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Participant Handbook

Sector
Agriculture and Allied

Sub-Sector
Agriculture Crop Production

Occupation
Floriculture Farming

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Floriculturist (Open Cultivation)

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Shri Narendra Modi
Prime Minister of India

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for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **'Floriculturist-Open Cultivation'** QP No. **'AGR/Q0701 NSQF Level 4'**

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We are thankful to all organizations, subject matter experts and individuals who have helped us in preparation of this Participant Handbook. We also wish to extend our gratitude to all those who have reviewed the content and provided valuable inputs for improving quality, coherence and content presentation of chapters. This handbook will lead to successful roll out the skill development initiatives, helping our stakeholders particularly trainees, trainers and assessors.

It is expected that this publication would meet the complete requirements of QP/NOS based training delivery. We welcome the suggestions from users, industry experts and other stakeholders for any improvement in future.

About this book

This book is a knowledge and skill development source for participants who wish to build their career in Floriculture sector. As per Qualification Pack (QP), a 'Floriculturist (Open Cultivation)' will be responsible for carrying out the ground level activities involved in Floriculture Farming. He/She is a person who has to undertake various activities of flower cultivation involving preparatory work, cultivation and post harvest management. Primary responsibilities will be to perform the duties of flower crop cultivation in open fields. The job is to be performed in an efficient manner to allow the production of a high quality flowers, their harvesting and post harvest management towards getting higher returns. This handbook will facilitate the participant to enhance his/her knowledge under the guidance of the trainer in the following skills:

- **Knowledge and Understanding**: Adequate operational knowledge and understanding to perform the required task
- **Performance Criteria**: Gain the required skills through hands on training and perform the required operations within the specified standards
- **Professional Skills**: Ability to make operational decisions pertaining to the area of work.

The individual would be able to use learnt skills to turn into profitable venture. We hope that participants would be able to acquire knowledge and make this programme a success to the recommended standards.

Symbols Used


Key Learning Outcomes


Steps


Time


Tips


Notes


Unit Objectives


Exercise

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1. Introduction

Unit 1.1 - Overview of floriculture

Key Learning Outcomes

At the end of this module, you will be able to:

1. Explain about floriculture
2. Describe the role of floriculturist
3. Identify the flowers suitable for open cultivation.

UNIT 1.1: Overview of Floriculture

Unit Objectives

At the end of this unit, you will be able to:

1. Explain about floriculture
2. Describe the role of floriculturist
3. Identify the type of flowers which will be used for "Open Cultivation"

1.1.1 Overview of Floriculture

Floriculture, or flower farming, is a discipline of horticulture concerned with the cultivation of flowering and ornamental plants for gardens and for forestry, comprising the floral industry. The development, via plant breeding, of new varieties is a major occupation of floriculturists.

Though flower cultivation has been practiced in india since times immemorial; floriculture has blossomed into a viable business only in recent years. Considering the potential this sector has in generating income and employment opportunities, promoting greater involvement of women and enhancement of exports, it has been identified as an extreme focus area for exports by the govt. Of india.

India is known for growing traditional flowers such as jasmine, marigold, chrysanthemum, tuberose, and crossandra. Commercial cultivation of cut flowers such as rose, orchids, gladiolus, carnation, anthodium, gerbera and lilies has also become popular. The important flower growing states are tamil nadu, karnataka, andhra pradesh in the south, maharashtra in west, west bengal and north sikkim in the east and himachal pradesh, jammu & kashmir in the north.

Foliage plants are also sold in pots and hanging baskets for indoor and patio use, including larger specimens for office, hotel, and restaurant interiors.

1.1.2. Role of Floriculturist

As per the qualification pack, floriculturist is a person who has to undertake various activities of flower cultivation in open fields including pre-cultivation, cultivation and post harvest management of the produce.

The Prime responsibilities will be to perform the duties of flower crop cultivation in open fields. The proper care of crop involves preparing land and various other inputs essential for flower crop cultivation.

The job needs to be performed efficiently for the production of high quality flowers, and their care and management at harvest and post harvest stages for higher returns.

1.1.3. Types of Flowers for Open Cultivation

Floriculture products mainly consist of cut flowers, pot plants, cut foilage, seeds bulbs, tubers, rooted cuttings and dried flowers or leaves. The important floricultural crops in the international cut flower trade are rose, carnation, chrysanthemum, gladiolus, gypsophila, liastris, , orchids, archilea, anthurium, tulip, and lilies.

