

Direct seeding of rice in Punjab:

Current status, performance and limitations

Gurpreet Singh, Sangeet Ranguwal* and Raj Kumar

Punjab Agricultural University, Ludhiana, Punjab 141 004

As an alternative solution to the traditional puddled transplanted rice (PTR), the direct seeding of rice (DSR) is a viable alternative to overcome the problems of rising cultivation costs and declining water table for sustainable rice production. The DSR is yet to become an integral part of the farming system in Punjab. Easy availability of labour for transplanting paddy followed by lack of technical knowledge, diffidence in adopting DSR and non-availability of required machinery/implements are the major reasons behind slow-adoption of DSR. For wider acceptance of DSR, there is a need to generate more awareness of recommended DSR production practices along with timely availability of required farm machinery on custom hiring basis, auxiliary research and development efforts.

Keywords: Adoption, Groundwater, Paddy, Variable costs

Rice is one of the most important food crops of India. About 70% Indians use rice as their primary food source, and it occupies 40–45% of all the land in India under cereal crops. The growing demand of rice has to be met by producing more rice with less agricultural input usages. Different challenges like lowering water table, labour shortage during peak times and declining soil quality necessitate an alternative establishment approach to maintain rice production as well as natural resources. When the future of rice production is in jeopardy due to worldwide water constraint, direct seeded rice (DSR) presents a desirable alternative. The conventional puddled transplanting of rice (PTR) is water, capital, energy and labour-intensive practice. There is an urgent need to switch from the traditional PTR to DSR because it is not only cost, input, energy and time saving but is also environment friendly.

Punjab state has been playing a leading role in the agricultural transformation of the country. A sustainable production of rice in the

state is crucial for the food security of India. The state has contributed about 25–30% rice and 35–40% wheat to the central pool during the last one decade. Water guzzling paddy is a dominant crop in the cropping pattern of the Punjab state and is putting the groundwater resources in a jeopardy situation. Out of 153 water blocks of Punjab, only 17 are safe and the remaining 136 (89%)

are in alarming condition. Further, electricity demand is increasing for irrigating the paddy crop which undermines the viability of the power sector as power for agricultural use is fully subsidized in the state. In addition, yield stability and assured marketing of paddy makes it the most remunerative rainy (*kharif*) season crop. Despite various efforts by the state government,



Direct seeding of rice under tar-wattar conditions by using lucky seed drill

the area under DSR in the state has not increased. Recently, as a pilot project, the state government has shortlisted 16 blocks in 16 districts (where water level has dropped from 21.3–1.5 m since 1998) in which 1.5 lakh acres have been planned to be sown with DSR technique during 2023–24.

In this backdrop, the study was carried out in of Punjab to examine the status of adoption of DSR along with relative economic benefits and constraints faced by the farmers in its adoption. The primary data pertaining to the input use pattern, use of labour and machinery, associated variable costs in DSR technique *vis-à-vis* PTR method of paddy transplanting were collected from 120 farmers (80 adopters and 40 non-adopters) from Giddarbaha and Muktsar blocks of the Sri Muktsar Sahib district having highest area under DSR in the state.

Status of DSR adoption in Punjab

DSR is yet to become an integral part of the farming ecosystem in Punjab. As per information obtained from the Department of Agriculture and Farmers' Welfare, Government of Punjab provided with the subsidy of ₹1500 per acre for adopting the DSR to 30553 farmers for which ₹25 crores have been disbursed during 2021–22. During this year, the area under DSR in the state was 84.9 thousand hectares forming only about 3% of the total area under paddy (3144.6 thousand ha).

District wise analysis revealed that the highest proportion of area under DSR was in Sri Muktsar Sahib district (20.8%) followed by Fazilka (19.28%), Bathinda (12.6%), Firozpur (6.86%) and Mansa (5.78%) while for other districts it lied below 5%. In terms of number of beneficiary farmers, the maximum belonged to Fazilka district (19.8%) followed by Sri Muktsar Sahib (16.3%), Bathinda (12.1%), Mansa (7.8%) and Sangrur (5.7%). With regard to the subsidy availed, Sri Muktsar Sahib is ranked first with about 23% share followed by Fazilka (20.8%), Bathinda (12.8%), Firozpur (6%) and Mansa (5.9%) with rest districts having share of below 5% in the total subsidy availed.



Tar-wattar direct seeded rice field

Thus, DSR had higher adoption in the south western region of the state. The major reason behind this is the poor quality of groundwater in most areas in this region which is not fit for irrigation.

