

Rice nursery bed

preparation and management

Sushmita Munda¹, Sanjoy Saha² and Totan Adak³

National Rice Research Institute, Cuttack (Odisha) 753 006

Rice is normally grown under favourable shallow lowlands and in irrigated lands where assured yield can be achieved through the adoption of proper management techniques. Use of healthy seedlings is of great importance not only to get better early vigour but also to obtain higher yields from a transplanted rice crop. Healthy seedlings help to get better early vigour which is finally reflected in higher productivity. The first 8 to 10 days growth of seedlings takes place from the reserve materials present in the seeds, and for this sufficient moisture, temperature and oxygen supplies are needed in the nursery bed. Afterwards, the newly emerged seedlings having adequate amount of roots start absorbing nutrients from the soil for photosynthesis and, thereby, gain weight depending upon the prevailing micro-climate. So, the seedlings should be raised in well-prepared weed free nurseries with proper irrigation and drainage facilities. The nursery land should be fertile and the seedlings are to be fed well with nutrients. The seedlings have to be disease and insect free. Thus, proper seed bed management is essential for a good harvest of rice.

Key words: Bed preparation, Management, Rice nursery



Fig. 1 (Left) Wet bed Nursery; (Middle) Dry bed Nursery; (Right) Dapog Nursery Source: <http://www.knowledgebank.irri.org>; agropedia.iitk.ac.in

RICE (*Oryza sativa*) is a major food grain crop and grown under diverse climatic and edaphic conditions globally. Transplanting is the normal and perhaps the most elaborate method of rice establishment. In this method, seeds are first sown in a nursery bed, and afterwards transplanted into well puddled and prepared field. Transplanting enables us to select only healthy seedlings for the main field. It also enables us to plant the robust seedlings at the right spacing

so as to ensure the uniform availability of water, nutrients and sunlight to the plants. The precise spacing between transplanted crops allows them to mature uniformly. Transplanted rice raised by improved nursery method has more vigorous and fibrous root system development.

To get a successful transplanted crop, healthy seedlings are crucial. Therefore, nursery bed management is a major factor in determining the ultimate grain yield. By proper management of rice seed bed, healthy

seedlings can be raised for a vigorous and healthy rice crop. Healthy seedlings help to get better early vigour which finally reflected in higher productivity. Nursery bed management includes selection of nursery bed, use of quality seeds, seed treatments, management of soil nutrients, proper weed control and precise use of water as and when required. Nursery bed management also includes decision at the seedling uprooting for transplanting in main field.

Nursery systems

A nursery is a place where plants are propagated and grown to usable size. Nursery bed is defined as 'prepared area' where seed is sown. Raising rice seedlings for transplanting could be done in wet bed, dry bed and dapog methods. For mechanical transplanting seedling mat beds could be used. The choice of a particular nursery system depends on the availability of water, labour, land and agricultural implements.

Wet-bed method

Wet seed bed nursery is mainly used in areas where water is adequately available for nursery establishment. Addition of well decomposed organic manure (5 tonne/ha) as basal will increase easiness of uprooting of seedlings. The seed bed area is about 1/10 of the main field and requires about 35 to 40 kg of seed/ ha for high-yielding variety. Raised beds of 4 to 5 cm high, 1 to 1.5 m wide and of convenient length are to be constructed to facilitate subsequent management. Space for drainage channel (40 cm) in between seed beds is to be kept. For every 1,000 m² seed bed, 5 to 10 kg to N, 5 kg P₂O₅ and 5 kg K₂O needs to be applied. Pre-germinated seeds at 30 to 40 g/m² to be sown by broadcasting/line sowing. Quality rice seeds should be soaked in clean water for a minimum period of 24 hr and incubate in a warm dry place for about 48 hr. Sprouted seed should then be broadcast uniformly on the nursery bed. Before seeding the nursery should be drained completely. Thereafter, nursery should be maintained in moist condition for about 5 days. Once the seedlings are established, the nursery is impounded with water and raise the water level gradually. The best stage of transplanting seedling is about 15 to 21 days, although 21 to 25 days transplanting is generally followed.

