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Mechanical Transplanting of Rice

Mohammad Shahid, A.K. Nayak, R.Tripathi, Sangita Mohanty, B.B. Panda,
S. Saha, Vijayakumar S, S.D.Mohapatra, S.Priyadarsini, P.K. Guru, S. Munda,
D.R. Sarangi, Udaya Sekhar Nagothu and H. Pathak



भाकृअनुप-राष्ट्रीय चावल अनुसंधान संस्थान
ICAR - National Rice Research Institute, Cuttack



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Introduction

Rice production is labour, water and energy intensive process. In India, rice is generally grown by transplanting of seedlings in the puddled fields. Land preparation and transplanting require about one-third of total man-power needed for rice production. Mechanical transplanting reduces labour requirement and helps timely completion of the crop establishment operations. This helps to mitigate the narrow window of crop establishment thrown by the climate change. This technical brief describes the technology and process of mechanical transplanting of rice.

Mechanical transplanting of rice

Mechanical transplanting of rice is the process of transplanting young rice seedlings, which have been specifically raised in a mat type nursery, using a rice transplanter. In conventional manual transplanting, 8-12 labourers are required to transplant one acre, mechanical transplanter could transplant upto four acres in a day with 3 labourers.

Mat nursery/Dapog nursery

In mat nursery seedlings are established in a layer of soil mix, arranged on a firm surface (concrete floor/ polythene sheet/ seedling trays). Rice seeds are sown on a thin layer (1.5 - 2.0 cm) of soil and farm yard manure (FYM) or compost or vermicompost mixture (4:1) in specifically designed frames or in fields by using polythene sheets. The frame or polythene sheet prevents the seedling roots from penetrating the underlying soil and a dense mat is created. The mat raised on the frames are of desired shape which fits well into the transplanter; however, the seedlings grown on polythene sheet in the field needs to be cut into desired shapes and sizes to fit into the trays of the transplanter. Seedlings are ready for planting within 14-20 days after seeding (DAS). Seedling raised in 100 m² (or) 2.5 cent is sufficient to transplant one hectare. At the time of transplanting, seedlings are uprooted like a mat. It can be easily rolled and transported to distant places. The mat nursery uses less land, can be installed closer to the house than traditional field nurseries.

Establishment of mat-type nursery

Mat nursery/Dapog nursery preparation should begin 15-20 days prior to transplanting. The success of paddy transplanter depends on the quality of nursery. For preparing good quality mat nursery following points should be taken into consideration:

Seed rate: To plant one acre, 10-15 kg of good quality seed is required. The seeds should be pre-treated to control seed borne diseases.

Pre-germination of seeds: Submerge the seeds in water and soak for 10-12 hrs. Remove the empty and damaged seeds that float on the surface. After soaking, drain the excess water and cover the soaked seeds with gunny bags. Sprinkle water over seed at regular intervals and turn with hands about 2-3 times for proper aeration and to avoid damage to seed by heat. After about 20-24 hrs, the seed sprouts and is ready for sowing. Avoid over sprouting of the seeds.

Preparing and spreading of soil mixture: Uniformity of the soil mixture is very much essential as it ensure proper nutrition and vigor to the growing seedling. Prepare the soil mixture by taking fine (pass through 2 mm sieve) and weed seed free soil. Mix this fine soil with farm yard manure or compost or vermicompost in 4:1 ratio. After thorough mixing, spread the mixture for about 2 cm thickness on the frame or plastic sheet. For spreading the soil over plastic sheet and making it uniform, use a wooden or iron frame divided into 4 equal segments. Fill the frame almost to the top with the soil mixture and level it.

Spreading of pre-germinated seeds on the soil mixture: Spread the pre-germinated seeds over the soil mixture evenly. After spreading, cover the seed with a thin layer (0.5 cm) of soil mixture and a thin layer of straw or banana leaves if the nursery is grown in open area. Remove the straw or banana leaf cover after 2-3 days.



