultivation. However, a maximum net monetary return of Rs.59835/ha was recorded by DSR method followed by the conventional transplanting method with Rs. 52750/ha. [1] reported that DSR method of rice cultivation minimized the cost of cultivation and gave a maximum netmonetary return of Rs.79710/ha over puddle transplanted rice method with Rs.75680/ ha net monetary return. The highest cost- benefit ratio 2.38 was recorded by DSR followed by the conventional transplanting method of rice cultivation 1.95. A similar trend of economics was also observed by [5].

Conclusion

The three years of on-farm research have led to the conclusion that the DSR technique of rice production is more economical, more lucrative, and more labor-efficient, making it useful in regions with a shortage of labor. Rice-cultivating farmers can be encouraged to implement this practice on a broad basis.

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Conflict of interest

The authors declare that they have no conflict of interest

Ethical approval

This article does not contain any studies with human

participants or animals performed by any of the authors.

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