The open field crops are chrysanthemum, roses, gaillardia, lily marygold, aster, tuberose etc. Based on type of plant, the flower crops are:

a. Herbaceous: Lilium, verbena, viola, etc.

b. Shrubs: Bougainvillea, jasmine, lawsonia, rose, etc.

c. Trees: Gulmohar, palash, amaltas, kadamb, pride of India, etc.

d. Climbers and Creepers: Antigonon, rangoon creeper, madhulata, petrea, thunbergia, etc.

e. Mode of propagation:

i. Bulbous plants: Lily, narcissus, tuberose, tulip, etc.

ii. Rhizomatous plants: Iris, lotus, etc.

iii. Tuberous plants: Begonia, Dahlia (root tuber), etc.

Floriculture crops include bedding plants, houseplants, flowering garden and pot plants, cut cultivated greens, and cut flowers. As distinguished from nursery crops, floriculture crops are generally herbaceous. Bedding and garden plants consist of young flowering plants (annuals and perennials) and vegetable plants. They are grown in cell packs (in flats or trays), in pots, or in hanging baskets, usually inside a controlled environment, and sold largely for gardens and landscaping. Pelargonium ("geraniums"), Impatiens ("busy lizzies"), and Petunia are the best-selling bedding plants.

Cut flowers are usually sold in bunches or as bouquets with cut foliage. The production of cut flowers is specifically known as the cut flower industry. Farming flowers and foliage employs special aspects of floriculture, such as spacing, training and pruning plants for optimal flower harvest; and post-harvest treatment such as chemical treatments, storage, preservation and packaging. In Australia and the United States, some species are harvested from the wild for the cut flower market.

Exercise

Q.1. What is floriculture?

Q.2. Explain the role of floriculturist to work in open fields.

Q.3. Mention the traditional flower crops grown in India.

Notes

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2. Preparatory Cultivation of Flower Crops

Unit 2.1 - Soil and water testing
Unit 2.2 - Selection of right crops for cultivation
Unit 2.3 - Nursery preparation
Unit 2.4 - Land preparation
Unit 2.5 - Transplantation of seeding

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Key Learning Outcomes

At the end of this module, you will be able to:

1. Perform soil testing.
2. Perform market feasibility for the flower crops and identify the available resources.
3. Select pest resistant, stress tolerant and high yielding crop variety.
4. Undertake land preparation.
5. Undertake nursery preparation and management.
6. Undertake transplantation of seedlings.

UNIT 2.1: Soil and Water Testing

Unit Objectives

At the end of this unit, you will be able to:

1. Take soil and water sample
2. Perform pH and electrical conductivity tests
3. Amend soil as per the requirement

2.1.1 Soil and Water Testing

1. Collection of soil sample

Utilize a trowel to acquire a little measure of soil from 10 to 15 spots over the region you wish to test. For gardens, take soil from the upper 2 to 4 inches. For scene plants, take soil from the upper 6 to 8 inches. Space your examining locales everywhere throughout the range. Place little specimens in a can and blend the dirt with the trowel to guarantee that all dirt is very much mixed. pH is measure of acidity or akalinity of soil on a scale of 1 to 14 and 7 is the neutral status of pH. pH limitation affects the nutrient uptake status by plants. A soil pH test will tell whether your soil will produce good plant growth or whether it will need to be treated to adjust the pH level. For most plants, the optimum pH range is from 5.5 to 7.0- Some plants grow in more acid soil or may require a more alkaline level. Check the alkalinity or acidity of the soil by using homekit/digital PH meter or colour charts. The samples could also be sent to soil testing lab.

To correct the pH, use amendments like lime /dolomite to reduce soil acidity and gyspsum or sulphur to make soil less alkaline. The amount of these materials to change the pH will depend on the soil type. The greater the amount of organic matter or clay in a soil, the more lime or dolomite is required to change the pH.

2. Collection of water sample

Keep running the water for ten minutes. Gather 1 half quart of water in clean plastic jug and close with tight top. Do not try utilize cleanser or cleanser bottles since it is hard to expel all buildups.

Notes

UNIT 2.2: Selection of Right Crops for Cultivation

Unit Objectives

At the end of this unit, you will be able to:

1. Select the crop and its variety as per the soil type, water, climate and market availability.

2.2.1 Site and Crop Selection for Cultivation

Selection of site

Many factors are to be coincided in crop selection, a requisite that must be undertaken before actually starting a farming venture. Even without a predetermined location and site of a farm, the crop to be grown can be decided based mainly on its marketability and profitability.

