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Comparative analysis between direct seeded rice and conventional transplanted rice method

Rashmi Tyagi[1] and Jatesh Kathpalia[2]

[1,2]Department of Sociology, ChaudharyCharan Singh Haryana Agricultural University, Hisar, Haryana, India

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ABSTRACT

Rice accounts for a significant contribution to the total food grain production in India and is grown in 43.86 million ha, the production level is 104.80 million tones and the productivity is about 2390 kg/ha (Agricultural Statistics at a glance-2015). Rohila *et al.* (2015) also mentioned in their study that Haryana is second largest state in central procurement pool of rice after Punjab. Most of the Direct Seede Rice (DSR) cultivators (75.00%) were agreed that demand were increasing day by day in view of depletion of water resources followed by disagree (16.00%) and undecided (9.00%) whereas 51% conventional adopters were agreed on same prospects followed by disagree (33.00%) and undecided (33.00%). DSR adopters categorized DSR as best rice production technology in water crisis situation. Overwhelming majority of the DSR adopters (87.00%) agreed that DSR is the less labour required technology and only 47.00% conventional growers agreed on it. Almost all the DSR adopters (95.00%) agreed that DSR require less water than transplanting and 79.00% agreed that their past experience favoured them direct-seeded rice (DSR) over transplanting whereas same response were given only by 53.00% and 46.00% conventional growers respectively. Most of the DSR cultivators (65.00%) were agreed that DSR best suited to climate change followed by undecided (19.00%) and disagree (16.00%) whereas 45.00% conventional adopters were agreed on same prospects followed by disagree (42.00%) and undecided (13.00%).

Key words *: Adopters, Direct seeded rice, Production, Climate, Prospects etc.*

Introduction

Rice accounts for a significant contribution to the total food grain production in India and to sustain the food production in coming decades, the rice production level needs to be increased every year by at least 2 million tonsand it represents a high value commodity crop. Currently, DSR in Asia occupies about 29 Mha which is approximately 21% of the total rice area in the region. (Kumar *et al.,* 2018) Marasini *et al.* (2016) in his study also mentioned that due to issues of water scarcity and expensive labour direct seeded rice cultivation technology is been adopted worldwide and it is a resource conservation technology and reduces water and labour by 50%. Anandan *et al.* (2015) mentioned in his study that now in recent times some states like UP, Punjab, Bihar, Haryana, Terai region of Uttaranchal, Odisha, Chattisgarh and West Bengal are shifting their pattern of brice cultivation towards DSR in appropriate eco systems. Nagargade *et al.* (2018) mentioned in his study that traditionally, rice is grown by raising rice nursery and transplanting one month old nursery seedlings in a puddle and flooded field which not only effectively suppress the rice weeds by preventing the light to reach the them through a layer of the standing water but also provides the rice plants with a better growing environment. The

[1]Assistant Professor

drawback here is that it requires immense labour and water. He also reported that puddling breaks soil aggregates, and soil becomes hard after drying, leading to the development of cracks and thereafter the water requirement increases manifold because of deep percolation through cracks. Not only this it also results in poor soil physical conditions for establishing and raising succeeding crops. In the backdrop of the declining water resources and reduced availability of the labour, the conventionally flooded rice system is losing its sustainability and economic viability. Therefore declined water table, increasing costs of diesel and electricity and climatic changes have further aggravated the problem and thus there is a need to shift from the conventionally flooded transplantation to direct seeding. Rao *et al.* (2007) stated in his study that directseeding refers to the process of establishing a rice crop from seeds sown in the field rather than by transplanting and once germination and seedling establishment are complete, the crop can then be sequentially flooded and water regimes maintained as for transplanted rice. In India, dryseeding is extensively practiced in rainfed lowlands, uplands, and floodprone areas, while wetseeding remains a common practice in irrigated areas (Misra *et al.,* 2005). Rao *et al* (2007) concluded in his study that directseeded rice is by nature knowledge intensive, and ensuring that relevant, beneficial, and costeffective decisions are made at the farm level is prerequisite for both farm profitability and sustainable weed management. Singh *et al.* (2018) stated in his study that the success of DSR dependslargelyon effective weed management especially the integrated approach for long time sustainability.

