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Agriculture Skill Council of India

Facilitator Guide



Sector
Agriculture

Sub-Sector
Agriculture Crop Production

Occupation
Floriculture Farming

Reference ID: **AGR/Q0701,**
Version 3.0 NSQF Level 4

Floriculturist



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Shri Narendra Modi
Prime Minister of India

“ Skilling is building a better India If We have to move India towards development then Skill Deveopment should be our mission ”

Acknowledgements

We are thankful to all organizations and individuals who have helped us in preparation of this facilitator guide. Our gratitude is also due to all organizations and individuals who have helped us in review of the content and provided valuable inputs for improving quality, coherence and content presentation. This facilitator guide will lead to successful roll out of the skill development initiatives, helping greatly 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 Guide

This Trainer guide is intended to empower the trainer/facilitator to prepare the participant to become 'Floriculturist' as per the Qualification Pack (QP). The objective of the guide is to provide an approach map for interacting with the trainees undergoing training on the job role. The aim of the course is to provide both theoretical and practical knowledge to the trainees, and also to guide them. The guide is neither a substitute nor complete road map, but an aid to help you to pass on the knowledge on all the aspects to the trainees in a systematic manner. It is expected that the trainer is fully conversant with all the contents of the handbook. The guide is just to indicate that how to proceed for covering a topic and includes some additional information that may be necessary for the trainer to develop better comprehension. Facilitator with the help of this guide will be able to build among participants

- **Knowledge and understanding:** Satisfactory operational learning and comprehension to play out the required chore
- **Performance Criteria:** Pick up the required aptitudes through hands on preparing and play out the required operations inside the predetermined measures
- **Professional Skills:** Capacity to settle on operational choices relating to the zone of work

The guide will also help them learn more by field visits and providing hands on training it is expected that irrespective of the region, knowledge on all aspects of poultry farm will be imparted to trainees.

Symbols Used



Notes



Objectives



Do



Ask



Explain



Elaborate



Field Visit



Exercise



Team Activity



Facilitation Notes



Learning Outcomes



Say



Resources



Activity

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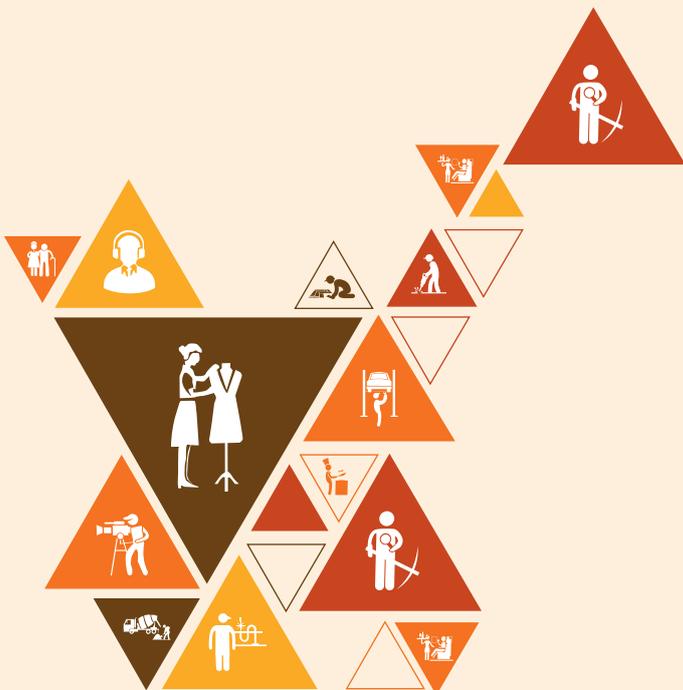
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1. Introduction

Unit 1.1 - Size and Scope of Agriculture Industry

Unit 1.2 - Role, Responsibility and Opportunities for Floriculturist



Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Discuss the job role of Floriculturist.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

1. Explain the size and scope of the agriculture industry and its sub sector.
2. Explain role and responsibility of a Floriculturist.
3. Identify various employment opportunities of a Floriculturist.

UNIT 1.1: Size and Scope of Agriculture Industry

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Explain size and scope of the agriculture industry and its sub sectors.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker, laptop, video films etc.
- Power points slides, pictures/posters e.g., which can illustrate the scope of agriculture.

Activity

Purpose: To acquaint the participants about size and scope of agriculture industry.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Stage presentation and group discussion on the chosen topic for about 15-20 minutes.

Make a group of 5 trainees. It is up to trainer and sitting arrangements that how he/ she would like to keep the trainees. Trainees should introduce themselves to each other and within a group. Trainer can call the individuals to the stage and particular participant has to introduce their team member like this way introduction session of each participants should begin. After this activity, stage is all set to start the session. Trainer has to show case video films on scope and importance of Agriculture industry and further wide scope of Floriculture sector.

Expected outcomes:

- Thorough understanding of the selected purpose
- Confidence building
- Group involvement

Say

- Thank you to everyone for their participation.
- Discuss with the participants to share their feelings about this exercise and what new things they have learned in this exercise.

Ask

- Ask the participants about their experience of working in agriculture field.
- Ask participants whether they have heard about Agricultural and Processed Food Products Export Development Authority (APEDA) or any other organization related to agriculture.

Explain

- Explain participants about need of floriculture in India.
- Explain various sectors of agriculture in power point presentation.

Elaborate

- Elaborate the potential and how one can generate foreign exchange through floriculture in India after showing video film.

Activity

This is pen and paper activity is for preparing trainees to apply for various job platforms in a professional manner. Plan this activity for at least 20-30 minutes.

Ask participants to prepare a short CV indicating name, educational details, academic achievements, work experience (if any), extra-curricular activities, hobbies and address details like email id, phone number.

Aware them about various placement portal where after skilling they can post their resume to seek employment opportunities.

Notes for Facilitation

- Help the participants to complete all the tasks involved in the participant hand book.
- Motivate the participants by involving them in sense of participation and realization of the importance of their work as a Floriculturist.
- Tell them their important role for the farming community of the country and they will be service provider of a sector which is important to a country's economy, social and cultural well-being.
- You can end the session asking participants to take the following pledge:
- "We will work hard and ensure every work done is well performed. We will do our best to protect and keep the produce safe in the workplace like a banking institution keep the money. We will devote our life for the betterment of farming community"

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Around 65% of the population is working & depends on agriculture and allied activities. Nearly 70% of the rural population earns its livelihood from agriculture and other occupations allied to agriculture. In cities also, a considerable part of the labour force is engaged in jobs depending on processing & marketing of agricultural products. India is blessed with varied and dynamic agro-climatic conditions, good quality soil and water made suitable for floriculture. Winter is very mild and hence there is a lot of scope to export Indian flowers to temperate countries during the winter season, when the demand is in peak because of important winter festivals like Christmas, New Year Day and Valentine's Day. Floriculture products possess 25-30 times more foreign exchange earning ability than cereals or any other agricultural/horticultural products. Floriculture is capable of attracting and retaining a large number of progressive farmers / entrepreneurs.

2. Crops grown in different zones of India

Sr. No.	Zone	Flower crops
1	Area around Delhi, uP and Punjab	Rose, Carnation, Chrysanthemum, Gladiolus
2	Area around Bengaluru	Rose, Carnation, Chrysanthemum, Ornamental Foliage Plants and seeds
3	Area around Trivendrum	Orchids, Anthurium and Foliage Plants
4	Area around Pune / Nashik	Rose, Carnation, Gladiolus, Dahlia, Chrysanthemum, Aster and Tuberose
5	North Eastern region including Sikkim	Orchids, Gladiolus, Liliiums, Gerbera, Salvia, Anthurium and other Foliage Plants
6	Area around Kolkata	Lotus, Tuberose, Jasmine, Chrysanthemum and Dahlia.
7	Area around Srinagar	Gladiolus, Lilies Carnation and Rose
8	Area around Solan, H.P.	Gladiolus, Other Bulbous Plants and seeds
9	Area around Coimbatore including Nilgiris	Jasmine, Tuberose, Chrysanthemum, Rose, Carnation and Orchids

3. Subsectors of agriculture are field crop cultivation, plantation crop cultivation, bee keeping, poultry farming, dairy farm management, farm machinery, equipment and manufacturing, research and development.