However, there are many cases especially in countries with agriculture-based economy in which the farm lot is already available. It could have been acquired through inheritance, or by purchase, or otherwise transferred through other means. Whatsoever, crop and variety selection is the first consideration in starting or developing the farm. Right decision in the selection of crop or crops to be grown, particularly perennial types, will ultimately convert into a successful farming venture.

What kind of plants should be selected for desirable characteristics that can be maintained by propagation? Most cultivars have been in cultivation but a few are special selections from the wild. Popular ornamental garden plants like roses, camellias, daffodils, rhododendrons, and azaleas are cultivars produced by careful breeding and selection for flower color and form.

Similarly, the world's agricultural food crops are almost exclusively cultivars that have been selected for characteristics such as improved yield, flavor, and resistance to disease: very few wild plants are now used as food sources. Trees used in forestry are also special selections grown for their enhanced quality and yield of timber.

In addition to the purpose of farming, the major factors to be considered in crop selection include the following:

1. Prevailing Farm Conditions

An environmental scanning should first be conducted. This involves a thorough ocular inspection and other methods to obtain information on the biotic factor that can affect plant growth and yield, soil and climatic conditions prevailing in the area, and accessibility.

Here the guiding rule is: know your farm first then select the right crop.

The biotic factor refers to living organisms including ruminant animals, insect and other pests, disease pathogens and weeds, as well as organisms having beneficial effects as pollinators. Where there is prevalence of a disease in a locality, susceptible crops may be excluded or a resistant variety may be selected.

The topographic features of the land like elevation, slope, and terrain as well as the physical and chemical properties of the soil such as texture, color, organic matter content, pH and fertility levels will determine the crops that are naturally suited. Also, the various climatic factors, such as prevailing climate type, temperature, rainfall, relative humidity, incidence of light, and frequency of typhoons will limit the choice of crops. A stable supply of water within the farm will allow wide possibilities in crop selection.

In addition, the accessibility of the farm to and from the market will influence the choice of crops.

2. Crop or Varietal Adaptability

The crop(s) and the variety (ies) to be grown should be selected based on their adaptability to the prevailing conditions in the farm. A useful guide is to identify the crops growing in the farm and in the neighborhood. An interview of the neighboring farmers will also provide valuable information as to the probability of success, or failure, of growing certain preferred crops. Furthermore, it is an advantage to have access to lists of different crops under the various plant classification based on natural adaptation or habitat.

3. Marketability and Profitability

For those who want to ensure financial sustainability, crop selection must consider marketability and profitability. In general, this means that the crop to be selected must be high yielding with potential of high economic returns. The product, be it seed, flower or foliage or any part, must have an accessible, stable and robust market. With efficient labour and use of inputs, the harvest will realize profit to finance the succeeding farm activities or generate substantial return on investment. However, market and price are dictated by many factors such as the number of competitors, supply and demand, and development of new products, promotional campaign, and agribusiness cycle.

4. Resistance to Pests and Diseases

Regardless of the purpose of farming, it is important to be able to select a crop and variety with wide resistance to important pests and diseases. The use of susceptible varieties may result to high cost of production or, worst, total crop failure.

5. Available Technology

The technology for the growing of the crop must have been well established or easy to learn and apply. Likewise, certain crops are preferred because technical assistance is available locally.

Notes

UNIT 2.3: Nursery Preparation

Unit Objectives

At the end of this unit, you will be able to:

1. Explain about nursery and its preparation procedure
2. Prepare raised bed
3. Prepare tray/ poly bag bed to sow seed
4. Prepare cuttings for raising nursery

2.3.1 Nursery Preparation

Nursery is a place where seedlings, cuttings and grafts are raised with care before transplanting.

Advantage of Raising Seedlings in Nursery

- It is very convenient to look after the tender seedlings
- It is easy to protect the seedlings from pests and diseases
- Economy of land usage (duration in the main field is reduced)
- Valuable and very small seeds can be raised effectively without any wastage
- Uniform crop stand in the main field can be maintained by selecting healthy, uniform and vigorous seedlings in the nursery itself.

