

Field Problems in Direct-Seeded Rice Using Drumseeder -- and Solutions



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Direct-Seeding in Rice Using Drumseeder

The technology

In the direct-seeded method of rice cultivation (DSR), the need for managing a nursery and tasks such as pulling, transporting and transplanting of seedlings are avoided as the soaked and germinated seeds are directly sown on a well-puddled, levelled wet field using an eight-row drumseeder. The seeds are dropped in rows @ 20 cms row-to-row spacing, and the seed rate required is just 25-37.5 kg/ha, depending on the size of the grain.

The drum-seeder is made of fibre material, and hence requires low pulling force to operate. It allows one person to sow one hectare in 5 to 6 hours, compared to the 2 to 3 days of transplanting work by some 30- 40 people needed in case of traditional cultivation method.

The need for hand weeding is reduced by the use of pre-emergence weedicides, coupled with the use of a modified cono-weeder in between the rows during the crop's period of vegetative growth. If for any reason, application of herbicides is not possible initially, post-emergence weedicides like Cyhalofop butyl or Bis pyribac sodium may be applied at 15-20 days after sowing.

The rice seeds that are directly sown on the field need moist field conditions, but flooded conditions on the field are avoided until the stage of panicle initiation. Up to panicle initiation, alternate wetting and drying of the field is practiced by irrigating the field every 2 to 3 days, depending the physical properties of the soil, whether it is light or heavy.

From the panicle initiation stage, shallow flooding is followed similar to traditional transplanted rice, with irrigation stopped 10 days before harvest. In direct-seeding method, the cost of cultivation is reduced by about Rs.10,000-14,000 per ha because operations like field preparation for nursery, raising a nursery, nursery pulling, and manual transplanting as done in traditional transplanting method are skipped.

Resource-efficient principles like low seed rate, intermittent drying of the field, low irrigation water requirement, reduced requirement of manual labour, improved productivity due to the wider spacing of 20 cm between rows, and reduced crop duration by 7-10 days are significant benefits to farmers.

Expansion of the area

The technical and economic feasibility of the technology for all types of farmers, coupled with incentive schemes of the Agricultural Department, have helped support mushrooming use of the technology in Andhra Pradesh state of India. Eight-rowed drumseeders and modified conoweeder were supplied to farmers on a 50% subsidy basis with the result that farmers became owners of the seeder, and the sowing operation is fully under their control. In Chittoor district of Andhra Pradesh alone, the area under this technology has expanded from just 0.5 acre in 2006 to 10,500 acres in 2013, and this upward trend is observed in other districts also.

Practical problems and possible solutions

The DSR method using a drumseeder is a very simple technology, easy for any farmer to adopt by just going through the literature, or by viewing a video on DSR with drumseeder. There are some practical issues that may present farmers with some dilemmas, however; so this report presents possible solutions. A full knowledge on the DSR method using drumseeder helps in maximizing the number of farmers who will continue with the technology.

S.no	Issues	Solutions
1	Seed variety	Farmers can use any variety with DSR, choosing according to their preferences, or according to market demand or because they have no alternative,.
2	Seed rate	25-37.5 kg/ha, depending upon the variety used. With finer seed, the seed rate by weight is less.
3	Soils	<p>Suitable to all types of rice-growing soils. It is better to avoid problematic soils like saline or alkali soils as intermittent drying of the field in such soils affects the plants' tillering capacity.</p> <p>It is also difficult to adopt DSR using the drumseeder in case of tank-irrigated rice fields as it is difficult to practice intermittent drying of these fields, although it is adoptable in tail-end fields.</p>
4	Seed treatment & pre-germination	<p>For a one-hectare area, suppose 25 kg of seeds are used; soak them in a solution of 25 gm of Carbendazim + 25 litres of water for 24 hours, and after that, remove the seeds and sprout them by sprinkling water on them for another 24 hours.</p> <p>The duration of soaking remains the same in all types of situations, while the duration for sprouting will vary with the size of the seed and the season. For fine-grain varieties, 12 hours is sufficient for sprouting, while for bold-seeded grains, 24 hours is required. Similarly, if the season is hot (as in early kharif or kharif in India), 12 hours is enough, whereas in winter (rabi season in India), the grain needs to be kept 24 hours in gunny bags for sprouting.</p>