B. State whether True/False (T/F)

1. False
2. False
3. True

C. Fill in the Blanks

1. 25-30
2. Singapore

D. Multiple Choice Questions

1. a) 8-10 %
2. a) New Delhi

UNIT 1.2: Role, Responsibility and Opportunities for Floriculturist

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Discuss role and responsibility of a Floriculturist.
2. Identify various employment opportunities of a Floriculturist.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Slides in power point presentation/ videos showing relevant visuals of various operation performed by floriculturist.

Activity

Purpose: To acquaint the participants about responsibilities of Floriculturist.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Debate competition for about 15-20 minutes.

Prepare the participants for performing healthy debate competition make a group of 5-6 participants. You can ask them to prepare power point presentation for their groups. Trainer has to narrate the need of this job role and what activities or responsibilities can be taken by Floriculturist. Trainer has to ensure the participation of each trainee in the discussion and put their ideas and interest on their interests and challenges in this field.

Expected outcomes:

- Group activity and team building
- Knowledge enhancement and focus building on the role of Floriculturist

Say

- Thank you to everyone for their participation.
- Describe the objective of above activity.

Ask

- Ask the participants if they have any experience of working in floriculture.
- Ask participants whether they know any role of Floriculturist.

Explain



- Introduce participants to the basic necessity of floriculture and various roles related to it.
- Explain employment opportunities in floriculture round-the-year.

Elaborate



- Elaborate different operations performed by Floriculturist.

Activity



This is a recall activity based on participatory approach for comparing pre and post Covid effects on agriculture. This activity may be planned for 15-20 minutes.

Ask participants about their experience of lockdown. Ask participants to discuss about the changes in floriculture in lockdown and during COVID-19 period.

Notes for Facilitation



- Help the participants to complete all the tasks or activities given in the participant hand book.
- Assist all the groups to systematically arrange collected information and analyse them when required.
- Where possible, display specific work of groups within the classroom.
- Make two groups within the batch and ask to demonstrate a debate on various opportunities in the field of floriculture.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Responsibility of floriculturist involves maintenance and care of the plant, design and maintenance of the greenhouse, preparing media and various other inputs essential for flower crop cultivation.

The job is to be performed in an efficient manner to allow the production of high quality flowers, their harvesting and post-harvest management towards getting higher returns.

2. Planting, prune, water, fertilize, harvest and ship these plants as well as monitor. Manipulate the environment under which they are grown both indoors in green houses and outdoors production where the climate is favourable.
3. One can set up a business on their own, growing flowers for the domestic or export of growing ornamental plants, running nurseries, or providing gardening and landscaping advisory services.

The employment opportunities in such fields are as enormous as the nature of work itself. One can join the field of floriculture as farm/ estate managers, plantation experts and supervisors, project coordinators etc. Research and teaching are some other avenues of employment in the field. Marketing of floriculture products for different ventures is emerging as a potential segment of this field. Professional qualification combined with an inclination towards gardening and such other activities produces efficient floriculturist and landscaping professionals.

B. State whether True/False (T/F)

1. False
2. False
3. True

C. Fill in the Blanks

1. Horticulture
2. Marketing
3. Value addition

D. Multiple Choice Questions

1. d) All of the above
2. a) Landscape design



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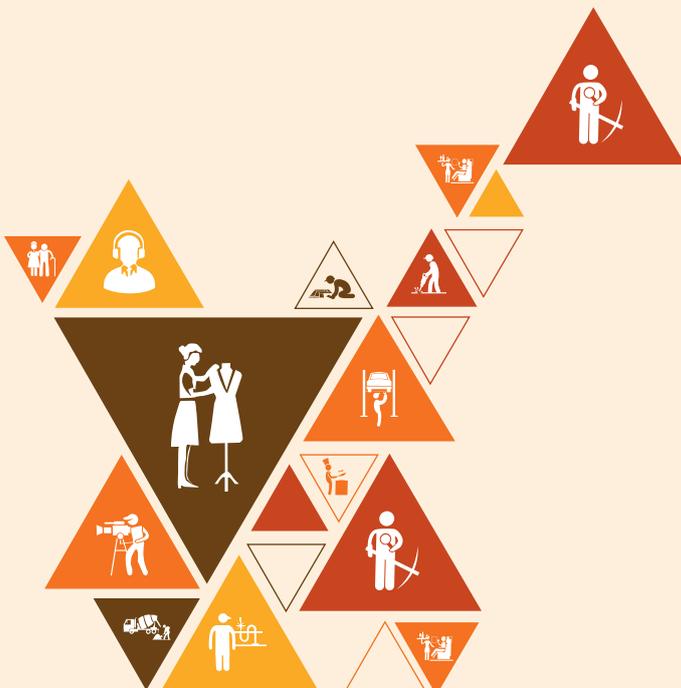
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2. Process for Preparing for the Cultivation of Flower Crop

Unit 2.1 - Criteria for Site Selection and Input Requirements and
Soil Management

Unit 2.2 - Varieties, Planting Material and Storage

Unit 2.3 - Creation of drains in field and Fences management



AGR/N0701

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Describe the process of selecting the site and flower varieties to be grown.
2. Describe the process of arranging the required resources.
3. Demonstrate the process of preparing the field for flower cultivation.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the criteria for selecting a site for flower cultivation such as the recommended temperature, atmospheric humidity, and various limiting factors such as strong winds and hailstorms. 2. List various inputs required for flower cultivation. 3. Explain the soil requirements for growing different types of flowers. 4. Explain the criteria for selecting the relevant varieties of flower crop to be grown such as the climatic conditions, soil type, market demand and profitability. 5. Describe the process of procuring planting material and storing it appropriately. 6. Explain the importance of getting the soil tested through an approved lab to identify its treatment requirements. 7. Explain various treatments to be applied to the soil to improve its fertility, and adjust the pH, alkalinity and salinity levels. 8. Explain the importance of mixing sand and farmyard manure in the soil. 9. Explain the importance of creating drains in the field for the effective drainage of water. 10. Explain the importance of erecting fences around the field to protect it from animals. 	<ol style="list-style-type: none"> 1. Demonstrate the process of applying the appropriate treatment to the soil as per the lab's recommendation. 2. Demonstrate how to remove all roots, debris, and waste materials from the field. 3. Demonstrate how to till the field to the required depth using the relevant farm machinery and mix sand in the soil in the prescribed quantity. 4. Show how to level the field appropriately. 5. Demonstrate the process of carrying out soil fumigation to prevent the growth of soil-borne pathogens. 6. Demonstrate the process of preparing ridges and furrows of the recommended dimensions and applying the recommended fertilisers to them. 7. Demonstrate the process of preparing sunken, level or raised nursery beds according to the requirement for raising saplings. 8. Demonstrate the process of installing the irrigation or fertigation system in the field. 9. Show how to create drains in the field for the effective drainage of water. 10. Show how to erect fences around the field to protect it from animals.

