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Rashmi Tyagi

Department of Sociology,
Chaudhary Charan Singh
Haryana Agricultural
University, Hisar, Haryana,
India

Jatesh Kathpalia

Department of Sociology,
Chaudhary Charan Singh
Haryana Agricultural
University, Hisar, Haryana,
India

Subhash Chandar

Department of Sociology,
Chaudhary Charan Singh
Haryana Agricultural
University, Hisar, Haryana,
India

Corresponding Author:

Rashmi Tyagi

Department of Sociology,
Chaudhary Charan Singh
Haryana Agricultural
University, Hisar, Haryana,
India

Comparative analysis between direct seeded rice and conventional transplanted rice method

Rashmi Tyagi, Jatesh Kathpalia and Subhash Chandar

Abstract

Rice is a staple food for more than half of world population and plays a vital role in national food security and is backbone of livelihood for billions of households. Therefore, the sustainability of rice eco systems and to increase the production of rice at par with population growth with reduced water and labour use are of major concerns. Direct seeded rice (DSR) method now a days offers an attractive alternative in this face of global water scarcity and escalating production costs. The study was conducted for comparative analysis between Direct seeded rice method and conventional transplanted rice method. The study was conducted in Kaithal district of Haryana state. From this district, two blocks namely Kaithal and Pundri were selected randomly. On the whole a total of 200 rice growing farmers were selected, who were using direct seeded rice method (100) and conventional transplanted rice method (100). Data highlighted significant difference in better rice production technology in water crisis situation ($t=11.98^*$) between direct seeded rice and conventional transplanting.

Keywords: Comparison, direct seeded rice, production, climate, prospects etc.

Introduction

Agriculture in the backbone of Indian economy, the overall rate of economic growth depends to a great extent on the growth of agricultural sector. Among the food grains, rice is the staple food of more than fifty percent of the world population. The population of the world at present is 7.4 billion. In India the present population is 1,329 million which will increase to 1,708 million and rank first by 2050. This increase is approximately 11.15 million people per year. Our country requires increasing rice production by 3 million tonnes every year to ensure food security. The lowering water table, scarcity of labour during peak periods, deteriorating soil health demands some of the major problems that seek alternative establishment method to sustain productivity of rice as well as natural resources. Direct seeded rice (DSR) is gaining popularity and is a feasible alternative to conventional puddled transplanted rice because of its low-input demand. It offers certain advantages viz., it saves labour, requires less water, better adaptation to climatic risks, less drudgery, early crop maturity, low production cost, better soil physical conditions for following crops and less methane emission, provides better option to be the best fit in different cropping systems. Tripathi *et al.* (2014) [8] also concluded in his study that Farmers preferred to adopt direct seeding in rice cultivation due to high labour requirement in TPR method. During transplanting of rice, farmers faced acute labour shortage. Although there was slightly lower yield in DSR, farmers in the study area showed keen interest in shifting from TPR to DSR method of crop production. According to their opinion, DSR requires less labour and provides more economical gain in rice production Comparative yields in DSR can be obtained by adopting various cultural practices viz., selection of suitable cultivars, proper sowing time, optimum seed rate, proper weed and water management. The soil problems related to rice and following crops can be solved with direct seeding. Kaur *et al.* (2017) [2] also reported that aerobic conditions' especially during the early growth stages in dry- DSR and until seedling establishment in wet-DSR are responsible for low methane emissions. In spite of potential benefits DSR suffers from several constraints associated with shift from PTR to DSR, such as high weed infestation, evolution of weedy rice, increase in soil borne pathogens, nutrient disorders, poor crop establishment, lodging, incidence of blast, brown leaf spot etc. By overcoming these constraints DSR can prove to be a very promising, technically and economically feasible alternative to PTR. Tripathi *et al.* (2014) [8] also confirmed that in the present scenario of rising inputs cost and labour shortage in agriculture, farmers need input saving alternative technologies to sustain crop production. The results indicated that DSR technology has potential to increase farmer's income and save scarce resources.

Hence, DSR technology is a viable alternative to overcome the problems of rising cost of cultivation, labour and water shortages for sustainable rice production.

Keeping in view to study the comparative analysis between Direct seeded rice and conventional transplanted rice method the following objectives were taken into consideration.

- Comparative analysis regarding general prospects of DSR cultivation
- Comparative analysis regarding production related prospects of DSR cultivation
- Comparative analysis regarding climate related prospects

Materials and methods

The study was conducted in Kaithal district of Haryana during 2017-18. From this district, two blocks namely Kaithal and Pundri were selected randomly. On the whole a total of 200 rice growing farmers were selected, who were using direct seeded rice method (100) and conventional transplanted rice method (100). Interview Schedule was prepared as per objectives of the study. Farmers were surveyed with the help of Interview Schedule. Statistical techniques were used as per the nature of data.