		Do not allow the radicle (sprout) to grow too long as this will interrupt the free dropping of the seed from the drumseeder. Hence, land preparation should be completed by the time that the seeds are germinated.
5	Land preparation	The land should be levelled as perfectly as possible to avoid stagnation of water here and there in the field, which will result in damage of the sown seed.
6	Uneven seed dropping from the drumseeders	Avoid sprinkling water over the sprouted seeds on the morning of the 3rd day before sowing as wet seeds will not drop freely through the holes. The seeds should be just moderately wet, avoiding over wet conditions. It is also observed that long, slender-grained varieties like Basmati do not flow freely through the drumseeder holes; hence, avoid sowing Basmati rice using drumseeder.
7	Heavy downpour immediately after sowing the seed with drumseeder	If there is a chance of a heavy downpour of rain on the same day of seeding, or on the next day, put a thin layer of water on the field that covers the seed and protects it from being directly hit by the splash of rainwater. As soon as the rain stops, drain off the water layer and maintain the field under moist conditions. This procedure avoids the disturbance of rows as well as tilting of the seed below the soil which otherwise will affect germination.
8	Seed eaten away by birds after sowing	In rice fields surrounded by sugarcane fields or forest trees, it is common that seeds get eaten by birds. Since 3-8 seeds are dropped at each hill, however, even if half of the seeds are eaten by birds, farmers need not worry as this will not cause any economic loss.
9	Basal dose of inorganic fertilizers	It is generally recommended that 1/3rd dose of nitrogen fertilizers and the full dose of phosphorus and potash fertilizers be applied as a basal dose before sowing. But it is observed that weeds grow vigorously when N fertilizers are applied basally. Hence, avoid basal application of N fertilizers and apply 1/3 dose as a top dressing starting from 20 days after sowing. Farmyard manure or any other green manure applied to the field at the time of land preparation supplements the N requirement for the crop.

10	Weed menace due to maintaining the field in moist conditions until the panicle initiation stage	<p>In traditional method of rice cultivation, farmers keep their fields under flooded conditions from the day of transplanting until 10 days before harvesting, mostly to suppress weed emergence. In SRI or DSR methods, the field is kept moist until the panicle initiation stage and then flooded with just 2-5 cm water level. Farmers who prepare their land (ploughing & puddling) just before their sowing operation experience emergence of weeds along with rice seedlings. Hence to overcome weed problems, the following practices are suggested to farmers.</p> <ol style="list-style-type: none"> a. Field preparation should be done well in advance, 1-2 months before actual sowing, by repeated ploughings. This minimizes the weed population by up to 70% in a majority of fields. b. Many pre- and post-emergence weedicides are available on the market, but farmers should be very careful in their dose and timing of application.
11	Weedicide application - toxicity symptoms observed	<p>Effectiveness of a weedicide depends upon the timing and doses of application. Generally any pre-emergence weedicide in rice is recommended for 3-5 days after sowing or transplanting operations.</p> <p>Of all the weedicides, Pyrazosulfuron-ethyl has proved to be less toxic and an effective pre-emergence weedicide. It is safe even when applied on the same day after sowing or on next day.</p> <p>In light soils, puddling, levelling and sowing with a drumseeder can be taken up sequentially, and all the operations can be completed in one day. In such case, pre-emergence weedicides like Butachlor @ 2.5 litres/ha, Pretilachlor @ 1 litre/ha, Oxadiarzil @ 87.5-125 gm/ha, or Pyrazosulfuron-ethyl @ 250 gm/ha, may be applied in the field 3-5 days after sowing. In heavy soils like black soils due to their heavy clay content, sowing operation is done one or two days after the puddling and levelling operation. Because of high clay content, it is difficult to pull the drumseeder immediately after land preparation as it sinks into the soil, and seed drop is interrupted.</p>

		<p>Hence on such soils, the actual application time of pre-emergence weedicides extends to 6-8 days after land preparation, and weeds might have emerged by that time. In such cases, Pyrazosulfuron-ethyl weedicide which is safe and effective even if applied immediately after sowing on the same day is preferable instead of other pre-emergence weedicides like Butachlor or Pretilachlor or Oxadiargil, etc.</p>
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12	Running a modified conoweeder	<p>A modified conoweeder is available which has been especially designed for DSR with drumseeder as the latter's inter-row spacing is 20 cm, unlike the traditional SRI method or mechanized transplanting method of 25 cm or other distance. This special conoweeder has a single wheel and involves less drudgery than the traditional two-wheeled conoweeder. The conoweeder can be run twice or thrice for effective aeration of the rooting system and for better nutrition uptake by the plants. The first weeding should be done about 20 days after sowing, and subsequent weedings would be at 10-day intervals.</p> <p>Mechanical conoweeders are available in the market which run on petrol. They further reduce the drudgery involved in weeding operations.</p>
13	Soil cracks developed due to intermittent drying	<p>It is recommended to keep the soil under wet conditions from the sowing day to the panicle initiation stage, and then to maintain lightly flooded conditions in the field until 10 days before harvesting. Due to a communication gap or to lack of precision in wetting and drying the field, some farmers are drying their fields to the stage where cracks develop. Hence, during training programmes and in other interactions with farmers, it is necessary to stress that <i>"the field should be kept under wet condition until panicle initiation stage; and for this purpose they need to irrigate the field once a day or once in 2 days or once in 3 days depending upon the heaviness of the soil and its moisture-holding capacity. Once we start running a conoweeder between the rows, these cracks are closed, and the field becomes smooth as it appears after puddling."</i></p>