UNIT 2.1: Site Selection, Input Requirements and Soil Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate how to remove all roots, debris, and waste materials from the field.
2. Demonstrate how to till the field to the required depth using the relevant farm machineries and mix sand in the soil in the prescribed quantity.
3. Show how to level the field appropriately.
4. Demonstrate the process of carrying out soil fumigation to prevent the growth of soil-borne pathogens.
5. Demonstrate the process of installing the irrigation or fertigation system in the field.
6. Demonstrate the process of applying the appropriate treatment to the soil as per the lab's recommendation.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which can show the various inputs required for cultivation.
- Tractor, Leveller, Soil Sampling Equipment, Soil Testing Instruments, Spade.

Team Activity

Purpose: To acquaint the participants about the site selection and input requirement for crop field.

Resources: Visit to flower crop field or nursery. If possible do select the flower crop in our list of Elective modules.

Methodology: Take participants to the nearby flower nursery which grows popular flowers species to understand entire transaction on field preparation. Plan this activity for at least 60 minutes.

Expected outcomes:

- utilization of different inputs required for flower cultivation.
- understand process of field preparation.

Say

- Thank you to everyone for their participation.
- Discuss different steps in field preparation to make it ready for plantation.

Ask 

- Ask the participants if they have experience of installing irrigation system.
- Ask participants about importance of soil fumigation.

Explain 

- Explain procedure of different soil treatment to prevent growth of soil-borne pathogen.
- Explain participants about preparation of different nursery beds.

Elaborate 

- Elaborate relevant farm machineries used in tillage operation.
- Elaborate any soil testing report and discuss lab's recommendation for the selected crop.

Activity 

- This pen and paper activity is for preparing participants to learn about process of carrying out soil fumigation. Plan this activity for at least 20-30 minutes.
- Ask the participants to find out various soil treatment followed in flower crops after that prepare a flow chart on steps involved in soil fumigation for growing healthy seedlings of flower crops.

Notes for Facilitation 

- Help the participants to complete all the tasks involved in the participant hand book.
- Discuss with them regarding the points mentioned in the text box regarding site selection.
- Motivate the participants by involving them in sense of participation and realization of the importance of their work as a floriculturist.
- With the help of available videos on Youtube showcase the participants "How to level the field? "

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Physical properties of soil

- Soil colour -
Soil surfaces, generally, show black, yellow, red and grey hues. Soil colour is an indicator of organic matter content, soil fertility, soil reaction, drainage, aeration and the ecosystem living beneath it.
- Soil texture -
It refers to the size of soil particles that make the soil. Soil, according to the particle size can be classified as sand, silt, loam and clay. Loamy and clayey soils have good water-holding capacity and are more suitable for the cultivation of flower crops.
- Porosity -
The quantity and size of pores show porosity of the soil. Soil having more or large pores is called 'porous soil'. Such soils have good drainage and aeration.
- Soil temperature -
It is regulated by the Sun and it helps in the decomposition process within the soil. Microorganisms of the soil are very active at a range of 27 0C to 32 0C.

2. Inputs required for flower cultivation

Consumable Inputs

As we stated before, consumable inputs are the types of inputs that will be consumed naturally by the crops. Consumable inputs are the most basic yet necessary aids. The most commonly used consumable inputs are:

Planting material - High-quality seeds, seedlings

- Soil
- Fertilizers
- Insecticides
- Pesticides
- Insect Traps
- Mulch
- Water

Capital Inputs

Capital inputs are inputs that are often mechanical and more technologically advanced. These inputs cannot be consumed by the crops themselves.

- Nylon netting
- Stakes
- Tractors
- Plows
- Irrigation systems

3. Chemical properties of soil

Chemical Properties

These properties govern soil fertility. It is related with the ability of the soil to supply nutrients to plants.

- **Soil pH**
Slightly acidic soils are more suitable for plant growth. Maximum plant nutrients are available to the crops, when the pH ranges from 6.5 to 7.0. The pH of soil can be measured by soil pH meter, pH scale, etc. pH scale has a range from 0–14pH. Soils with minimum pH are more acidic. Similarly, as the pH increases above 7, alkaline reaction of the soil increases with the concentration of OH-ion. Such soil is called alkaline soil.
- **Cation exchange capacity**
Cation Exchange Capacity is a measure of the quantity of cations that can be absorbed and held by a soil. Highly fertile soils, containing high organic matter have more cation exchange capacity. Soil fertility increases with increase in cation exchange capacity.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. 2 7 °C to 32 °C
2. Porosity
3. Capital inputs

D. Multiple Choice Questions

1. d) Soil pH
2. d) Both a and b

UNIT 2.2: Varieties, Planting Material and Storage

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of preparing ridges and furrows of the recommended dimensions and applying the recommended fertilisers to them.
2. Demonstrate the process of preparing sunken, level or raised nursery beds according to the requirement for raising saplings.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Slides in power point presentation/ videos showing relevant visuals of various operation performed by floriculturist.

Activity

Purpose: To acquaint the participants about preparation of various nursery bed.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Identification and group discussion for about 15-20 minutes.

Display the photos of various nursery bed viz., raised bed, flat bed, and nursery bed. Ask the participants identify beds and list down the observations. Make the participants aware about the variation in bed preparation and its linkage between growth of crop. It is important to introduce participants, "How ridge & furrows planting pattern optimizes canopy structure and enhances micro environment for the sapling? "

Expected outcomes:

- Knowledge enhancement of bed preparation for quality growth of seedlings.

Say

- Thank you to everyone for their participation.
- Discuss about different fertilizers used in plant propagation.

Ask 

- Ask the participants whether they understood the ridges and furrow method.
- Ask participants to identify suitable nursery bed for raising seedling.

Explain 

- Explain participants how to plan dimensions of nursery bed ?

Elaborate 

- Elaborate the process of preparation of different nursery bed and ridges and furrow.

Activity 

- This is a self-learning activity to enhance the knowledge on nursery bed for flower crop.
- Let the participants read about nursery bed and its importance for crop growth.
- After that participants can discuss together about it.

Notes for Facilitation 

- Help the participants to all the exercises mentioned in the participants handbook.
- Make every participant aware about the advantages and limitations of all the methods used for preparation of nursery beds.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Criteria for selecting varieties in flower cultivation

- Yield
- The variety should have the potential to produce crops at the same or better yield and quality to those already grown. It should be noted that harvested yield may be much less than potential yield depending on markets and quality factors.
- Days to Harvest/Maturity
- Choose varieties that are based on days to harvest. Earliness is a major selection factor especially in shorter season areas of the region.
- Disease and Insect Resistance
- The most economical and effective means of pest management is through the use of varieties that are resistant or tolerant to diseases including those caused by fungi, bacteria, viruses, or nematodes.
- Resistance to Adverse Environmental Conditions
- Choose varieties that are resistant to environmental conditions that are likely to be encountered. This includes heat or cold tolerance
- Adaptability
- Successful varieties must perform well under the range of environmental conditions and production practices usually encountered on the individual farm.
- Plant Characteristics
- Plant characteristics that may be considered in variety selection include plant form such as bush, upright, or vining; plant height; plant size; and ease of harvest.
- Market Acceptability
- The harvested plant product must have characteristics desired by both the grower and the buyer.

2. Steps in soil sampling

- Selecting sampling spot
- Remove the surface litter at the sampling spot
- Make a 'V' shaped cut to a depth of 15 cm in the sampling spot
- Drive the auger to a plough depth of 15 cm and draw the soil sample
- Collect soils using khurpi
- Mix the samples thoroughly
- Remove foreign materials like roots, stones, pebbles and gravels
- Quartering is done by dividing the thoroughly mixed sample into four equal parts
- Two opposite quarters are discarded and the remaining is mixed
- Collect the sample in a clean cloth or polythene bag
- Label with required information

3. Pests and pathogens can make their way into a nursery by riding aboard incoming plant material. To avoid bringing in unwanted problems, nurseries should practice due diligence when they procure plant material.