The questions were framed which clearly indicate their meaning to the respondent and cover relevant aspects of problems according to the objectives of the study. Interview schedule was prepared with the help of various books, bulletins, journals, periodicals, government publications etc. After completion the interview schedule, data was collected regarding farmers of Haryana. The collected data were coded, tabulated, analyzed and interpreted according to the objective

of the present study with the help of appropriate statistical techniques. The descriptive statistical tools such as frequency, percentage and chi-square had been adopted to draw the inference from the study. In the end, the collected data from the field was analysed in term of identifying various specific objectives.

Results and discussion

Comparative analysis regarding general prospects of DSR cultivation technology. The results clearly revealed that significant difference in general prospects of DSR cultivation technology by DSR and conventional transplanting methods. Data highlighted significant difference in better rice production technology in water crisis situation ($t=11.98^*$) between direct seeded rice and conventional transplanting. Similarly all general prospects of DSR cultivation technology, i.e., it is better being less labour requiring technology ($t=8.76^*$), better credit facilities are available at present ($t=8.47^*$), easy availability of power machinery ($t=7.69^*$), best resource conservation technology in food crops production system ($t=7.28^*$) and higher fertilizer use efficiency due to its placement in the root zone ($t=6.66^*$) also indicated significant differences between direct seeded rice and conventional transplanting. Ali *et al.* (2014)^[1] also confirmed that although DSR technology has a positive impact on yield and demands less water and labour, it is still a new venture for the farmers who have been practicing conventional methods of sowing for centuries. DSR technology has great potential because as it requires less labour and irrigation and produces higher yields and net returns.

Table 1: Comparative analysis regarding general prospects of DSR cultivation technology by DSR and conventional growers (n=100)

S. No.	General prospects	Prospects level (DSR)		Prospects level (DSR Non adopter)		t-test
		Mean	SD	Mean	SD	
1.	Better rice production technology in water crisis situation	2.58	0.60	1.83	0.85	11.98*
2.	It is better being less labour requiring technology	2.55	0.70	1.93	0.92	8.76*
3.	Better credit facilities are available at present	2.85	0.47	2.08	0.93	8.47*
4.	Easy availability of power machinery	2.68	0.66	2.15	0.83	7.69*
5.	Better resource conservation technology in food crops production system	2.50	0.74	2.07	0.93	7.28*
6.	Higher fertilizer use efficiency due to its placement in the root zone	2.23	0.64	1.92	0.50	6.66*

*significant of 5% level of significance

Comparative analysis regarding production related prospects of DSR cultivation

Regarding production related prospects data significant difference in early maturity (7-10 days) results in timely sowing of succeeding crop ($t=9.56^*$) of direct seeded rice to conventional transplanting. In all production related prospects found significantly different from direct seeded rice to conventional transplanting. Respondents who were using

direct seeded rice had better mean scores as compared to conventional transplanting in all aspects. Kumar *et al.* (2018)^[3] also confirmed in his study that 1475 acre of rice was cultivated in Kaithal District in 2014-15 and increased to 7500 acre in year 2015-16 which was an indication that the DSR technology was becoming popular among farmers and level of adoption was increasing.

Table 2: Comparative analysis regarding production related prospects of DSR cultivation technology by DSR and conventional growers (n=100)

S. No.	Production related prospects	Prospects level (DSR)		Prospects level (DSR Non-adopter)		t-test
		Mean	SD	Mean	SD	
1.	Early maturity (7-10 days) results in timely sowing of succeeding crop	2.30	0.62	1.82	0.80	9.56*
2.	Better quality of yield	2.95	0.29	2.20	0.87	8.74*
3.	DSR cultivation require less water	2.77	0.60	2.29	0.93	6.01*
4.	Low production cost due to fully crop mechanization	2.54	0.82	2.13	0.94	5.64*
5.	Better economic return	2.69	2.65	2.27	0.91	5.88*

*significant of 5% level of significance

Comparative analysis regarding climate related prospects

Results indicated that significant difference in climate related prospects between direct seeded rice and conventional transplanting reduces the risk in unfavorable weather condition ($t=5.28^*$), best suited to climate change ($t=7.69^*$) and mitigation of the green-house gases emission ($t=4.34^*$). Comparing the mean scores of respondents who used direct seeded rice were significantly better in climate related prospects. Kaur *et al.* (2017) ^[2] also reported that

Direct seeding offers certain advantages like saving irrigation water, labour, energy, time, reduces emission of greenhouse-gases, better growth of succeeding crops, etc but in conventional puddled transplanting system (PTR), large quantity of irrigation water is used for puddling which breaks capillary pores, destroys soil aggregates and results in formation of hard pan, creating problems for the establishment and growth of succeeding crops

Table 3: Comparative analysis regarding prospects of DSR cultivation technology related to climate change by DSR and conventional growers (n=100)

S. No.	Climate related prospects	Prospects level (DSR)		Prospects level (DSR Non-adopter)		t-test
		Mean	SD	Mean	SD	
1.	Reduces the risk in unfavourable weather condition	1.92	0.76	1.70	0.07	5.28*
2.	Better suited to climate change	2.51	0.07	1.92	0.09	7.69*
3.	Mitigation of the green-house gases emission	1.49	0.06	1.33	0.05	4.34*

*significant of 5% level of significance

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