Comparative economics of DSR and PTR

From the results of the study, it has been observed that use of almost all the inputs was significantly lower in DSR as compared to PTR resulting in reduction in the cost of human labour, animal labour, machine labour and fertilizers (including manure) by 40.5, 25, 15.0, 7.6% over the PTR though it enhanced the cost of seed and plant protection measures by 72.7 and 44.3% (Table 1). The total variable costs involved in DSR were about 16% lower than the PTR. As the DSR does not require raising seedlings

in nursery, puddling, transplanting and continued water submergence like that in PTR, the overall water requirement for DSR paddy cultivation is reduced by about 16%. The groundwater draft for paddy cultivation was estimated to the tune of about 6366 m³ per acre in the case of DSR as against 7569 m³ per acre in the case of PTR method. Thus, if the entire area under paddy in the state is sown by DSR technology, the ground water use will be about 49.46 billion cubic meters (BCM) whereas in the case of PTR method it will be about 58.81 BCM. Therefore, about 9.35 BCM water may be saved annually in the state by shifting from PTR to DSR method of paddy transplanting/sowing. In spite of marginally lower yield of paddy in DSR (2769 kg/acre) than PTR (2801 kg/acre), the returns over variable

Table 1. Economic benefits in DSR cultivation in Punjab (in ₹/acre)

Particular	DSR	PTR	Savings in DSR over PTR	
			Absolute	Per cent
Human labour	5355	9005	3650	40.5
Animal labour	263	350	88	25.0
Machine use	4760	5606	847	15.0
Cost of seed	681	395	-287	-72.7
Fertilizers and manures	3064	3317	253	7.6
Plant protection chemicals	3946	2735	-1211	-44.3
Interest on variable costs @9% per annum for half the crop period	813	963	150	15.6
Total variable cost	18882	22371	3490	15.6
Gross return	54826	55466	-640	-1.2
Returns over variable cost	35945	33095	2850	8.6
Cost of paddy production (₹/kg)	6.8	8.0	1.2	15.0

DSR, Direct seeded rice; PTR, Puddled transplanted rice.

costs were observed to be higher by about 9% in DSR (₹35945/acre) than PTR (₹33095/acre) because of lesser variable costs involved in DSR technology (Table 1). The cost to produce one kg paddy with DSR was found to be lower (₹6.8/kg) by about 15% than with PTR (₹8/kg).

Constraints in adoption of DSR

An attempt has been made to identify the various reasons for non-adoption of DSR. As per the perception of 80% respondents, the easy availability of labour for transplanting paddy was the major reason for not following the DSR. Other perceptions like lack of technical knowledge of DSR (77.5%), diffidence in adopting DSR (72.50%) and non-availability of required machinery/implements for sowing (55%) were the major reasons for not opting DSR. Other reasons such as high risk of weed infestation and rodent attack and experiences of fellow farmers were reported by about 43 and 28%, respectively. According to another study conducted in Punjab, several constraints associated with DSR technology were identified like 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.

Way forward

The DSR is yet to become an integral part of the farming ecosystem in Punjab. For its wider adoption, there is a need to generate more awareness of recommended DSR production practices among the farmers along with the benefits of such practices. Government initiatives like subsidizing the cost of direct seeding of rice per acre can also help in extension of area under



Direct seeding of rice in field
Source: The Tribune, 27 March 2023

DSR. In this regard, Agro Service Centres in all co-operative societies need to be strengthened so that timely availability of required farm machinery/implements on custom hiring basis could be enhanced for the benefit of the small farmers. There is a need for auxiliary research and development efforts in developing suitable agronomic practices, varieties and mechanized devices to overcome the problem of weeds. More research is needed to develop high yielding rice varieties with desirable traits, viz. vigorous growth, weeds suppressing ability, tolerance to micronutrient deficiency which is suitable for DSR. There is a need to focus more on capacity building by educating/training the farmers for promotion of DSR. A campaign with the combined efforts of various stakeholders such as government agencies and non-government organizations including these change agents will help in fast pacing the adoption process of DSR.

SUMMARY

The problem of ground water depletion which has arisen due to continuous cultivation of water-guzzling paddy crop is of major concern to the Punjab state. The concept of crop diversification is one of the alternative solutions for diverting the area from paddy to other less water consuming crops. But assured irrigation along with guaranteed marketing to some extent encourages the farmers towards paddy cultivation as a major *kharif* crop. An alternative solution to the traditional puddled transplanted rice (PTR) is direct seeding of rice (DSR) which is a viable alternative to overcome the problems of rising cost, labour and water shortages for sustainable rice production. For increasing the adoption of DSR, its major constraints, i.e. lack of technical knowledge of DSR, diffidence in adopting DSR, easy availability of farm machinery for sowing need to be addressed

*Corresponding author's e-mail:
sangeet@pau.edu



**Plant trees, Conserve water,
Protect environment.**