Generally, the risk associated with bringing in a new pest is proportional to the number of incoming shipments and the volume of material. Certain plant genera are

also more prone to infection or contamination by specific pests and pathogens. To reduce these risks, some growers are propagating more plants on site and greatly limiting new introductions to their facilities.

B. State whether True/False (T/F)

1. True
2. True
3. True

C. Fill in the Blanks

1. Soil sampling
2. Soil sampling

D. Multiple Choice Questions

1. a) 15 cm
2. b) V shape

UNIT 2.3: Drainage and Fence Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Show how to create drains in the field for the effective drainage of water.
2. Show how to erect fences around the field to protect it from animals.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which can illustrate the effective drainage methods in the field and fences to protect the crop.

Activity

Purpose: To acquaint the participants about the importance of drainage system in crop field.

Resources: Projector, system facilitating power point presentations, microphone, camera and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 15-20 minutes.

Prepare the participants for group discussion make a group of 4-5 participants. Make them aware about the types of drainage systems and how to understand the optimum irrigation conditions in the field and proper drainage by eye judgements.

Expected outcomes:

- Efficient ways of drainage in field to avoid waterlogged condition.
- understanding about the surface and sub- surface drainage systems.

Say

- Thank you to everyone for their participation.
- Discuss about the drainage creation.
- To collect pictures of their current fencing patterns of field.

Ask

- Ask the participants about efficient ways for drainage in field.
- Ask them to draw the sketch of subsurface drainage system and Narrow ditches.
- Ask participants about, "How their current fencing patterns are helping them and what challenges are occurred? "

Explain 

- Explain different types of drainage to avoid waterlogged condition in field.
- Explain types of drainage and their relevance to the utility, soil and crop.

Elaborate 

- Elaborate how to identify waterlogged field and its effect on plant growth.
- Elaborate the how drainage influence crop uptake of soil mineral.

Activity 

This is a self-learning activity to enhance knowledge on fencing. Let the participants read about various types of fences used in agriculture field and identify animals that cause more loss to crop field in their surrounding region. Find out which type of fencing is more affordable.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Importance of creating drains in the field for the effective drainage of water
 - Improved crop yield and quality
 - Improved environment for soil organisms
 - Better access to water and oxygen for plant roots
 - Better crop uptake of soil mineral nitrogen
 - Less structural damage to soils
 - Better water infiltration
 - Reduced surface run-off and erosion
 - Reduced phosphorus and pesticide losses to water
 - Decreased potential for slug activity and reproduction
2. Solar fencing system is a conventional fencing system to protect crops at agricultural land & property. It acts as a physical barrier for animals, thieves, and other unusual elements. When any living object comes in contact with the fencing wire, it experiences a sharp, short yet a safe electric shock. It doesn't harm the animal but protects your farm effectively without using electric power.
3. Advantages of electric fencing
 - Low cost as compare to wood, or vinyl wire fencing,
 - Lower maintenance cost
 - Flexible
 - Durable
 - Portable
 - More effective as generates high voltage shock
 - Easy to install
 - Easy to operate

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. Bio-fencing
2. Wire fence

D. Multiple Choice Questions

1. d) Bio-fencing
2. b) Protects nature



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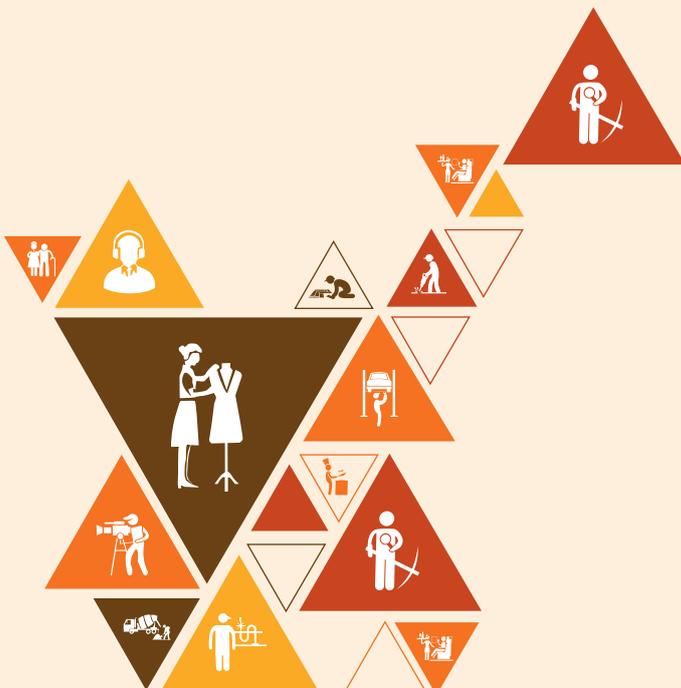
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3. Process of Propagating Flower Plant Saplings

Unit 3.1 - Seedbed Preparation and
Fertilizer Management

Unit 3.2 - Propagation Methods and
use of Pesticides and Insecticides



AGR/N0718

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Demonstrate the process of propagating saplings through seeds.
2. Demonstrate the process of propagating saplings through the cutting method, division method, layering and budding method.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the importance and process of preparing the seedbed according to the local conditions. 2. Explain the importance of using treated soil for raising saplings. 3. Explain the importance of sowing seeds in the seedbed, polybags and containers at the recommended depth. 4. State the recommended quantity of water and organic or inorganic fertilisers to be applied to the sown seeds. 5. State the recommended period for maintaining saplings in the seedbed, polybags or containers before being harvested. 6. Explain the importance and process of acclimatizing saplings before transplanting them. 7. Explain the importance and process of extracting cuttings from a healthy plant and using them to propagate saplings. 8. Explain the importance of maintaining the required level of moisture and sunlight exposure for propagating saplings. 9. Explain the criteria for selecting a plant for extracting cuttings or roots. 10. Explain different ways of layering to propagate plants such as stem layering, tip layering and trunk layering. 11. State the approved pesticides and insecticides to be used on saplings to protect them from pests and diseases. 	<ol style="list-style-type: none"> 1. Demonstrate how to sort out the poor-quality or damaged seeds. 2. Demonstrate the process of carrying out the pre-sowing treatment of seeds. 3. Demonstrate the process of preparing the seedbed according to the local conditions. 4. Show how to fill in the polybags and containers with the recommended quantity of treated soil. 5. Demonstrate the process of sowing seeds in the seedbed, poly bags and containers at the recommended depth. 6. Demonstrate the process of applying the recommended quantity of water and organic or inorganic fertilisers on the sown seeds. 7. Demonstrate how to harvest and acclimatise the saplings before transplanting. 8. Show how to extract stems of the recommended specifications from the plant. 9. Demonstrate how to use rooting mixtures and plant growth hormones in appropriate quantities. 10. Show how to create root divisions from the plant's root. 11. Demonstrate the process of using the root divisions to propagate plants maintaining the recommended conditions. 12. Demonstrate the process of applying the recommended quantity of water and fertilisers to support the growth of roots. 13. Demonstrate the process of preparing the rootstock for budding. 14. Show how to cut a bud-stick from a healthy and disease-free plant with the required characteristics. 15. Demonstrate the process of preparing and using bud-scion to propagate plants. 16. Demonstrate the process of applying the approved pesticides and insecticides to protect the saplings from pests and diseases.

UNIT 3.1 Seedbed Preparation and Fertilizer Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate how to sort out the poor-quality or damaged seeds.
2. Demonstrate the process of carrying out the pre-sowing treatment of seeds.
3. Demonstrate the process of preparing the seedbed according to the local conditions.
4. Show how to fill in the polybags and containers with the recommended quantity of treated soil.
5. Demonstrate the process of sowing seeds in the seedbed, poly bags and containers at the recommended depth.
6. Demonstrate the process of applying the recommended quantity of water and organic or inorganic fertilisers on the sown seeds.
7. Demonstrate how to harvest and acclimatise the saplings before transplanting.
8. Demonstrate the process of applying the recommended quantity of water and fertilisers to support the growth of roots.

