

Direct Seeded Rice for Changing Climate

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Rice (*Oryza sativa* L.) ($2n=24$) is the major food to the lives of billions of people around the World. It is the world's most important cereal crop and serves as the primary source of staple food for more than half of the global population. It belongs to the family *Poaceae* and subfamily *Oryzoidea*. It is one of the very few crop species endowed with rich genetic diversity which accounts for more than 100,000 landraces and improved cultivars. The main method of rice establishment in the country is transplanting. But this production system is water, labour, and energy intensive. Nowadays, these resources are becoming increasingly scarce, so this system is becoming less profitable. All these factors played an important role to increase the demand transplanting to direct irrigated rice ecosystems.

In Asia, 90% of exploited by Agriculture utilized to irrigate rice. rice supply comes from Therefore, food security threatened by declining end of 2025, 2 m ha of



ha of wet season rice would suffer from “physical water scarcity” in Asia. On the other hand, 22 m ha of irrigated dry season rice in South and Southeast Asia already experiencing “economic water scarcity”. Therefore, Agriculture scientists looking for different approaches to reduce water use and increase the water use efficiency for rice production. An alternative approach to reduce water consumption and labour drudgery in rice cultivation is DSR method (Anandan *et al.*, 2015). Since, the yield of DSR is comparable with transplanted rice, this can be an alternative option to overcome the problem of labour and water shortage.

fresh water has been and more than 50% is More than 75% of the 79 m ha of irrigated land. is challenged and water availability. By the dry season rice and 13 m

What is DSR?

Direct Seeded Rice (DSR) refers to the process of establishing a rice crop from seeds sown in the field rather than by transplanting seedlings from the nursery. This method is mostly adopted in rainfed uplands, medium lands, and lowlands where rainfall is uncertain, the topography is undulating, and fields are unbunded. Actually, direct seeding is not a new concept; rather it is the oldest method of rice establishment. DSR was the most common method before the 1950s (Grigg, 1974; Pandey and Velasco, 2005). In DSR, there are three principle methods: wet seeding (sowing pre-germinated seeds on wet puddled soils), dry seeding (sowing dry seeds into dry soil), and water seeding (seeds sown into standing water).

All these methods are different from each other by different land preparations or by different crop establishment methods or by both.

Classification of direct-seeded rice systems with seed and seedbed conditions and area

Direct seeding system	Area	Seed condition	Seedbed condition and environment	Seeding method
Dry direct-seeded	Mostly in rainfed areas and some in irrigated areas with precise water control	Dry seeds	Dry soil, mostly aerobic	Broadcasting; drilling or sowing in rows
Wet direct-seeded	Mostly in irrigated areas with good drainage	Pre-germinated seeds	Puddled soil, may be aerobic or anaerobic	Various
Water seeding	In irrigated areas with good land leveling and in areas with red rice problem	Dry or pre-germinated seeds	Standing water, mostly anaerobic	Broadcasting on standing Water

Importance of Direct Seeded Rice

Direct-seeded rice (DSR) is a feasible alternative to conventional puddled transplanted rice with good potential to save water, reduce labor requirement, mitigate green-house gas (GHG) emission and adapt to climatic risks. The yields are comparable with transplanted rice if crop is properly managed. In recent years, efforts have been made in promoting the DSR technology by various organizations. Scientists are concentrating in developing suitable varieties and agronomic packages for promoting the DSR. However, the DSR suffers from some constraints particularly high weed infestation. The system has been proved cost-effective and farmers' friendly but require further improvement in technological approach to realize greater benefits.

The most common method for rice establishment is transplanting of young seedlings into puddled soil (wet tillage) in India. But this production method is becoming less profitable these days because it is a water, labor, and energy-intensive method and these resources are becoming increasingly scarce (Kumar and Ladha, 2011). Besides this, transplanted rice causes the deterioration of physical properties of soil and also emits methane gas (an important greenhouse gas) into the atmosphere. All these factors act as a driver of the shift from puddled transplanting to direct seeding of rice (DSR). DSR is the technology which is water, labor, and energy efficient along with eco-friendly characteristics and can be used as a potential alternative to conventional puddled transplanted rice (Kumar and Ladha, 2011). No doubt, direct seeding method has several benefits as compared to puddled transplanting, which include similar yield level, economized irrigation water, labor, reduced cost of production and thus increased net returns, and methane emission reduction.