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 Kurukshetra district of Haryana state. From this district, two blocks namely Thanesar and Pehowa were selected randomly. Further, Amin, Alampur, Bachgaon, Dodakheri, Balani, Bir Amin, Issargarh, Ghamoor Kheeri, Jiven Kheri, Jyotisar, Kamoda, Kisangarh, Lukhi, Muthana, Ghararsi, Barana, Mirjapur, Pindarasi, Sirsana and Umri villages were selected from Thanesar block. Talhari, Chandanheri, Ishaq, Bilochpura, Megha Majra, JurasiKalan, Shahpur, Sainsa, Saina Saida, Malikpur, Karan Shahab, Gumthala, Thana, Neemwala and Kakrali villages were selected randomly from Pehowa block. 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 and percentage 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

General Prospects of DSR cultivation technology

The results clearly revealed that the general prospects agreed by farmers of DSR cultivation technology and conventional transplanting methods. Most of the DSR cultivators (75.00%) were agreed that demand were increasing day by day in view of depletion of water resources followed by disagree (16.00%) and undecided (9.00%) whereas 51% conventional adopters were agreed on same prospects followed by disagree (33.00%) and undecided (33.00%). 65.00% DSR cultivators and 41.00% conventional adopters were agreed that better technical support were available for technology. More than half of the DSR cultivators (65.00%) were agreed

about available credit facilities followed by undecided (23.00%), disagree (14.00%) whereas only 37.00% conventional adopters agreed followed by disagree (44.00%), and undecided (19.00%). A considerable number of DSR adopters (67.00%) agreed that power machinery were easily available followed by undecided (30.00%) and disagree (3.00%) whereas only 31.00% conventional adopters agreed on it. Prospects regarding input facilities, 47.00% DSR adopters whereas only 36.00% conventional adopters were agreed. Regarding high fertilizer use efficiency and resource conservation technique, 25.00% and 62.00% DSR farmers were agreed whereas in conventional area only 7.00% and 45.00% were agreed respectively. 77.00% DSR adopters categorized DSR as best rice production technology in water crisis situation. Overwhelming majority of the DSR adopters (87.00%) agreed that DSR is the less labour required technology and only 47.00% conventional growers agreed on it. Anandan *et al.* (2015) also mentioned and reported in his study that DSR trials conducted in Haryana by adopting zero or reduced till system had good grain yield comparable with TPR under less water with

Table 1. Comparative analysis regarding General Prospects of DSR Cultivation Technology by DSR and Conventional growers

Sr. No.	Aspects	Prospects level (DSR)			Prospects level (Conventional)		
		Agree	Undecided	Disagree	Agree	Undecided	Disagree
A. General prospects of DSR cultivation technology							
1.	Demand is increasing day by day in view of depleting water resources	75	9	16	51	16	33
2.	Better technical support is available	65	17	18	41	9	50
3.	Better credit facilities are available at present	63	23	14	37	19	44
4.	Easy availability of power machinery	67	30	3	31	22	47
5.	Better input facilities are available	47	19	34	36	11	53
6.	Higher fertilizer use efficiency due to its placement in the root zone	25	65	10	7	76	17
7.	Best resource conservation technology in food crops production system	62	21	17	45	13	42
8.	Best rice production technology in water crisis situation	77	8	15	48	21	31
9.	In case Govt. provides facility would you take up this technology as replacement of the transplanting?	83	9	8	65	20	15
10.	It is better being less labour requiring technology	87	4	9	47	9	44

Table 2. Comparative analysis regarding Production related prospects ofDSR Cultivation Technology by DSR and Conventional growers

S. No.	Aspects	Prospects level (DSR Adopters)			Prospects level (Non- adopters)		
		Agree	Undecided	Disagree	Agree	Undecided	Disagree
B.	Production related prospects of DSR cultivation technology						
1.	Better quality of yield	77	9	14	56	6	38
2.	Better economic return	84	6	10	63	2	36
3.	Low production cost due to fully crop mechanization	73	7	20	54	5	41
4.	Early maturity (7-10 days) results in timely sowing of succeeding crop	38	49	13	27	34	39
5.	Direct-seeded rice (DSR) cultivation require less water than transplanting	95	2	3	53	18	29
6.	Past experience favours the direct-seeded rice (DSR) over transplanting	79	5	16	46	9	45

more water productivity and greater net profit as well as it increases net return, efficiency in water and fertilizer use. Kumar (2013) also concluded that varietal improvements in rice under DSR is likely to be crucial for improving potential of direct seeding. Bhullar *et al.* (2018) also mentioned in their study that all the farmers whom they surveyed were convinced that critical care during first month had been the major contributor towards success of DSR and this technology has been readily accepted by the growers in Punjab.