Resources to be used

Available objects such as participant's handbook, white board, duster, marker etc.
Power points slides, pictures/posters e.g., showing relevant pictures of methods of fertilizer application.

Activity

Purpose: To acquaint the participants about application of water and fertilizers on the sown seeds.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion, you tube videos on selected activity.

Methodology: Stage presentation and group discussion for about 20-25 minutes. Rest of the activities can be planned throughout the day.

Prepare two groups of participants and perform a healthy debate competition on different types of organic and inorganic fertilizers available in market. Take revision on the different pre-sowing treatments of seeds and identification of seed quality through a group discussion. Show some videos to participants about application of water and fertilizer to sown seeds. Do ask them find out right or scientific methods for fertilizer application and how to tackle the risk of any emergency situation. Photo album on various containers & polybags can be prepared by visiting various nearby nurseries; Seedbed structures and capacity at those nurseries can also be recorded in terms of number of raised seedlings and recommended depths. Arrange a group discussion on the risk of fertilizer applications. You act as a moderator and drive the discussion to achieve set outcome. Then try to align the thoughts and discuss the both sides of coin.

Expected outcomes:

- Awareness about different types of fertilizers available in market.
- Importance of applying appropriate quantity and time of water and fertilizer.
- Nursery seedbed preparation and crop wise seedling raising capacity and cost effectiveness
- Seed treatment methods for commonly grown crops in your area.
- understand crucial handling of seedlings while transplanting from Nursery.

Say

- Thank you everyone for their participation.
- Discuss with the participants to share their feelings about this exercise and what new things they have learned in this exercise.

Ask

- Ask the participants how to acclimatise the transplanting process before and after watering and fertigation.
- Ask the participants about various pre sowing treatment carried out at their fields for their respective crops.

Explain

- Explain the process of soil treatment and further polybag/container filling as well seedbed preparation.

Elaborate

- Elaborate importance of pre-sowing treatment of seeds for growing healthy sapling and its impact on yield.
- Elaborate recommended doses for inorganic/organic fertilizers and quantity of water and their impact on root strengthening.

Activity for participants

Ask participants sowing seeds in the seedbed, poly bags and containers at the recommended depth.

- This is a self-learning activity to enhance knowledge on sowing depth.
- Ask participants to prepare a chart regarding sowing depth of various flower crops. Content can be retrieved from Research Gate, Google scholar etc. after that participants can discuss together about sowing depth.
- Ask participants to collect poor and pure quality seed for any crop available in their field.

Notes for Facilitation

- Help the participants to complete all the tasks involved in the participant hand book.
- Discuss with them regarding the points mentioned in the text box regarding seed bed preparation, sowing, water and fertilizer application.
- Encourage participant for group discussion to ask question so that they can clear their doubts (if any) on future job role.
- Guide participants to sort pure seeds correctly and achieve maximum germination and healthy saplings.

Exercise

Key Solutions o PHB Exercise

A. Short Questions

1. Importance of soil treatment

- Soil solarization capable of controlling verticilium wilt, some fusarium wilts, clubroot, southern blight, root rots, and other diseases. Although it won't control nematodes completely, it does reduce infestations.
- In combination with other methods, soil solarization allows shallow-rooted crops to be grown in nematode-infested soil.
- It also kills many kinds of weeds and weed seeds, especially those of weedy grasses.
- Plants often grow better in solarized soil, even when no pests were known to be present.
- Solarization seems to make nutrients temporarily more available, and it may also allow greater proliferation of some helpful soil organisms.

2. Preparation of raised bed

- It is especially useful for raising seedlings during rainy season when stagnation of water becomes problematic and causes damping off disease.
- Raised bed of 10 to 15 cm height from ground level is prepared.
- All the stumps, stones, pebbles, weeds etc. are removed from the bed and FYM at the rate of 10kg per square meter is mixed in the soil.
- In between two rows, a space of 45 to 60cm is left so as to carry out cultural practices easily. The seeds are sown in lines in the bed.

3. Broadcasting method of seed sowing

- Broadcasting is the process of random scattering of seed on the surface of seedbeds.
- It can be done manually or mechanically both.
- When broadcasting is done manually, uniformity of seed depends upon skill of the man.
- Soon after broadcasting the seeds are covered by planking or some other devices.
- usually higher seed rate is obtained in this system.
- Mechanical broadcasters are used for large-scale work.
- This machine scatters the seeds on the surface of the seedbed at controlled rates.

B. State whether true or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Soil solarization
2. Spring-summer season

D. Multiple Choice Questions

1. a) 2-4 weeks
2. a) Lush vegetation

UNIT 3.2: Propagation Methods and use of Pesticides and Insecticides

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Show how to extract stems of the recommended specifications from the plant.
2. Demonstrate how to use rooting mixtures and plant growth hormones in appropriate quantities.
3. Show how to create root divisions from the plant's root.
4. Demonstrate the process of using the root divisions to propagate plants maintaining the recommended conditions.
5. Demonstrate the process of preparing the rootstock for budding.
6. Show how to cut a bud-stick from a healthy and disease-free plant with the required characteristics.
7. Demonstrate the process of preparing and using bud-scion to propagate plants.
8. Demonstrate the process of applying the approved pesticides and insecticides to protect the saplings from pests and diseases.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of the process of preparing and using bud-scion to propagate plants, videos on growth hormone application.

Activity

Purpose: To acquaint the participants about the process of preparing and using bud-scion to propagate plants and usage of plant growth regulators.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion, Visuals on different Grafting methods, Videos on Root mixture & Hormone application.

Methodology: Plan group discussion for about 15-20 minutes. Rest of the activities can be planned throughout the day.

Prepare 4 to 5 groups of participants and perform a group discussion activity plant growth regulator influence on the crops in their residential areas. Ask them to visit nearby Agri input dealer and collect the rates of various popular brands of Growth regulators. Arrange a recap session on critical growth stages of crops and their nutrient needs. Show some videos to participants about plant propagation by using root division methods. Do ask them to find out right or scientific methods for grafting and budding. Photo album of various grafting methods can be prepared as a group activity. Arrange a group discussion on the risk of deficiencies of nutrients and crop immunity and disease management. You act as a moderator and drive the discussion to achieve set outcome. Then try to align the thoughts and discuss the both sides of coin.

Expected outcomes:

- Group activity and team building
- Knowledge enhancement on plant growth hormones.
- understanding on various grafting & budding methods.
- Clarity correlation between Morphology of crop and nutrient deficiency.

Say

- Thank you to everyone for their participation.
- Describe the objective of above activity.

Ask

- Ask the participants whether they have any experience of budding in flower crop.
- Ask the participants about any pesticides and insecticides name used to control insect pest.

Explain

- Introduce participants about available insecticide and pesticide in market.
- Explain different propagation methods used for different flower crop.

Elaborate

- Elaborate the procedure of budding in flower crops.
- Elaborate how to cut a bud-stick from a healthy and disease-free plant.

Activity for participants

Plan this activity for at least 20-30 minutes.

- Ask the participant to prepare list of banned and new insecticide and pesticide in market. Ask the participant to get information on alternative to chemical control of insect and pest. This exercise can help the participants to get in depth of this topic.

Notes for Facilitation

- You can ask participants to identify different propagation methods and keep visiting websites for regular updates.
- Provide a complete set of notes on preparing the rootstock for budding
- Motivate the participants by involving them in sense of participation. Arrange group presentation.