Advantages of wet bed method: The advantages are: less seed is required, more choices of location for seed bed, growth is quick with strong and sturdy seedlings, and less weed infestation.

Disadvantages of wet bed nursery: The advantages are: copious water supply is essential; preparation and care of seed bed and pulling of seedlings are laborious; seedlings cannot withstand drought; and seedlings cannot be kept longer in nurseries as they tend to tiller and produce nodes under favourable condition.

Dry-bed method

This system of nursery is prepared under dry soil conditions. The site should be free of shade and has access to irrigation facilities. Seed beds of convenient dimensions are prepared by raising the soil to a height of about 5 to 10 cm.

A thin layer of half burnt paddy husk could be distributed on the nursery bed mainly to facilitate uprooting. In this method dry seeds are sown in 10 cm apart rows. Sowing of seeds could also be done by broadcasting but it should be discouraged as the weed control is difficult. Nursery area should be about 1/10 of area to be transplanted. A relatively higher seed rate (about 40 to 50 kg/ha) is required for good initial stand. Uprooting of seedlings should be done within between 15 and 21 days after germination. Nursery should be maintained without any moisture stress. A basal fertilizer mixture could be applied and incorporated between rows, if the soil nutrient supply is low.

Advantages of dry bed method: These are as follows:

- It can be raised with limited water supply.
- Preparation of dry nursery is easier than wet nursery.
- Pulling is easier; seedlings come out easily.
- Seedlings do not adhere to each other, facilitates single planting.
- Seedlings are hardy and can resist adverse condition to some extent.
- Seedlings raised in dry nursery tiller early and profusely.
- Seedlings are short and strong, has longer root system than wet bed and can be raised even during heavy rains which is not possible with wet bed.

Disadvantages of dry nursery bed: These are as discussed here.

- Roots may get damaged during pulling.
- Seedlings may get infected with blast and are more prone to pests such as rodents etc.
- Seedling stake more time to achieve optimum growth for transplanting.
- Not suitable for sandy, stiff clay or saline soils.
- Seedlings are usually thin and slender.
- Higher seed rate is required than wet nursery bed.

Dapog method

Dapog or mat method is most appropriate for growing short duration varieties, as seedlings experience less transplanting shock. Compared to other methods, this requires less labour, and has minimal root damage. The nurseries could be located anywhere on a flat surface where water supply is very reliable. An area of 100 m²/ha or 1% of the field is required for the seedbed with 35 to 40 kg/ha seeds. Seed bed should be levelled and make the centre slightly higher than the edges to permit water to drain off the surface. Cover the surface with polyethylene sheets or any flexible material to prevent seedling roots penetrating to the bottom soil layer. Cemented floors can also be used for this purpose. Seed bed should be covered with about 0.625 cm layer burnt paddy husk or compost.

Pre-germinated seeds should be broadcast uniformly on the seed bed to a thickness of 2 to 3 seeds. Water is to be splashed on the germinating seeds and pressed down by hand or with a wooden flat board in the morning and afternoon from 3 to 4 days to prevent uneven growth. More frequent irrigation is necessary, if seeds were sown without the bedding. The nursery should be transplanted in 9 to 14 days after germination of seeds. The advantage over wet/dry bed method need less area and the cost of uprooting of seedling is minimal. However, since the seedlings are small, transplanting is difficult. Other disadvantage of dapog seedling was that field should be very well levelled and free of water since the seedlings are very short.

Modified mat nursery

The modified mat nursery uses less land and requires fewer seeds (12 to 15 kg of good quality seeds) and inputs (i.e., fertilizer and water). An area of 100 m³/ha is sufficient for the seedbed. Nurseries should be about 1.2 m wide (may vary with the type of transplanter). A sheet of polythene is placed on the levelled nursery bed and a compost layer to a height of 1.5 to 2 cm is placed on it. Sprouted seeds are then broadcast. Irrigation should be given twice in a day for 5 days to prevent water stress. Seedlings are ready for transplanting after 9 to 14 days, appropriate transplanting age is around 10 days (4-leaf stage), to avoid competition. Also, early transplanting at 10 days allows a smaller nursery area, even if density is high.