Analysis clearly revealed that production related prospects of DSR cultivation technology. Most of the DSR cultivators (77.00%) were agreed about better quality of crop produce followed by disagree (14.00%) and undecided (9.00%) whereas 56.00% conventional adopters were agreed on same prospects followed by disagree (38.00%) and undecided (6.00%). Most of the DSR cultivators (84.00%) were agreed about better economic returns in comparison to transplanting followed by disagree (10.00%) and undecided (6.00%) whereas 63.00% conventional adopters agreed and followed by disagree (36.00%), undecided (2.00%). 73.% DSR adopters agreed DSR has low production cost due to fully crop mechanization and 38.00% agreed that its early maturity (7-10 days) results in timely sowing of succeeding crop whereas same response were given only by 54.00% and 27.00% conventional growers respectively. Almost all the DSR adopters (95.00%) agreed that DSR require less water than transplanting and 79.00% agreed that their past experience favoured them direct-seeded rice (DSR) over transplanting whereas same response were given only by 53.00% and 46.00% conventional growers respectively. Anandan *et al.* (2015) also stated in his study that DSR helps farmers to earn more carbon credits than TPR by mitigating methane emission and higher economic returns along with reduced water and labour costs. He also mentioned that possibility of early maturity (7-10) days , timely sowing of succeeding crop are the additional advantages of DSR crop. *Marasini et al* (2016) reported that there is reduced water consumption by about 30% in direct seeding as it eliminates raising of seedlings in nursery transplanting under puddled soil and maintaining 4 to 5 inches of water at the base of the transplanted seedlings. It also helps to avoid nursery raising ,seedling uprooting, puddling and thus labour costs are also reduced to great extent. This way there is no transplant injury thus DSR is established earlier than TPR without growth delays and fastens physiological maturity and reduces vulnerability to late season droughts. Kaur *et al.* (2017) also reported in their study that direct seeding helps to improve the soil structure which otherwise gets destroyed by continouspuddling and thus provides congenial environment for succeeding crops.

The results described comparative analysis regarding prospects of DSR cultivation technology related to climate change by DSR and Conventional growers. Most of the DSR cultivators (65.00%) were agreed that DSR best suited to climate change followed by undecided (19.00%) and disagree (16.00%) whereas 45.00% conventional adopters were agreed on same prospects followed by disagree (42.00%) and undecided (13.00%). Only a few number of DSR adopters (23.00%) were agreed that DSR reduces the risk in unfavorable weather condition and 4.00% agreed on prospectus of mitigation of the green house gases emissions whereas same response were given only by 31.00% and 57.00% conventional growers respectively. Marasini *et al* (2016) also repoted that productivity of DSR is 5-10% more than the yield of transplanted rice and it also offers a very exhilarating opportunity to improve water and environment sustainability as methane gas emissions is lower in DSR than with conventionally

Table 3. Comparative analysis regarding Prospects of DSR cultivation technology related to climate change by DSR and Conventional growers

S. No.	Aspects	Prospects level (DSR Adopters)			Prospects level (DSR Non-dopters)		
		Agree	Undecided	Disagree	Agree	Undecided	Disagree
C.	**Prospects of DSR cultivation technology related to climate change**						
1.	Reduces the risk in unfavourable weather condition	23	46	31	17	34	49
2.	Best suited to climate change	65	19	16	45	13	42
3.	Mitigation of the green house gases emission	4	39	57	3	28	69

tilled transplanted puddle rice. Pathak *et al.* (2011) stated in his study that DSR is a feasible alternative to conventional puddle transplanted rice having good potential to mitigate and adapt to climate change. It was also mentioned that DSR increases the capacity of poor farmers to cope up with climate change not only by offering alternate rice establishment methods but also by reducing the water required for crop establishment and for growth of succeeding crops. Earlier crop establishment through DSR also reduces yield loss from late season drought to great extent.