Exercise

Key Solutions to PHB Exercise

A. Short Questions

1. Hardwood cutting

- Hardwood cuttings are taken from dormant, mature stems in late fall, winter, or early spring.
- Plants generally are fully dormant with no obvious signs of active growth.
- The wood is firm and does not bend easily. Hardwood cuttings are used most often for deciduous shrubs but can be used for many evergreens.
- The three types of hardwood cuttings are straight, mallet, and heel.
- A straight cutting is the most commonly used stem cutting. Mallet and heel cuttings are used for plants that might otherwise be more difficult to root.
- For the heel cutting, a small section of older wood is included at the base of the cutting. For the mallet cutting, an entire section of older stem wood is included.

2. Air layering

- Air layering is an ancient method of layering, originally introduced from China and now commercially used for propagation of a number of plants.
- Air layers are made in the spring or summer on stems of the previous season's growth. The presence of active leaves on the layered shoot speeds root formation.
- Layers are prepared by making an upward cut about 5 cm long at or about the center of the shoot.
- The shoot is then girdled by removing a ring of bark about 2 cm wide.
- The upper part of wound is applied with IBA paste made in lanolin. The wound is covered with moist sphagnum moss in a way to provide complete cover to it.
- Polyethylene film is wrapped around the moss grass in such a way as to leave no opening, which could allow evaporation of moisture from the moss.

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- ##### 3. Control measures of aphid - Check plants regularly for aphids at least twice a week when plants are growing rapidly in order to catch infestations early. Application of Dimethoate 2 ml/l and Neem oil 4–5 ml/l for control of Aphids.

Control measures of thrips - Neem oil and Azadiractin can provide moderate control of thrips. Spinosad is a natural insecticide that was found to be very effective against thrips. Pyrethrins insecticides are also used to control thrips.

B. State whether true or False (T/F)

1. False
2. True
3. False

C. Fill in the Blanks

1. 15 to 20 cm
2. Mealybug

D. Multiple Choice Questio

1. c) 2 g/l
2. a) Roots



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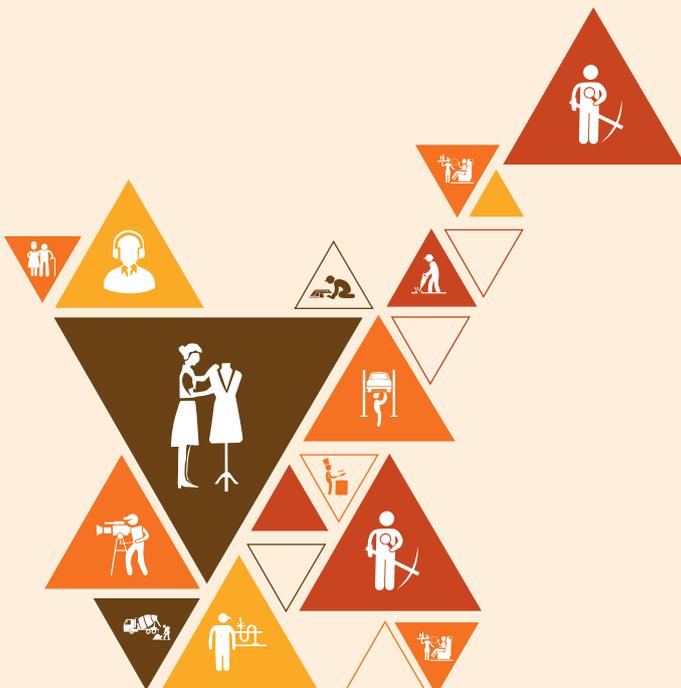
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4. Process of Harvesting, Transplanting and Maintaining Saplings to Grow Flowers

Unit 4.1 - Harvesting, Transplanting and After Care of Sapling

Unit 4.2 - Disease, Pest, Weed Management and Pruning

Unit 4.3 - Resource Optimisation and Recycling of Waste



AGR/N0702

Key Learning Outcomes

By the end of this module, participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. State the indicators of maturity of a variety of saplings for being harvested. 2. List the relevant tools, implements and accessories required for harvesting and collecting saplings. 3. Explain the importance of transplanting saplings at the recommended planting depth and density. 4. Explain the importance of watering saplings with the recommended quantity and applying appropriate organic or inorganic fertilisers soon after transplanting. 5. Explain the importance of installing support such as bamboo sticks to train and support the saplings. 6. Explain the importance of protecting saplings from strong winds and excessive heat or cold. 7. Explain the importance of watering the plants with the recommended quantity, as per the irrigation schedule and prevailing weather conditions. 8. State various practices to be followed to protect the plants and flowers from pests and diseases. 9. Explain the use of a variety of organic preparations, pesticides, insecticides and fungicides for treating the infected plants and flowers. 10. Explain the importance and process of pruning different types of flower plants. 11. Explain the use of mulch to prevent the growth of weeds and improve soil fertility. 12. Describe the process of weeding out unwanted plants. 	<ol style="list-style-type: none"> 1. Demonstrate the process of harvesting and collecting the saplings in appropriate baskets or containers, ensuring no damage to them. 2. Demonstrate the process of transplanting the saplings in the field using the appropriate tools and implements, at the recommended planting depth and density. 3. Show how to water the saplings with the recommended quantity and apply the recommended organic or inorganic fertilisers appropriately soon after transplanting. 4. Demonstrate the process of installing support such as bamboo sticks to train and support the saplings. 5. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity for the optimum growth of plants. 6. Show how to water the plants with the recommended quantity, as per the irrigation schedule and prevailing weather conditions. 7. Demonstrate the process of applying the recommended organic preparations and/ or pesticides, insecticides or fungicides to treat the infected plants and flowers. 8. Demonstrate the process of carrying out pruning to remove dead and unwanted leaves and branches from plants. 9. Show how to apply mulch in the field to prevent weed growth. 10. Demonstrate the process of carrying out weeding to remove unwanted plants.

Theory	Practical
<p>13. Explain the importance of draining out water accumulated in the field to prevent root rot among the flower crop plants.</p> <p>14. Explain the benefits of resource optimisation.</p> <p>15. Explain the importance of recycling and disposing different types of waste as per the applicable regulations.</p>	<p>11. Show how to drain out any water accumulated in the field to prevent root rot among the flower crop plants.</p> <p>12. Demonstrate various practices to optimise the usage of various resources such as water and electricity.</p> <p>13. Demonstrate the process of recycling and disposing different types of waste appropriately.</p>

UNIT 4.1: Transplanting of Sapling, Fertilizers and Water Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Explain the process of harvesting and collecting the saplings in appropriate baskets or containers.
2. Explain the process of transplanting the saplings in the field using the appropriate tools and implements, at the recommended planting depth and density.
3. Show how to water the saplings with the recommended quantity and apply the recommended organic or inorganic fertilisers appropriately soon after transplanting.
4. Explain the process of installing support such as bamboo sticks to train and support the saplings.
5. Explain the process of applying organic and inorganic fertilisers for the optimum growth of plants.
6. Discuss how to water the plants, as per the irrigation schedule and prevailing weather conditions.
7. Explain about organic preparations and/ or pesticides, insecticides or fungicides to treat the infected plants and flowers.
8. Show how to drain out any water accumulated in the field to prevent root rot among the flower crop plants.

Resources to be used

Available objects such as participant's handbook, white board, duster, marker etc.

Power points slides, pictures/posters e.g., which can illustrate the different methods of irrigation, Video content (freely available) from various leading companies working in Micro irrigation.

Activity

Purpose: To acquaint the participants about irrigation management of sapling.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Stage presentation and group discussion for about 20-25 minutes. Rest of the activities can be planned throughout the day.

Prepare two groups of participants and perform a healthy debate competition on how to care the sapling after transplanting? Arrange a recap session on implements and tools used in transplanting process and also risks involved in the transplanting and crucial stages in the transplanting. Take revision on how to apply the recommended organic or inorganic fertilisers appropriately soon after transplanting. This will help them to understand correlation between crop growth & nutrient requirement. Show some videos to participants about scheduling the irrigation to various crops in their areas, irrigation optimization through micro irrigation systems. Do ask them to find out pest and diseases of any single crop in their field. Do arrange a discussion on prevention methods for water logging and efficient drainage in the field. You act as a moderator and drive the discussion to achieve set outcome. Then try to align the thoughts and discuss the both sides of coin.

Expected outcomes:

- Participants would get to know the scheduling of irrigation.
- understand the water need of plant according to weather and soil condition.

Say

- Thank you to everyone for their participation
- Discuss with the participants to share their feelings about this exercise and what new things they have learned in this exercise.

Ask

- Ask the participants about their experience of harvesting and handling of sapling.
- Ask participants about importance of training and supporting the saplings.

Explain

- Explain how to drain out water accumulated in the field.
- Explain appropriate quantities of organic or inorganic fertilisers given after transplanting.

Elaborate

- Elaborate the harvesting and collecting of saplings in appropriate container.
- Elaborate transplanting of sapling at recommended planting depth and density.

Activity for participants

- Plan this activity for at least 20-30 minutes. This is activity based on participant's approach either towards organic preparations or pesticides, insecticides or fungicides to treat the infected plants and flowers.
- Ask the participant's to prepare of list various organic preparation used in their region.

Notes for Facilitation

- Encourage participants for group discussion to ask questions so that they can clear their doubts (if any) future job role.
- Discuss with them regarding water and organic and inorganic fertilizer requirement of saplings for optimum growth.

Exercise

Key Solutions to PHB Exercise

A. Short Questions

1. Fertilizer management

- Application of fertilizer at the time of transplanting can help bring soil nutrients to an adequate level and ensure that the crop has a sufficient pool of nutrients to use at the time the nutrients are required. Fertilizers should be applied 4 to 6 weeks after transplanting to avoid burning the new roots that will grow in the new soil.
- Fertilizing is one way to minimize the shock and replenish the lost nutrients during transplanting. The success of a fertilizer program for transplants is determined by more than just the rate (ppm) of fertilizer applied.
- Taller plants result from using fertilizers supplying >50% NH₄ (e.g., 15-15-15, 15-16-17, 20-10-20) and shorter plants can be had by fertilizing with a high NO₃ fertilizer (e.g., 15-0-15, calcium and potassium nitrate, EXCEL fertilizers). These effects are somewhat complicated by the pH effects and the P levels of the fertilizers.

2. Write about harvesting tools required for transplanting.

- Hand-transplanting
- One popular hand tool for transplanting is the Japanese transplanting hoe (hori hori).
- Tractor-mounted mechanical transplanters
- Tractor-mounted mechanical transplanters are the next step up from transplanting by hand.
- Mechanical transplanters are not necessarily faster than hand transplanting, at least for small areas. Water-wheel transplanters are very common because of their ability to deliver water and fertilizer directly into the transplanting holes, reducing transplant shock.

3. Surface drainage

- Removing the excess water from the land surface is known as surface drainage. Adequate arrangement for surface drainage in heavy rainfall areas is essential for speedy water disposal.
- A surface drainage system may be required in humid or irrigated areas, which is usually an integrated part of the irrigation system on slowly permeable soils or in areas with high precipitation rates.
- Sub-Surface or Internal Drainage
- Removing the water from the subsurface of soil profile is known as sub-surface or internal drainage. There should be subsurface drainage in high water table areas. In either case, the system is conveniently divided into collection system, functional system and outlet.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Hand transplanting
2. P

D. Multiple Choice Questions

1. c) 4-6 weeks
2. c) Both a and b

UNIT 4.2: Disease, Pest, Weed Management and Pruning

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Explain the process of carrying out pruning to remove dead and unwanted leaves and branches from plants.
2. Show how to apply mulch in the field to prevent weed growth.
3. Demonstrate the process of carrying out weeding to remove unwanted plants.

Resources to be used

- Visit to nearby flower crop nursery.

Activity

Purpose: To understand the participants about importance of pruning.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 20-25 minutes. Rest of the activities can be planned throughout the day.

Prepare 4 to 5 groups of participants and perform a healthy group discussion on traditional and mechanical ways of weed management. Arrange a session on how to overcome the challenges in the traditional methods of weed control? Do prepare a survey format for the farming community in the nearby vicinity to list down their day today methods for the weed control and process of carrying out pruning to remove dead and unwanted leaves and branches from plants. With the help of any video film demonstrate the process of carrying out weeding to remove unwanted plants and show how to apply mulch in the field to prevent weed growth. This will help them to understand correlation between mulching and saving of evapotranspiration losses. Do ask them to find out various mulches available in the market. You act as a moderator and drive the discussion to achieve set outcome. Then try to align the thoughts and discuss the both sides of coin.

Expected outcomes:

- Participants will understand the need of pruning in flower crops.
- Participants would know the reason why to remove dead and unwanted leaves and branches from plants.
- Participants will understand importance of mulching to control weed growth and evapotranspiration losses.

Say 

- Thank you everyone for their participation.
- Describe the importance of pruning.

Ask 

- Ask the participants if they know what is mulching and its importance.

Explain 

- Explain different types of mulching materials like organic and polythene mulching.
- Explain the purpose of mulching.

Elaborate 

- Elaborate the importance of poultry farming in India and how they can bring prosperity.
- Elaborate the impact of weeds on plant growth in terms of nutrients, water, space and sunlight.
- Elaborate how to use mulch in a field to stop growth of weeds.

Activity for participants 

- Plan this activity for at least 20-30 minutes. Ask the participants to collect information on different methods of weeding viz., hand weeding and mechanical weeding etc. Conduct a healthy group discussion on it.
- Ask participants to enlist different herbicides used in their area.

Notes for Facilitation 

- Discuss with them regarding procedure of pruning and mulching in various flower crops.
- Encourage participants to undergo field visits and how they can learn more through these visits.
- Encourage participants for group discussion.

Exercise

Key Solutions o PHB Exercise

A. Short Questions

1. Pruning in rose

- Late winter (February or March) is often a good time for pruning roses but see the individual rose profiles above for more specific timing. Cuts should be no more than 5mm (¼ in) above a bud and should slope downwards away from it, so that water does not collect on the bud. This applies to all cuts, whether removing dead wood, deadheading or annual pruning.
- Cut to an outward-facing bud to encourage an open-centred shape. With roses of spreading habit, prune some stems to inward-facing buds to encourage more upright growth. Cut to the appropriate height, if a dormant bud is not visible.
- Cuts must be clean, so keep your secateurs sharp. For larger stems, use loppers or a pruning saw. Prune dieback to healthy white pith. Cut out dead and diseased stems and spindly and crossing stems.
- On established roses, cut out poorly flowering old wood and saw away old stubs that have failed to produce new shoots.

2. Damping off in seedling

- Sapling diseases create problems for those trying to establish grass from seed in the fall. Pythium contribute to a disease causing damping-off.
- The disease attacks seemingly healthy vigorous stands of saplings and kills the young plants in patches.
- Pythium incited damping-off is characterized by a high order of pre-emergence killing of seedlings. In this case, the deterioration process begins soon after the seed coat is broken.
- To reduce the incidence of seedling diseases, plant only top quality seed. Seed that germinate quickly and produce vigorous plants are more likely to survive the seedling stage.

3. Mulching in flower crop

- Various kinds of bark, composted yard waste, and other organic material can be used to help suppress annual weeds by covering the soil surface and preventing weed seed germination and establishment.
- Only 2 to 3 inches of fine organic mulch (finished yard waste) may be required to totally eliminate light on the soil and suppress the growth of weeds.
- An advantage of the fine mulches is that after the crop is harvested, the mulch can be worked into the soil to improve drainage, soil structure, and water-holding capacity of the soil.
- Synthetic materials made of polypropylene or polyester can also be used as mulches. Dark plastic mulches can be used for weed control when using drip or furrow irrigation.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Dehorning
2. Pruning

D. Multiple Choice Questions

1. c) 15-20 cm
2. d) Both A and B

UNIT 4.3: Drainage System, Resource Optimisation and Recycling of Waste

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate various practices to optimise the usage of various resources such as water and electricity.
2. Demonstrate the process of recycling and disposing different types of waste appropriately.

Resources to be used

Available objects such as participant's handbook, white board, duster, marker etc.
Power points slides, pictures/posters e.g., showing relevant visuals of various recycling and disposal of waste.

Activity

urpose: To acquaint the participant about various processes carried out in recycling.

To acquaint the participant about different types of waste disposal.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Debate competition for about 15-20 minutes. Rest of the activities can be planned throughout the day.

Prepare two groups of participants and perform a healthy debate competition on how to reduce cost on electricity and water consumption for the crops in their fields. Show some videos to participants about optimization of irrigation cycles and processes w.r.t. root depth to avoid percolation losses. Do arrange a debate on Traditional irrigation methods Vs. Modern irrigation methods and which will help in optimizing the irrigation and electricity usage to various crops in their areas? Do ask them to find out process of recycling and disposing different types of waste appropriately. Do arrange a discussion on how to recycle the waste material in the field? You act as a moderator and drive the discussion to achieve set outcome. Then try to align the thoughts and discuss the both sides of coin.

Expected outcomes:

- Management & Recycling of waste material.
- Efficient utilization of water & electricity in crop management.

Make a group of 4-5 participants. Prepare participants to have a healthy debate competition on different methods of waste disposal. Ask them to prepare a power point presentation.

Ask participant's to list down the various agricultural waste which are recyclable and its processing methods.

Say 

- Thank you everyone for their participation.
- Describe the objectives of above activity.

Ask 

- Ask the participants whether they have done recycling of any waste at home or whether they visited any recycling unit in their area.

Explain 

- Explain various practices of resource optimization and discuss various resources.

Elaborate 

- Elaborate how to optimise the various water and electricity resources.
- Elaborate the different disposal methods of agricultural waste.

Activity for participants 

- This pen and paper activity is for preparing participants to learn efficient management. Plan this activity for at least 20-30 minutes. Ask the participant to observe and analyse the practices to optimise the usage of various resources in agriculture such as water, electricity in their region.

Notes for Facilitation 

- Motivate the participants by involving them in sense of participation and realization of the importance of their work.
- Encourage the participant to undergo visits related to recycling and disposal of waste and how they can learn more through visits.

Exercise

Key Solutions o PHB Exercise

A. Short Questions

1. Recyclable farm waste

- Straw Waste
- Straw is the middle structure of a crop grown in the field. This crop can be anything from rice, wheat, mustard, lentils, chickpea, etc.
- Stubble
- Stubble is generated during the extraction of paddy crops like rice. These stubbles are generated in huge quantity that can be easily recycled.
- Dry Leaves
- Dry leaves are waste generated from trees like Banyan, mango and sal leaves.
- Food Waste
- Crops that are left unutilized due to pest, rot, lower quality, fungus, etc. can also be utilized for recycling. Sugarcane bagasse are also a good source through which paper can be made.
- Cow Dung
- Most of the farmers in India do have cows and bulls that are used for milk and plough the field. These animals produce a decent amount of waste in the form cow dung that can also be utilized.

2. Vermicompost

- Vermicomposting is the process by which worms are used to convert organic materials (usually wastes) into a humus-like material known as vermicompost.
- Worms ingest the waste material - break it up in their rudimentary gizzards - consume the digestible/putrefiable portion, and then excrete a stable, humus-like material that can be immediately marketed and has a variety of documented benefits to the consumer.
- It is an aerobic, bio-oxidation, non-thermophilic process of organic waste decomposition brought about by earthworms which promote microbial activity.
- Earthworms increase the nitrate production by stimulating bacterial activity and through their own decomposition.
- Concentrations of exchangeable cations such as Ca, Mg, Na, K, available P and Mo in the worm casts are higher than those in the surrounding soil.
- 3. Stubble recycling
- Stubble can be reused in many ways. The first usage is making bedding material for cattle from the stubble.
- A bedding material is like a bed where stubble is spread to form a comfortable bed so that cattle like cows can rest in cold climates.
- The other usage is using stubble to grow mushrooms. For this you need to create a situation where mushrooms can be grown, a little moisture with humid weather is best to grow mushrooms that can be sold at good prices.
- Stubbles in large capacities can be sold to bio-thermal plants where electricity can be produced.

B. State whether True or False (T/F)

1. True
2. True
3. False

C. Fill in the blanks

1. Vermicompost
2. Banana waste

D. Multiple choice question

1. d) Coconut husk
2. c) Both A and B



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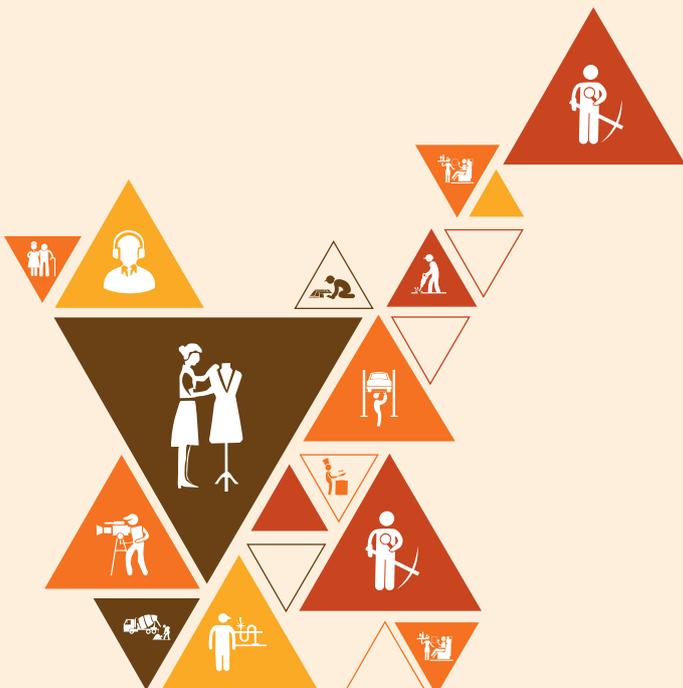
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5. Process of Carrying out Harvesting and Post-Harvest Management of Flower Crop

Unit 5.1 - Harvesting of Flowers

Unit 5.2 - Sorting and Grading of Flowers

Unit 5.3 - Flower Packaging, Transport and Record Maintenance



AGR/N0703

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Demonstrate the process of harvesting the flower crop.
2. Demonstrate the process of carrying out post-harvest management.
3. Demonstrate the process of preparing the storage area and storing the flower crop.
4. Describe the process of marketing the flower crop.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the maturity indicators for varieties of flowers. 2. Explain various techniques for harvesting the flower crop. 3. Explain the criteria for sorting and grading the harvested flowers. 4. State the recommended temperature and humidity for storing flowers. 5. Describe the process of identifying the market demand for the flower crop, connecting with potential buyers and negotiating with them. 6. List different types of packing material suitable for flowers. 7. State the appropriate mode of transport for safe and hygienic delivery of flowers. 8. