

# Unit 3



## Nursery Preparation and Transportation

### INTRODUCTION

Transplanting is a process, wherein, young seedlings are transferred from a nursery to be planted in a field. Nursery is a small area, where seeds are sown to raise seedlings. In general, the required nursery area is about 8–10 per cent of the total area to be transplanted. A nursery site needs to be levelled and made free from weeds, insect-pests and diseases. Farm Yard Manure (FYM) and fertilisers containing nitrogen and phosphorus must be added to the nursery soil to increase its fertility. The seed rate for nursery raising depends on the locality, soil type, variety and seed quality. Vigorous seedlings can be raised in the nursery, which can later be transplanted in the field.



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### SESSION 1: TYPES OF NURSERY AND SEED SOWING

#### Selection of nursery site

Centrally located flat bed having a slope of less than 3 degrees is ideal for nursery raising. A fertile land having adequate water holding capacity and drainage facility must be selected for the nursery site. Regular supply of irrigation water must be ensured at the site. Avoid a site that is prone to flood, animal attacks, etc., as these may

damage the seedlings. Approach roads and irrigation or drainage channels in the nursery site must be carefully planned.

### Criteria for nursery site selection

- The soil of the nursery site must be loamy or clayey loam but it must not be too porous. It is important to avoid heavy leaching of nutrients and water.
- There must be fencing around the site to protect crop damage from animals.
- The nursery site must be changed every season to check diseases, insect-pests and weeds.
- The site must have optimum drainage and irrigation facility.
- Adequate and appropriate transportation facility must be available near the nursery site.
- Avoid setting up nurseries under the shade of trees as this can lead to weak seedlings.



Fig. 3.1: Raising seedlings in a wet bed nursery

### Types of nursery

#### Wet bed nursery

The wet bed method of raising paddy seedlings is most popular among farmers. In this method, a fertile and levelled area having adequate drainage facility is selected. Decomposed organic material and inorganic fertilisers need to be added to the nursery soil as they help ensure healthy and vigorous seedling growth. Treated and pre-germinated seeds must be sown in the nursery as they enhance seedling establishment and germination. Such a nursery needs to be raised in about 600–800 m<sup>2</sup> area for transplanting 1 ha land.

Generally, 25–30 kg of seeds are sufficient to transplant 1 hectare land. However, the quantity of seeds depends on the variety to be sown. In this method, the seedlings are pulled out one week prior to transplanting.



Irrigation channels having a width of 30–40 cm must be constructed around the nursery beds as they serve as pathways and barriers against predators. The beds need to be prepared at a width of 1.25 m by choosing a convenient length, normally, up to 5 m. The bed height must be raised up to 5–10 cm and the pre-germinated seeds need to be broadcast in puddled and levelled field. The transplanting of seedlings must be done when they are 20–25 days' old. Younger seedlings are preferred as they are easy and fast to establish.

The seedlings must be pulled with the help of the thumb and index finger, and held close to the roots. It needs to be ensured that the seedlings are handled gently during uprooting and transporting. There must be minimum damage to the roots during uprooting.

### **Advantages**

- Less number of seeds is required per unit area.
- Quick growth can be obtained with strong and sturdy seedlings.

### **Dry bed nursery**

This method is practised in areas, where water is not sufficient to grow seedlings. Dry bed nursery is prepared in dry soil conditions. The seedbed area is 10 per cent of the total area to be transplanted. The seedbed must be ploughed three–four times to achieve the required conditions for sowing. Prepare beds of the same size as in wet nursery. But in dry nursery, the beds must be raised by 15 cm. Channels having a width of 30 cm must be prepared between two beds length wise. The seeds must be sown uniformly in lines at a spacing of 10 cm. The sowing depth needs to be 1–3 cm. Use the same seed and fertiliser rate as in case of wet nursery. After sowing in rows, the sown seeds must be covered with soil. Water is allowed to run through the channels first, and then, the water level is slowly raised to saturate the soil bed. If possible, a thin film of water needs to be maintained



*Fig. 3.2: Raising seedlings in a dry bed nursery*





(a)



(b)



(c)

Fig. 3.3 (a-c): Raising seedlings in dapog nursery

after five days of sowing. Follow all operations as discussed in case of wet nursery here too.

### **Advantages**

- Heavy rain does not affect the growth of seedlings.
- The seedlings develop better root system.
- They are easy to uproot.
- They are short and sturdy.

### **Dapog nursery**

This method of nursery raising entails growing seedlings on a flat soil surface or raised bed covered with polyethylene sheets or banana leaves. A nursery area of 25–30 sqm is enough for transplanting 1 ha land. If the seed rate of a particular variety is 30 kg/ha, then about 3 kg seeds need to be spread in 1 sqm area. The pre-germinated seeds must be broadcast uniformly over the plastic sheets or banana leaves. The seeds must be packed manually to make a uniform layer. The seeds must not be pressed too hard. Water must be sprinkled gently on the nursery bed three–four times a day to keep it wet for four–five days. The seeds, later, need to be covered with 1–2 cm water till the end.

By this method, the seedlings are raised faster and are ready in 9–14 days of sowing. The seedlings, thus, raised can be rolled like a carpet and carried to the transplanting site. They can be separated by loosening the interlocked roots carefully before transplanting. Three to four seedlings must be transplanted at a hill in the main field. This method saves almost half the time that goes in raising the seedlings. The other advantage

is that less area is required to raise the seedlings. The seedlings raised by this method are, generally, delicate, thin and can survive only for about two weeks. When allowed to remain in the bed for a longer period than two weeks, the seedlings may dry up.

## SRI nursery

The ideal site for an SRI nursery is a levelled area having adequate water supply. Drainage channels are necessary for draining out excess water. About 100 m<sup>2</sup> area is sufficient for transplanting 1 ha land. The seed rate for SRI method is low, i.e., 7–8 kg/ha. It is due to the transplanting of only one seedling per hill. Around 6.8 tonne of soil mixture is needed for 100 m<sup>2</sup> nursery. The soil mixture can be prepared with soil (70%) + FYM (20%) + powdered rice hull (10%). Nitrogen, phosphorous and potash fertiliser must be added to this mixture. A wooden frame measuring 0.5 m long, 1 m wide and 4 cm deep must be placed in equal parts on a plastic sheet.

Pre-germinated seeds are required for raising the nursery. The seeds must be soaked in water for 24 hours, and thereafter, incubated for another 24 hours. Next, the pre-germinated seeds need to be spread in the wooden frame uniformly and covered with dry soil having a thickness of 5 mm. Adequate moisture must be maintained by sprinkling water in the wooden frame. The nursery must be protected from heavy rains for the first five days. A spray of 0.5% urea + 0.5% Zinc sulphate solution may be applied after 8–10 days from sowing for ensuring fast growth of the seedlings. The seedlings become ready for transplanting after 12–14 days from sowing. The problem of diseases and insect-pests is minimum in SRI nursery.

### Care and maintenance of nursery

Care and maintenance of a nursery are essential for raising healthy seedlings. Factors like moisture, light and temperature need to be conducive for better seedling development. Care and maintenance help in vigorous growth of the seedlings, and may enable them to survive adverse environmental conditions.



Fig. 3.4: Raising seedlings in an SRI nursery





Fig. 3.5: Seed germination of rice

### **Seed germination**

It must be ensured that all seeds planted in the nursery are treated with appropriate chemicals to check seed-borne infections. Pre-germination includes two steps — soaking of the seeds and their incubation. The seeds are soaked in a loose cloth or jute bag for 24 hours so that the moisture gets absorbed. Incubation implies withdrawal of excess water from the seeds and keeping them in a ventilated place (close to 30 °C), until they begin to germinate, which, usually, takes 24 to 36 hours.

### **Irrigation**

Make sure that the nursery never dries up or has excess water. Ensure frequent irrigation to keep the nursery soil moist. The following precautions must be taken during irrigation.

- Ensure adequate drainage.
- Maintain 2–3 cm water for up to 10 days during the seedling stage.
- The nursery must be watered in the evening to avoid damage to the seedlings as water becomes hot during the day.
- The seedlings must not be completely submerged in water.

### **Fertiliser application**

Adequate and appropriate fertiliser application practices need to be followed to improve soil fertility conditions. In case of poor seedling growth, apply top dressing of 10 g urea per m<sup>2</sup> after two weeks of sowing.

### **Disease and insect–pest management**

As already mentioned, the seeds must be treated to check the occurrence of diseases and insect–pests. But if diseases or insect–pests attack the seeds despite treatment, then the symptoms must be identified and corrective measures be taken.



**Table 3.1: Nursery management schedule**

S. No.	Operations	Days
1.	Manage weeds (if needed)	3-5
2.	Manage insect-pests and diseases	10-20
3.	Apply Di Ammonium Phosphate (DAP) fertiliser (if it is not applied as basal dose)	15
4.	Pulling out the seedlings <ul style="list-style-type: none"> <li>• Short duration</li> <li>• Medium duration</li> <li>• Long duration</li> <li>• SRI method</li> </ul>	20-35 20-25 25-30 30-35 Less than 14

**NOTES****Practical Exercise****Activity**

Prepare a dry bed nursery for growing paddy seedlings.

**Material required:** measuring tape, rope, fertilisers, seeds, etc.

**Procedure**

- Plough or dig the nursery soil of a given area or plot.
- Remove crop stubbles from the soil and level the plot.
- Mix FYM and fertilisers into the soil.
- Prepare a seedbed of 1.25 m width, having a height of about 15 cm.
- Make 30 to 40-cm wide drainage channels around the bed.
- Treat the seeds with fungicides before sowing.
- Broadcast the seeds on the seedbed and cover them with fine soil.
- Irrigate the seedbed after sowing.
- Maintain soil moisture till the seedlings are ready for transplanting.

**Check Your Progress****A. Fill in the Blanks**

1. For wet bed nursery, the optimum size of the nursery for transplanting 1 ha land is \_\_\_\_\_ sqm.
2. Dry bed nursery is prepared for \_\_\_\_\_ soil conditions.
3. A drainage channel is required to remove \_\_\_\_\_ water.



## NOTES

4. Pre-germinated seeds are covered with \_\_\_\_\_ in SRI system.
5. Pre-germination includes \_\_\_\_\_ and \_\_\_\_\_ of seeds.

### B. Multiple Choice Questions

1. The most popular type of nursery for paddy cultivation is \_\_\_\_\_ nursery.  
(a) *dapog* (b) dry bed  
(c) wet bed (d) None
2. Seedlings in *dapog* nursery are ready for transplanting after \_\_\_\_\_ days.  
(a) 3–5 (b) 9–14 (c) 20–25 (d) 25–30
3. The problem of diseases and insect-pests is minimum in \_\_\_\_\_ nursery.  
(a) *dapog* nursery (b) dry bed  
(c) wet bed nursery (d) SRI
4. The size of the nursery area required to transplant 1 ha by SRI method is \_\_\_\_\_ m<sup>2</sup>.  
(a) 10 (b) 50 (c) 100 (d) 1000
5. Seedlings in wet bed nursery are ready for transplanting after \_\_\_\_\_ days.  
(a) 30–35 (b) 20–25 (c) 15–21 (d) 9–14

### C. Match the Columns

A	B
1. Seed treatment	(a) Better root system
2. <i>Dapog</i> method	(b) Check occurrence of diseases and insects-pets
3. SRI	(c) Flat soil surface covered with polythene sheet for banana leaves
4. Dry bed	(d) Single seedling per hill

### D. Subjective Questions

1. Describe the site selection criteria for a paddy nursery.
2. What is a nursery? Describe different types of rice nursery.
3. Explain how an SRI nursery is prepared.
4. Distinguish between dry and wet bed nurseries. Also, write how are they prepared.



## SESSION 2: WEEDS, INSECT-PESTS AND DISEASE MANAGEMENT IN A PADDY NURSERY

There is severe yield loss if paddy crop is attacked by insect-pests, or acquires some diseases. Better crop management, crop rotation and certain preventive measures can help check the problems. The use of appropriate insecticides can help eradicate such problems after the diagnosis of diseases or insect-pests.

### Type of weeds

The different type of weeds found in a paddy nursery are as follows.

#### Grasses

Grasses are monocots having narrow, upright and long leaves with parallel venation. Examples of grass weeds are *doob* grass, barnyard grass, *saava*, etc.

#### Sedges

These are similar to grasses. They have triangular stems without nodes and internodes. Sedges multiply by rhizomes, for example *motha*, yellow nut sedge, etc.

#### Broad-leaved weeds

Broad-leaved weeds are, usually, dicot in nature with taproot system. The stem bears branches and leaves possess a net venation. Examples of broad-leaved weeds are *hazardana*, *kana*, *bhringraj*, *brahma manduki*, etc.

### Weed management in nursery

Herbicides are the chemicals used to kill herbs that occur in the form of weeds in a field. Weeds in a nursery can be easily managed by spraying pre-emergence herbicides like *butachlor* at 2.0l/ha or *pendimethalin* at 2.5l/ha. These herbicides need to be applied only after ensuring enough moisture in the field.

### Insect-pests and diseases

Insect-pests and diseases adversely affect the crop in a nursery. Sometimes, the entire nursery gets destroyed



Fig. 3.6(a): Grasses



Fig. 3.6(b): Sedges



Fig. 3.6(c): Broad-leaved weeds





Fig. 3.7: Army cutworm



Fig. 3.8(a): Thrips (adult)



Fig. 3.8(b): Thrips



Fig. 3.9: Green leafhopper



Fig. 3.10: Rice case worm

due to the presence of insect-pests and diseases. Therefore, management of insect-pests and diseases is important.

## Insect-pest management

Some of the common insect-pests found in a nursery are army cutworm, thrips, green leafhopper and case worm.

### Army cutworm

The damage caused by the larvae of army cutworm may occur on a large scale during the seedling stage of paddy crop. In severe cases of infestation, the nursery looks like a grazed field. The infestation is severe during July to September. Drain out excess water and spray *chlorpyrifos 20 EC* at 0.05% to check the spread of army cutworm. One can also mix some kerosene in water and use it for flooding the nursery, which suffocates and kills the larvae.

### Thrips

The affected leaves show a rolled tip and there are needle-like outgrowths in the leaves at the seedling stage. In severe cases, lower leaves of the plant show chlorosis and scorching. *Phosphamidon 40 SL* or *Monocrotophos 36 SL* are effective in controlling the spread of thrips.

### Green leafhopper

It causes yellowing of the leaves from the tip to bottom. Rice tungro virus is also transmitted by this insect. Both nymphs and adults cause damage to the leaves by sucking the sap. *Phorate 10G* at 10 kg/ha or *quinalphos 5G* at 30 kg/ha can be used to check the occurrence of green leafhoppers.

### Rice case worm

This insect causes damage at the caterpillar stage. Caterpillars feed on green tissues of leaves, which become whitish and papery in appearance. The spread of rice case worms can be checked by spraying 2 ml *quinalphos 25 EC* or 1.3 ml *monocrotophos 36 SL* in 1 litre of water.



## Disease management

The major diseases affecting paddy crop in a nursery are as follows.

### **Blast**

Brown to dark brown boat-shaped spots with ashy centres appear on the leaves. Growing of resistant varieties and application of recommended dose of fertilisers are effective in checking this disease. Spray *carbendazim* at 2g/litre on the seedlings to prevent the occurrence or spread of this disease.

### **Brown spot**

These are dark brown oval spots on the leaves and stems. In severe cases, it causes heavy mortality of the seedlings. For prevention of brown spots, apply dose of recommended fertilisers only.



Fig. 3.11: Blast disease in paddy plant



Fig. 3.12: Brown spot disease in a paddy plant

## Practical Exercise

### Activity

Identify different insect-pests and diseases in a paddy nursery in your area.

**Material required:** notebook, pen, pencil, eraser, etc.

### Procedure

- Visit a paddy nursery and identify insect-pests and diseases infecting the plants there.
- Write the symptoms that you spot in the plants.
- Collect the specimen of insect-pests and diseases.
- Write the measures that you would take to control the spread of insect-pests and diseases.

## Check Your Progress

### A. Fill in the Blanks

1. Monocot grasses have parallel leaf \_\_\_\_\_.
2. Sedges have triangular stems without \_\_\_\_\_ and \_\_\_\_\_.
3. Brown spot disease is characterised by oval dark brown spots on \_\_\_\_\_ and \_\_\_\_\_.
4. Rice tungro virus is transmitted by \_\_\_\_\_.
5. Army cutworm infestation in rice is severe during \_\_\_\_\_ to \_\_\_\_\_.



## NOTES

### B. Multiple Choice Questions

1. *Butachlore* is a \_\_\_\_\_.  
(a) herbicide (b) fungicide  
(c) insecticide (d) nematicide
2. In paddy crop, *butachlor* is used for controlling \_\_\_\_\_.  
(a) diseases (b) insect-pests  
(c) weeds (d) nematodes
3. The most damaging stage of army cutworms is \_\_\_\_\_.  
(a) fly (b) caterpillar  
(c) pupa (d) larvae
4. Dark brown and boat-shaped spots on paddy leaves are caused by \_\_\_\_\_.  
(a) bacterial blight (b) brown spots  
(c) blast (d) sheath blight

### C. Match the Columns

A	B
1. Broad-leaved weed	(a) Leaves become whitish and papery in appearance
2. Rice case worm	(b) Nursery looks like a grazed field
3. Army cutworms	(c) Taproot system
4. Brown spot	(d) Nymphs and adults
5. Green leafhopper	(e) Mortality of seedlings

### D. Subjective Questions

1. Write down the name of common weeds found in a paddy nursery.
2. Describe the insect-pests and diseases that affect paddy plants.

## SESSION 3: PACKAGING AND TRANSPORTATION

### Selection of seedlings for transplanting

Seedling age during transplanting stage largely depends on season, variety and method of paddy cultivation. Usually, three to four-week old seedlings are transplanted during rainy season. Under unfavourable conditions, more than five-week old seedlings are also transplanted. Before transplanting, the roots of the seedlings need to be treated with the suspension of a bio-agent (*Pseudomonas fluorescens*) at 5 g/litre to withstand possible soil-borne fungal infections.



In case of short duration varieties, three to four-week old seedlings can be used. Seedlings aged five to six-week are also used for long duration varieties without much loss to the yield. As a general rule, seedlings at 4–5 leaf stage or 15–20 cm tall are suitable for transplanting.

### **Uprooting of seedlings**

It is a delicate operation in a paddy nursery. An unskilled person may damage the roots while uprooting the seedlings. It may cause poor establishment of the seedlings in the main field and may require gap filling. The seedlings must be pulled out gently only after ensuring enough moisture in the nursery. Take two to three seedlings between the thumb and index finger, positioning the thumb parallel to the seedlings and the index finger almost perpendicular. Apply low pressure downwards prior to pulling out the seedlings while holding them close to the ground or roots. Care must be taken while removing weed seedlings as they might get transplanted in the main field instead of paddy seedlings.



*Fig. 3.13: Uprooting of paddy seedlings*

### **Packaging and transportation of seedlings**

It must be ensured that there is minimum time lapse between uprooting of the seedlings from a nursery and transplanting them in the main field. For transportation, the seedlings must be picked up a day before or on the same day. The seedlings must be transported in a covered vehicle to avoid direct sunlight. They must be kept in a cool and shady place in the main field. During transportation, the leaves and roots of the seedlings must be kept moistened by sprinkling water at regular intervals.

Packaging protects the seedlings from transportation hazards, and injuries. Pack the seedlings carefully while transporting them to longer distances. The seedlings must be packed in a suitable material (see Table 3.2), ensuring their viability during transportation. Label the packed seedlings with necessary information like name of the seedlings' variety, name of the nursery from where they have been pulled out, age, etc.



## NOTES

### Packaging material

The packaging material must be easily available and affordable. It must be convenient to handle and adaptable for transportation. Besides, it needs to be ensured that the seedlings are protected against drying out and mechanical injury.

**Table 3.2: Common packaging material**

Hessian cloth	Made from quality jute fibre
Sacking cloth	Made from raw grade jute fibre
Plastic	Low and high density polyethylene
Paddy straw	For wrapping the earthen balls of the seedlings
Dried grass	For wrapping the earthen balls of the seedlings

### Practical Exercise

#### Activity

Demonstrate the packaging of paddy seedlings for transportation.

**Material required:** paddy seedlings, packaging material like hessian or sacking cloth, paddy straw, dried grass, etc.

#### Procedure

- Select a nursery site to collect paddy seedlings.
- Irrigate the nursery to maintain adequate moisture.
- Pull out the seedlings gently without damaging the roots.
- Now, wrap the seedlings with a suitable packaging material.
- Sprinkle water on the packaged bundles containing the seedlings.
- Label each package to identify the variety of the seedlings.
- Place the packages in a suitable container to maintain their viability during transportation.
- Perform all activities in a cool and shady environment.

### Check Your Progress

#### A. Fill in the Blanks

1. Generally, three to four-week old seedlings are transplanted during \_\_\_\_\_ season.
2. Five to six week old seedlings are often used for \_\_\_\_\_ duration varieties.
3. Packaging of seedlings protects them from various transportation \_\_\_\_\_.



4. Under unfavourable conditions, more than \_\_\_\_\_ week old seedlings are also transplanted.

**B. Multiple Choice Questions**

- In general, a seedling suitable for transplanting must be in \_\_\_\_\_ leaf stage and \_\_\_\_\_ in height.
  - 2–3 and 10–15 cm
  - 4–5 and 15–20 cm
  - 6–7 and 25–30 cm
  - 8–9 and 30–35 cm
- Paddy seedlings must be transported in a covered vehicle to avoid them from coming in contact with \_\_\_\_\_.
  - birds
  - diseases
  - insect-pests
  - direct sunlight
- Paddy seedlings need to be treated with a bio-agent (*Pseudomonas fluorescens*) at the rate of \_\_\_\_\_ g/litre.
  - 7
  - 5
  - 4
  - 3

**C. Match the Columns**

A	B
1. Bio-agent	(a) Sacking cloth
2. Packaging material	(b) Avoids transportation hazards
3. Packaging	(c) <i>Pseudomonas fluorescens</i>

**D. Subjective Questions**

- Describe the process of packaging and transportation of paddy seedlings.
- Write in brief on the following.
  - Age of seedlings for transplanting
  - Precautions to be taken while pulling out seedlings
  - Packaging material for seedlings

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