Preparation of Nursery

Selection of site:

The nursery site should be located in the nutrient rich/medium soil, near to water source, free from soil pathogens and insects, availability of cheap and skilled labors and has good access to the main road for easy transportation. The site should be on gently sloping area and away from other tall crops: this is important for good drainage as well as to encourage air circulation. An appropriate site must be selected for the most effective, efficient, and economical design of a nursery. The purpose and target of plants to be produced will decide the site selection and its improvement. Careful observation of site conditions and an assessment of past and present climatic records are important.

Following parameters need to be administered before preparation of nursery:

- The nursery area should be nearer to the water source. It should be in pollution free environment.
- Generally, the location should be partially shaded i.e. under the trees. If not, artificial shade is to be provided
- It should be well protected from animals
- Proper drainage facilities should be provided available.

Selection of Soil

A medium textured, loam (or) sand loam soil is preferred. Soil should be rich in organic matter. Soil depth should be preferably by 15-25 cm. Soil pH should vary from slight acidic to neutral side. It should be well aerated , fertilie and should have good water retention capacity.

Types of Nursery Bed

a) Flat bed b) Raised nursery bed

A. Preparation of raised nursery bed

Selected soil should be worked well to break the clods. Weeds, stones and stubbles should be removed. Height of the raised bed should be 10-15 cm with a width of 1m and length may be according to the requirement and conveniences. Two parts of fine red earth, one part of sand and one part of FYM can be incorporated to each bed to improve aeration and fertility of the soil. Before preparing the bed, the soil should be drenched wit 4 % formaldehyde or 0.3 % copper oxy chloride to kill the pathogenic spores in the soil.

Advantage of Raised Nursery Bed

- Water movement will be uniform and drainage of excess water is possible (In the case of flat bed, water moves from one end to the other and there is possibility of washing away of seeds).
- Germination percentage of seeds is normally high. Operations like weeding and plant protection measures are easy.

Inputs

- Nursery media, propagates, water, fertilizers, containers, chemicals, electricity, tools, equipment, machineries and labor are the major input this nursery.

A. Media for Propagating Nursery Plants

Several materials and combination of different materials are available as media for germinating seeds and rooting cuttings. A good propagating medium should possess the following characters.

- It must be firm and dense to hold the cuttings or seeds in place during rooting or germination.
- It must possess sufficient moisture retaining capacity.
- It must be sufficiently porous to permit excess water to drain away and to admit properaeration.
- It must be free from weed seeds, nematodes and pathogens.

The growth medium must be sufficiently firm to hold the seedling or propagates during rooting and supply food and water for the successful growth of young seedlings. Soil is a very common easily available and comparatively cheaper medium used in nursery. Sand is generally used in mother bed and vegetative plant propagation media. The other media used in nursery are peat soil, sphagnum mass, vermiculite, pearlite, leaf mold, saw dust, grain husk and Coco peat. Among them vermiculite is mostly used for cuttings while sphagnum mass is used for air layering. Generally, availability of all mineral nutrients is affected by the pH of the growing medium. In growing media such as organic soils, maximum availability occurs between 5.5 and 6.5 pH.

1. Soil Mixture

This is the most commonly employed medium for pot plants. It usually consists of red earth, well decomposed cattle manure, leaf mold, river sand and also charcoal in some cases. Soil mixture commonly used for propagation is:

- Red earth - 2 parts
- FYM - 1 part
- Sand - 1 part

2. Sand

It is the most satisfactory medium for rooting of cuttings.

3. Peat

It consists of the remains of aquatic marsh, bog or swamp vegetation which has been preserved under water in a partially decomposed state. When such peat is derived from sphagnum, hypnum or other mosses, it is known as peat moss. it is used in mixture after breaking them and moistened.

4. Sphagnum Moss

Commercial sphagnum moss is the dehydrated young residue or living portion of acid-bog plants in the genus Sphagnum such as *S. papilliosum, S. capillacem* and S. palustre. it is generally collected from the tree trunks of the forest species in south Indian hills above 1500m above mean sea level during rainy period. It is relatively sterile, light in weight and has a very high water-holding capacity. It is the commonly used medium in air layering.

5. Vermiculite

It is very light in weight and able to absorb large quantities of water. This can be used as a rooting medium for air layering and also in pots for raising certain plants.

B. Propagates: Seed, cutting, rootstock, scion, explains, etc.

C. Water and Fertilizers: water for irrigation and fertilizer for major and minor nutrient supply.

D. Chemicals: Pesticides, fungicide, herbicides and growth regulators.

Plant growth regulators are organic compounds other than plant nutrients used in minute quantities to improve or retard the plant growth. Eg. cytokinins for cell division, gibberlins for elongation of size, auxins for delayed flowering and ethylene for ripening.