Conclusion

Anandan *et al.* (2015) also concluded in his study that the reason DSR is gaining momentum among rice farmers is that its yield is comparable with transplanted riceand thus it is an alternative option to overcome the problems of labour and water shortage. He also emphasised on the development of early maturing varieties with early seedling vigour and efficient nutrient management techniques along with integrated weed management would encourage farmers to adopt DSR culture than TPR method. Moreover he also confirmed that methane emissions are substantially reduced in DSR. Nagargade *et al.* (2018) also concluded that high yielding rice varieties suitable for DSR under different agro-climatic conditions must possess the desirable traits, *viz.* vigorous growth; weed suppressing ability, germinating ability under moisture stress, tolerant to micronutrient deficiency. Mariane *et al.* (2015) also stated in the study that mitigation strategies to CH_4 emission from rice paddies must be at farm and eco friendly cost effective without depleting crop yields and at farm level, some strategies may arise that is management of water, inorganic inputs and selecting rice cultivars. Kaur *et al.* (2017) concluded in his paper that in recent times when there is global scarcity of water and increasing labour wages, DSR is the most viable option for getting sustainable yields without any overexploitation of the available natural resources. Rohila *et al.* (2015) also concluded that more number of result demonstrations and skill development trainings of both the farmers and field functionaries in participatory mode are required to be conducted at farmers fields to establish this technology into the fields.

References

Anandan, A., Pradhan, S.K. and Singh, O.N. 2015. Direct seeded rice- An approach to trim down water consumption and labour. Krishi Sewa 18th August.

Bhullar, M.S., Singh, Sukhpal, Kumar, Sunny; and Gill, Gurjeet, 2018. Agronomic and economic impacts of direct seeded rice in Punjab. *Agric Res J* 55(2) : 236-242.

Kaur, J. and Singh, Avtar, 2017. Direct Seeded Rice: Prospects,Problems/Constraints and Researchable Issues in India. *Current Agriculture Research Journal 2017 Bhopal.* 5(i) : 13-32.

Kumar Ravinder, Batra, S.C. and Kumar Mohit 2018. Use pattern of Direct Seeded Rice (DSR) Technology in Paddy. *Int. J. Pure App. Bio Sci.* 6 (6): 562-578.

Kumar, V. and Ladha, J. K. 2013. Direct seeding of rice : Research developments and future research needs. *Advances in Agronomy.* 111 : 387-391.

Mariane Silva de Mirande, Marina Leite Fonseca Alexandre Lima, Tatiane Faustino de Moraes, FlavioAparecido Rodrigues 2015. Environmental impacts of rice cultivation. *American Journal of Plant Sciences*. 6 : 2009-2018.

Marasini, S., Joshi, T.N. and Amgain, LP. 2016. Direct seeded rice cultivation method: A new technology for climate change and food security. *The Journal of Agriculture and Environment*. 17 : 30-38.

Misra, B., SubbaRao, L. V. and Subbaiah, S. V. 2005. Rice varieties for directseeding. In: *Direct Seeding of Rice and Weed Management in the Irrigated Rice Wheat Cropping* 244 A. N. RAO ET AL. System of the Indo Gangetic Plains'' (Y. Singh, G. Singh, V. P. Singh, P. Singh, B. Hardy, D. E. Johnson, and M. Mortimer, Eds.), p. 10. Directorate of Experiment Station, G.B. Pant University of Agriculture and Technology, Pantnagar, India.

Nagargade, Mona, Singh, M.K. and Tyagi, V. 2018. Ecologically sustainable integrated weed management in dry and irrigated direct-seeded rice. *Advances in Plants & Agriculture Research.* 8(4) : 319-331.

A status note on Rice in India -National Food Security Mission

Pathak, H., Tewari, A. N., Sankhyan, S., Dubey, D.S., Mina, U., Singh Virender, K. Jain, N. and Bhatia, A. 2011. Direct seeded rice - Potential, performance and problems - A review. *Current Advances, in Agricultural Sciences.* 3(2) : 77-88.

Rao, A.N., Johnson, D.E., Sivaprasad, B., Ladha, J.K. and Mortimer, A.M. 2007. Weed management in direct seeded rice. *Advances in Agronomy*. 93 : 155-255

Rohila, A.K., Ghanghas, B.K. and Sehrawat, P.S. 2015. Adoption status of direct seede rice cultivation technology in Haryana. *Annals of Agri-Bio Research.* 20 (1): 115-117.