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## DIRECT-SEEDED RICE- A TECHNOLOGY FOR REDUCING RESOURCE USE IN RICE PRODUCTION

Email

Subham Chakraborty

[subhame2994@gmail.com](mailto:subhame2994@gmail.com)

Department of Agronomy, Institute of Agricultural Science,  
University of Calcutta, 51/2, Hazra Road, Kolkata-700019,  
West Bengal, India

**R**ice also known as “global grain” is the staple food for more than half of the world’s population and 90% of the rice is produced in consumed in Asian countries (Bandumala, 2017). Rice act as calorie source for two-third of the Indian population supplying 43% of calorie requirement (Kaur and Singh, 2017). Rice production plays an important role in maintaining food security of India. According to the estimation on rice production globally, India crossed China followed by Bangladesh and Indonesia. The production of rice is estimated to be 150 MMT in India during the year 2024-2025. The major factor in rice production is water. Rice requires a lot of water than other crop from nursery bed preparation to main field preparation and also during the growth stages until it reaches near about maturity period. In this phase of climate change, to conserve resources but on the other hand to maintain the productivity of rice, direct seeded rice can be very beneficial method of rice production for Indian farmers where use of water is lower than transplanted method and the requirement of nurse bed is avoided. In this method rice seeds pre-germinated are directly sown in the field basically in aerobic or anaerobic situation where the main constraint is weed as the weed readily grows along the rice crop. It was a well-known method until 1950 before the spreading of puddled transplanting method of rice establishment. DSR is a very efficient method in replacing transplanted rice in order to cope up climate change.

### Principles of Establishing Direct-Seeded Rice

There are primarily 3 principles of establishing DSR in field which are as follows:

- i) **Dry-seeded:** Such kind of DSR is done in aerobic condition maintaining a non-puddled condition or sometimes with dibble method or with power tiller operated seeder after minimum tillage or conservation tillage.

**ii) Wet-seeded:** Pre-germinated rice seeds are sown in well-prepared soil mostly aerobic or anaerobic condition. In such case seeds can be broadcasted or line sown as per labour availability. Sometimes drum seeder is also used for sowing in this case and aerobic seeder with furrow opener and closer are also utilized.

**iii) Water-seeding:** In this process, pregerminated seeds are sown in standing water usually broadcasting of seeds are done on standing water (5-10 cm).

(Joshi *et al.*, 2013; Farooq *et al.*, 2011, Singh *et al.*, 2024)

### Advantages of Transplanted Rice Vs Direct Seeded Rice

1. More water is required in TPR whereas less water required in DSR throughout the crop growth period.
2. Labour requirement is higher due to nursery bed management, transplanting, flooding etc. in TPR whereas as nursery management is not required in DSR and transplanting is also not involved.
3. Weed management is possible in TPR but in DSR weeding is the main constraint due to huge weed population. In TPR flooding and manual weeding is much easier but in DSR pre-emergence herbicide is a must.
4. In TPR, water foot print is higher whereas lower water foot print is lower in DSR due to effective usage.
5. In DSR yield is approx. 12% lower than TPR.
6. Rice crop can be harvested slightly faster in DSR than in TPR due to quick maturity as in TPR the transplanting shock received in rice crop delays the maturity.
7. Less strain on ground water in DSR compared to TPR.
8. Higher GHG emission in TPR due to tillage operations and water use and less GHG emission in DSR can be observed.
9. The challenges faced in TPR production is lower than DSR as proper management of soil, crop and other factors are a must in DSR to avoid failure of crop. (Bhatt *et al.*, 2024).

### Why DSR is Important in Modern Day Rice Cultivation

In present days labour shortage, water shortage and GHG load is the main problem. Labour are costly and less due to people shifting towards urban areas and non-agri activities. The depletion of ground water is also leading to water shortage along with carbon and other

harmful gas emission from burning of fuels. It saves labour upto 30-46%. DSR requires zero tillage and aerobic condition sometimes anaerobic conditions are required but water usage is less due to which 10-20% water for irrigation is saved along with energy-saving as tillage operations are limited contributing to less generation of GHG. The methane emission from the field is also reduced by 30-40%. It also cause less soil disturbance due to minimum tillage thus conserving the soil structure and no hard pan in soil is formed below the surface. The aerobic condition produces less or no methane from the rice field. Also, the crop matures faster providing extra time for next crop to be sown in the field. Nutrient management is also easier to non-puddled condition as in puddled soil nitrogen loss is more and requires precise application. Such problem is absent in DSR and crop uptake N, P and K in more amount. Less infestation of disease and pest in DSR also provides upper hand over TPR method. (Singh et al., 2024).

**Table 1:** Suitable varieties for DSR cultivation

Variety Name	Key Features / Suitability for DSR	Purpose
<b>Pusa Basmati 1979</b>	Non-GM herbicide-tolerant Basmati; tolerant to Imazethapyr aiding weed control in DSR conditions.	Released for DSR cultivation in India.
<b>Pusa Basmati 1985</b>	Similar to PB 1979 with herbicide tolerance; suitable for direct seeding with improved weed management.	Developed for DSR and weed control.
<b>Pusa Basmati 1121</b>	Popular basmati cultivar recommended among short/medium-duration varieties for direct-seeding with relatively less water requirement.	Listed as suitable for direct seeding in agronomic recommendations.
<b>Punjab Mehak 1</b>	Medium duration Basmati type indicated in DSR varietal recommendations for basmati direct seeding systems.	Reported among varieties suitable for direct seeding.
<b>CSR 30 (Coarse rice)</b>	Listed as suitable under direct seeding conditions (not basmati).	Reported in ICAR varietal recommendations.
<b>Taraori Basmati</b>	Traditional basmati variety included in varietal recommendations for direct seeding (short/medium duration).	Included in direct seeding recommendations.
<b>CR Dhan 108</b>	Specifically mentioned as suited for DSR systems in newly released rice varieties list.	Recent variety indicated for DSR system adoption.
<b>Sabour Pratap Dhan</b>	New variety noted for DSR system suitability, part of stress tolerant releases.	Reported as DSR-suited variety.

**Swarna  
Purvi  
Dhan-5  
PR 115  
(coarse  
rice)**

Listed as suitable for direct seeding (DSR) in recent varietal evaluation news.

Reported among DSR-suited varieties.

Cited among short/medium duration rice types recommended for direct seeding.

Mentioned in agronomic package recommendations.

(Kaur and Singh, 2017; IREF, 2026; Agrospectrum India, 2026)

## Conclusion

DSR can be a good alternative for TPR method in future if proper implementation of technology is adopted by farmers as in DSR good management practices are required to attain higher yield through application of nutrients and timely weed management to avoid losses in grain yield. More DSR suitable varieties are required to be introduced which can be grown with less input of water and resistance to pests and diseases. Seed priming can be adopted for getting healthy seedlings. It is technologically sustainable practice and economically well for the farmers to adopt also suitable for climate resilience agriculture practices. Biotechnological approach and agronomical measures are required in combined form for better establishment of DSR in Indian condition.

**Notations used:** TPR- Transplanted rice, DSR- Direct seeded rice, GHG- Green House Gas

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