Filling of soil mixture & Spreading of pre-germinated seeds



Covering the seeds and watering using rose cane



Mat nursery ready for transplanting

Watering of mat nursery: Maintaining of proper moisture content by regular sprinkling of water over the nursery is essential for rice seedlings to produce roots and shoots and hold the soil together. Sprinkle the water in fine droplets with the use of fountain type small containers or rose cane uniformly over the nursery bed at regular interval (2 times in a day) in order to establish the mat type nursery. However, when the nursery is grown on plastic sheet in the field, keep the peripheral channels/furrows between two beds flooded. Retain the water on the top of the beds by keeping the height of bunds higher than the bed height. Drain the excess water 12 hrs before transplanting to ensure an optimum dry mat for cutting and transplanting.

Fertilizer management: When the nursery is grown in the soil mixture, its nutritional requirement is usually fulfilled by the soil/FYM mixture. However, application of 1.5 kg powdered DAP for every 80 m² of nursery area will help in faster growth. In case, if the nutrient deficiency symptoms (yellowing) appear, apply foliar spray of mixed solution of 0.5% zinc sulphate + 2.5 % urea in 1.2 liter of water. Repeat the spray after 5-7 days, if the symptoms appear again. For correcting the iron deficiency (interveinal yellowing and chlorosis of leaves), apply 0.5% solution of iron sulphate as foliar spray.

Removing nursery for transplanting: When the seedlings in mat nursery are ready for transplanting, the mats are either removed when grown on tray or cut into the required size (depending on the standard size of nursery platform of the transplanter) using a sharp knife or sickle when grown in field. If mats are to be transported to distant places, they should be kept moist by sprinkling water intermittently to avoid wilting.



Field preparation before transplanting: The performance of rice transplanter mainly depends on the condition of field at the time of transplanting. Field should be well prepared before operation of the rice transplanter. A well puddled and leveled field helps in maintaining 3-4 cm standing water for smooth operation of transplanter. After puddling and leveling, field should be left for 18-24 hrs to allow the puddle to settle down completely and to avoid soil flow for better seedling establishment.

Mechanical rice transplanter:

The rice transplanters are generally of two types manual and self-propelled. The manual transplanters are walking type and manually driven, however, self-propelled transplanter can be walking type or riding type and requires machine energy. The mechanical rice transplanter is fitted with a tin/fibre based tray like a roof top on which mat type nurseries are placed during the operation.



Mechanical transplanting using self propelled transplanter

Steps for transplanting rice seedlings using transplanter: Following steps are to be followed during transplanting of rice seedlings using transplanter:

- Prepare the mat-type nursery.
- Prepare a well-puddled and well-levelled field for transplanting.
- Prior to transplanting, apply light irrigation or drain off any excess water from the field to maintain a uniform depth of 1-2 cm standing water.
- Load the mat nursery cakes on the slanting nursery platform and transplant the seedlings at the selected machine setting.
- On all four sides of the field, leave area equal to one machine pass before starting transplanting to prevent the damage to the already transplanted seedlings during turning of machine.
- Operate the machine in a straight line from one point to other in the field, take U-turn at the end, and proceed in the same manner. Each return pass should be parallel to the last row of the previous pass at a desired row spacing.
- Keep ready the extra nursery cakes and feed the machine as per need during the transplanting operation.
- The unsown area left on sides of the field will facilitate transplanting at corners and taking the machine out of the field after the operation.
- After completing the transplanting, carefully look at the field for any missing hill and do the gap filling manually.
- Once the seedlings are established, other standard management practices like irrigation, weed, nutrient, insect pest and disease management should be followed as that of conventional puddle transplanted rice.

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Director

ICAR-National Rice Research Institute, Cuttack-753006, Odisha

Phone : 91-671-2367768-783 (EPABX); Fax : 91-671-2367663

Email : director.nrri@icar.gov.in, crrietc@nic.in; Website : <http://www.icar-nrri.in>