RECOMMENDATIONS TO GROW HEALTHY SEEDLINGS

Followings recommendations should be followed

- Use of healthy seeds.
- Nursery should be well prepared with proper irrigation and drainage facilities.
- Fertility in nursery should be optimum.
- Proper weed management should be followed.
- Seed bed preferably separate from main field.
- Appropriate seed rate (high seed rate in nursery impedes plant growth and imparts competition. Seedlings do not attain expected size, if not managed properly).
- Seed priming may be done to break dormancy, if needed.

Characteristics of good seed

Seeds are the protectors and propagators of their kind. Thus farmers' entire crop depends on the quality of the seed what he uses for sowing. Use of good quality seeds help to produce healthy seedlings.

A good quality seed should have the following characters:

- Seeds must be true to its type.
- It should be free from all the inert materials and weed seeds.
- The seed must be viable, the

germination capacity is up to the standard (> 80%) and uniform in its texture, structure and look.

- It should be free from seed-borne disease and insect-pests.
- Fresh seed should be purchased from certified agencies or it should be truthfully labeled and produced under all due cares and strict supervision so that it does not degenerate quickly.

Protection against pests and diseases

Seed treatment in rice is generally taken as a precautionary measure. Carbendazim 1 g/kg seed of rice can be used to control seed borne diseases. Yellow stem borer is the most important insect pest of nursery. It occurs in January in seed bed. One foliar spray of imidacloprid @ 25g a.i./ha or Chlorpyrifos @ 375g a.i./ha may be applied when adult moth is observed. Granular carbofuran @ 1 kg a.i./1,000 m² five days before transplanting, if yellow stem borer is observed at later stage in nursery. Chlorpyrifos @ 1 kg a.i./100 kg seed gives good protection in termite and ant infested soils. For protection against grasshopper, imidacloprid @ 25 g a.i./ha may be applied. In wet season nursery, thrips can be controlled by spray of neem oil @ 10 ml/litre for seedlings 20 or more days older and 3 ml/litre for younger seedlings. Seed purification with 2% salt solution can be done to get rid of weed seeds.

Soil fertility management

To get good yield it is essential that seedlings should be healthy and vigorous. Healthy and vigorously growing seedlings give a good start to the main crop. Application of adequate amount of well decomposed manure (5 tonne/ha) to the seed bed takes care of micronutrient deficiencies. A fertilizer dose of 10 kg N, 5 kg P₂O₅ and 5 kg K₂O/ha should be applied to the seed bed for better seedling growth.

Weed management

In rice seed bed, weeds begin to emerge in 4 to 5 days after sowing, and most weeds emerge in 7 to 8

days, then the number of emerging weeds decreases. The important weeds like *Echinochloa colona* and *Cyperus difformis* are generally grown in nursery and about 5 to 10 % of these weed population grows with rice in the main field causing crop yield reduction up to about 20%. Some of the important preventive measures are use of clean certified seed, which is free from weed seeds, proper land preparation and water management, cleaning out weeds in levees and field margins and cleaning implements to avoid spreading of weed seeds. The practical way to control weeds in seed bed is with chemicals combined with some cultural practices. In high weed infested areas, water management in rice seed bed is a tactic for weed control. The 10 to 20 cm standing water for 7 days before sowing and 10 cm immediately after sowing helps to suppress weeds. Draining of water is essential during rice germination. Again maintaining water depth of 3 to 5 cm suppresses the weeds in seed bed. Application of pendimethalin at 750 g/ha or pyrazosulfuron ethyl at 20 g/ha or Flucetosulfuron at 25 g/ha can effectively control the weeds in the seed bed.

SUMMARY

By proper management of seed bed, healthy rice seedlings can be raised for getting a healthy rice crop that finally contributes to improve grain yield. Nursery bed should be selected on the basis of existing resources, viz. availability of water, labour, land and agricultural implements. Good quality seeds, proper water management and plant protection measures are essential. Age of seedlings needs to be given utmost importance to raise healthy seedlings for future healthy crop. Success in raising healthy rice seedlings depends mainly on the constant supervision and proper management.

^{1,3}Scientist, ³Principal Scientist, Division of Crop Production, Corresponding authors' e mail: sustot@gmail.com, ssaharri@gmail.com