The use of plant growth regulators (PGR) is crucial for commercial growers of ornamental plants as a part of cultural practice. One of the factors contributing to the efficacy of plant growth regulators is their method of application. Most popular methods of application of PGRs are foliar sprays, drenching and pre-plant soaking.

E. Container for propagation and growing young plants: Containers made up of polythene (bags, pots, and root trainers), clay (pots) or iron material. Polybags are the cheap containers, while root trainers are user friendly, easy to handle and transport.

1. Earthen pots

They are made of burnt porous clay in various sizes to provide requisite amount of soil and root space to different kinds and sizes of plants. They have straight sides and are made wider at the top than at the bottom to hold the greatest bulk of compost where the feeding roots are and also to facilitate easy removal of soil, intact with roots (ball of earth) at the time of planting or repotting. In our county, tube pots of varying sizes are used as follows.

Table: 2.3.1 Different earthen pot sizes:

Tools	Height (cm)	Diameter (cm)	Approx.Cost per pot (Rs.)
Tube pot	20	13	15.00
¼ size pot	18	22	15.00
½ size pot	20	27	30.00
¾ size pot	25	32	50.00
Full size pot	35	35	65.00
Tub size pots	35	50	90.00

2. Seed Pan and Seed Boxes

Seeds pans are shallow earthen pots about 10 cm high and 35 cm in diameter at the top. They have one large hole for drainage in the centre or 3 /4 holes at equidistant from each other. Seed boxes are made of wood, 40 cm wide and 60 cm long and 10 cm deep, with 6-8 properly spaced holes drilled in the bottom. Against each of the holes is placed a crock with its concave side down. Some large pieces of crock are put over it and also by the side of this crock, some coarse sand 2 or 3 handfuls are sprinkled on the crock pieces forming a thin layer to prevent fine soil from clogging the drainage.

Over this, required soil mixture is added. Very delicate kinds of seeds like Cineraria, Begonia, etc. are best sown in these containers.

3. Polythene Bags

Small polythene bags with holes punched in the bottom for drainage and filled with a porous rooting medium are used for propagation of cuttings like Jasmines, Duranta, Crotons etc. in the mist chamber. Sometimes, young seedlings which are raised in the nursery are subsequently transplanted in these polythene bags and kept there till they attain required growth for transplanting them to the main field.

4. Plastic Pots

Plastic pots, round and square are used to keep mostly indoor plants. They are reusable, light weight, non-porous and they require only little storage space.

F. Tools and implements for nursery work

Axes, crow bar, wheel barrows, boxes, plastic buckets, watering cans, wire cutters, digging forks, hammer, nails, hoes, hand pruning knives, budding knives, respiratory masks, sprayers, saws, scissors, secateurs, budding and grafting knives, budding and grafting tape, germination trays, khurpis, iron pan, spade, forks, etc.

Some of the tools are described as under:

1. Water Can: This is used for watering the nursery. Fine spray of water should be used for watering nursery of small sized seeds.

2. Digging Fork: This has prongs of 20 cm long fitted to a wooden handle. This is used for uprooting plants, rooted cuttings, harvesting of tubers etc., without damaging the root system or tubers.

3. Shovel: This is a curved steel plate attached to a wooden handle and used for transferring soil, manure etc.

4. Garden Rake: This is used for levelling lands and collecting weeds. The rake consists of a number of nail like projections from a crow bar provided with long handle.

5. Hand Trowel: This is used as a small tool for making holes for planting seedlings and small plants. This is also useful for removing surface weeds in nursery beds.

6. Secateurs: This is used for cutting small shoots to regulate shoot growth in fruit trees

7. Budding or Grafting knife: This knife is used for budding and grafting. This has two blades in which one is with ivory edge used for lifting the bark in budding operation.

G. Electricity

Electricity is required for operating power machineries and to provide control led environment in nursery.

H. Equipment and Machinery

The nursery operations like transporting, watering and sales depend on the vehicle and machineries and equipment in the nursery. Among them tractor with trolley, disc plough, water tanker are necessary. The nursery potting media filling and machine or automated container filling machines for nursery mixture preparation and filling, grafting machine facilitate the speedy operation of nursery in cost effective way.

I. Labour

Nursery is a labour intensive activity. Skilled and permanent labour engagement ensures quality seedling production and their maintenance in nursery.

Potting of Plants

Potting of plants is done to:

- Prepare plants for sale such as rooted cuttings of grapes
- Grow plants for decoration like crotons
- Grow plants for experimental studies like pot -culture studies
- Use plants as rootstocks in certain grafting methods as in Inarching of mango.

Pot mixture

- The pot mixture is prepared by using various ingredients. The proportion of pot mixtures will vary with different kinds of plants.
- An ideal pot mixture should have an open structure, which allows good drainage and holds sufficient moisture for plant growth and permits excess waster to drain away.
- It should supply adequate nutrient to the plants during all stages of growth
- It should be free from all harmful organisms and toxic minerals and
- It should be light in weight

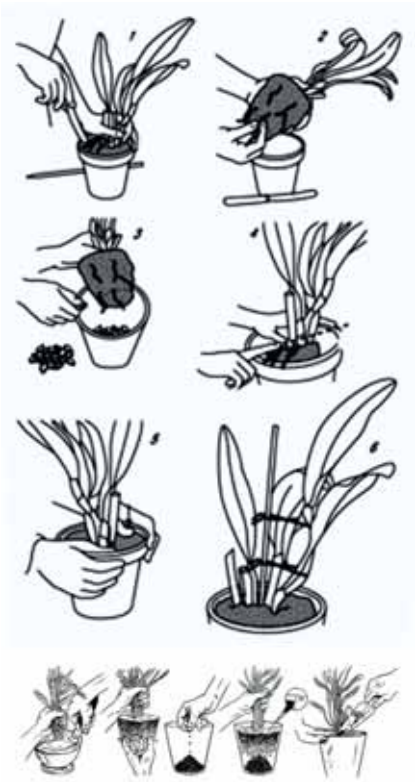

Fig 2.3.1 Potting of plants-repotting instructions

Potting Procedure

- Wet the seed bed before lifting plants. Take with a ball of earth with as much of the root system intact, as possible. Do not pullout seedlings in the hot sun. Do not allow roots or the soil around the roots to dry.
- Fill up pots by putting some crocks first, then a layer of sand (5-8 cm) and finally pot mixture (8-10 cm).
- Place the plant with the ball of earth in the centre upon the layer of pot mixture (Place on one side of pots in the case of root stock plants used in Inarching)
- Put pot mixture around the ball of earth, press as you fill up and level off, and leaving one inch head space at top. Do not press over the ball of earth. It will break and damage the roots.
- Set the stem of plant at the same height as it was in the seed bed
- Immerse pot with plant in a tub of water gently and keep inside water till air bubbles cease to come out. Remove and place the pot under shade of trees.

Repotting

- Repotting is done for changing the soil medium for pot bound plants.

Fig 2.3.2 Changing soil medium in the pot

Pot bound condition:

- When the potted plants are grown for more than one season or one year in pot, the root very soon become a tangled mass and exhaust all the nutrient in the limited soil, besides being circumscribed in the limited place. This stage is known as pot bound condition.

Repotting Procedure

- It is better to west the potted plant 24 hours earlier to facilitate repotting.
- The technique to remove the plant with intact ball of earth is to keep the right hand palm over the soil, allowing the stem of the plant in between the first fingers and turn the pot upside down holding the pot at the bottom with the left hand and gently knocking the rim of the pot on the edge of table or any other hard surface or even on the bottom edge of another inverted pot. The ball of earth comes out of the pot. If for any reason, it fails to come out, break the pot knocking the sides with a stone or fork and free the soil from it.
- Examine the roots, cut neatly with a secateurs, the decayed, dead and dried or twisted roots. Reduce the size of the ball of earth around the roots.
- Place the plant in the new pot at the same height at which it was in the old pot. Fill up pot with fresh pot mixture and immerse in water.

General

- The initial reaction after potting and repotting is wilting. The transpiration loss has to be checked to help plants revive. Hence keep freshly potted plants under shade and "pot water daily".
- After about ten days under shade, the plants should be gradually exposed to sun by keeping them for some hours under sun and then putting them under shade. The period of exposure can be increased every week until finally the plants can be kept in the open. This process is called "hardening".
- Time of sowing/initiation of propagules production depend on how long the seedlings will take to have an optimum size of a seedling (with good rooting and about 20cm tall) and coincidence of its ready availability at the time of initiation of monsoon (July for South West monsoon and October for North East monsoon areas).

The number of plants required to be produced from a nursery can be calculated as below:

- Number of plants required for the season = W
- Mortality in nursery = X
- Transportation/culling loss = Y
- Seedling required of buffer loss = Z
- Total seedlings required to be produced from the nursery = W + X + Y + Z

Notes

UNIT 2.4: Nursery Preparation

Unit Objectives

At the end of this unit, you will be able to:

1. Clean the field
2. Plough or dig the field
3. Level the field
4. Construct drains

2.4.1 Land Preparation

Land topography must be levelled enough for proper intercultural operations. Terracing is required in the hilly areas. pH of the soil determines the acidity or alkalinity levels of the soil where crop is to be planted. In general, slight acid to neutral pH soils are indicator of good soil for nutrient uptake by plants. In case of acid soils use lime while in saline/alkali soils, apply gypsum/sulphur at the recommended rates.

- Ensure to enrich the soil with good amount of organic matter for maintaining porosity, fertility and proper water retention and drainage capacity.
- Ensure that land site selected be free from water logging which might affect root growth.
- Ensure that land should be properly dug to break clods and removed unwanted plants and weeds.

Land/soil solarisation: Soil treatment should be commenced to decontaminate the soil/land from pests. Application of formalin and soil solarisation are two important soil treatments. Soil solarisation is the method of utilizing sun heat to destroy the pests. A properly levelled and worked soil is irrigated and then tightly covered with black poly sheet for 5-6 weeks to raise the temperature upto 47 degrees celsius. This high temperature will help in disinfecting the soil/land which can be used for raising healthy nursery or putting the soil in pots.

Land preparation for raised beds: In land preparation for raised beds, the soil is pulled over to height of 15-20 cm above the surface which result in automatic development of trenches for drainage. These raised beds are beneficial in rainy season. Fertilizers and manures are incorporated and fungicide treated seeds are sown to prevent soil borne diseases. A general spacing of 30-50 cm between two rows of the bed is left to facilitate intercultural operations.

Land preparation for flat beds: The land preparation for flatbed requires digging up the soil to fine tilth, addition of fertilizers and manures, seed treatment with pesticides (e.g.: thiram@ 3g/kg) and small irrigation channels. The usual width of bed is about 1m.

Economics of Nursery Development

Nursery is considered as a small entrepreneur activity. When this venture provides profit to the investors, then only it will be considered for practicing. The following fixed (Table 10) and variable costs associated with establishment of nursery and expected return (Table 12) by seedling production activity will be helpful to assess the cost benefit ratio of this activity.

Table 2.4.1 Fixed cost of development of nursery in one hectare area:

Particulars	Quantity	Rate (Rs.)/unit	Cost (Rs.)		
			Year I	Year II	Year III
Fencing	400 sq. m	600	240000	-	-
Work shed	20 sq. m	1100	22000	-	-
Mother plant block	6000 sq. m	5	30000	9000	6000
Irrigation with pipeline	10000 sq. m	13.5	135000	4000	3000
Office cum store	25 sq. m	1100	27500	-	-
Shade net house	400 sq. m	350	140000	-	-
Polyhouse	200 sq. m	600	120000	-	-
Polytunnel	100 sq. m	300	30000	-	-
Preparation of land, nursery beds, internal roads, pathways	2000 sq. m	20	40000	-	-
Water storage	1 unit	125000	125000	-	-
Nursery tools	required	-	15000	-	-
Root trainers, pots	10000 no	3	30000		
Propagation kit	required	-	3500	-	-
Electricity/generator	1 unit	27000	20000	-	-
Total			**978000**	**13000**	**9000**

Table 2.4.2 Variable cost of seedling production
(For 50000 seedlings and 15000 graft/cutting propagules)

Particulars	Required quantity	Rate (Rs.) / unit	Cost (Rs.)
Cost of poly bag	200 kg	150/kg	30000
Vermiculite/Sphagnum mass	200 kg	25/kg	5000
FYM, compost	10 trolley	800/trolley	8000
Soil	20 trolley	600/trolley	12000
Growth regulators	25 grams	600/5gram	3000
Bag filling labour charges	65000 bags	1/bag	65000
Cutting / grafting charges	15000 grafts	5/graft	75000
Watering, seedling maintenance cost	12 months	5000/month	60000
Electricity, water and protection cost	12 months	3000/month	36000
Total			**294000**

Table 2.4.3 Expected return from nursery per year

Particulars	Quantity and rate	Cost of return (Rs.)
Sale of seedlings	50000 nos, Rs. 5 each	250000
Sale of grafts/cuttings	15000 nos, Rs. 15 each	225000
Total		**475000**

Notes

UNIT 2.5: Transplantation of Seedling

Unit Objectives

At the end of this unit, you will be able to:

1. Transplant seedlings
2. Uproot the undesired plants
3. Fill the gaps
4. Perform mulching

2.5.1 Transplantation of Seedling

Transplanting Seedlings:
Transplanting is moving plant or seedling from the nursery and replanting it in another permanent location. Transplanting seedlings from nursery bed to open place or to another pot is very essential. As the plant grows, it needs more nutrient and space to proliferate. Transplanting appears to be easy task but inappropriate procedure and poor time selection could harm and may kill the seedlings. Planting of seedlings should only be commenced after hardening of the seedling, a process discussed in previous unit. In this unit we will learn important steps to be followed for transplanting of seedling in pot or in open land.

Tools required for transplanting: Spade, hoe for holes

Steps in Transplanting seedling:
Transplanting is done either in pots or in open fields. We have learned potting and repotting in our previous section.

1. For transfer in pot:

- Water the plants to be transplanted at least one hour prior to transplanting so as to facilitate in loosening the soil and easy removal
- While transplanting a seedling, wait till 2-3 leaf stage
- Get bigger size pot than the one that the plant is already in. Cover the drainage hole in the new pot with a piece of mesh or any strainer.
- In the absence of drainage hole, place 1 to 2 inches of gravel in the pot and fill with so much potting soil that root ball could be easily settled. Use potting soil carrying equal parts of sand, loam, and organic matter to improve the soil structure and aeration.
- Take out the plant by turning the pot upside down and gently tapping it. Take care that plant should be carefully taken out and transplanted in another pot.
- Water the plant properly and care should be taken to avoid overwatering of plants.
- Gradually expose the plant to sunlight daily increasing the time duration by one hour to avoid heat stress.
- In case wilting is observed, sprinkle water and may be covered with plastic wrap. Keep in shade and avoid direct sunlight.

2. Transplanting seedling in open area:
Ensure following points while transplanting the seedlings in open area:

- Selection of Site
- Land Preparation of the site
- Time of transplanting

Let us understand the above points in detail:

1. Similar to transplanting in pot, hardening of the seedlings is also essential before 2 weeks of transplanting them in open area with no fertilizer and lesser water applications
2. Site should be selected which is not very hard or too wet/swampy. Ensure that the selected area or site has sufficient sunlight as well shade
3. The land should be well prepared by proper digging through appropriate tools and sterilized or treated for any kind of soil borne insects pests through solarisation or using formalin as explained in previous unit. Mixing organic manure either as farm yard manure or compost will improve the soil structure and fertility of the soil.
4. Seedlings get ready for transplanting normally at 2-3 leaf stage.
5. Depending on good weather conditions, seedlings should be taken out during early morning or late afternoon to avoid heat stress. Ensure that seedlings come with their root ball.
6. Make small holes with available tools like hoe, spade or trowel in the selected land a for each seedling. Ensure the depth of holes so that the root balls of transplant can settle firmly. At least the size of the pot should be as big as that of seedling pot.
7. If the seedlings are in paper or peat pots, the upper few inches and sides may be removed and the pot may directly be put in the prepared hole. In other cases, gently remove the seedlings by slightly moistening it and putting the pot upside down cupping seedling with the help of your hands and loosening the root ball soil as done in case of transplanting in pots.
8. Put the seedlings in the prepared holes and cover them with the enriched soil with compost or organic manure. Ensure that plant should level with soil or may be little higher. Also root ball top should be in line with the top pf the prepared hole. In case of too deep holes, some inches of soil could be put into the hole before placing the seedlings.
9. Press the soil with hands around the transplanted seedling.
10. Water the transplanted seedlings to keep them moist and for better growth. After that, plant could be watered as per requirement. Ensure that soil should not get hard.
11. The transplanted area could be partially shaded in cases of hot and dry weather conditions.

Exercise

Q.1. Mention types of nursery beds.

Q.2. Explain soil solarization.

Q.3. List some plant growth regulators in flower crops and their mode of action.

Q.4. List important points for consideration at the time of transplanting.

Notes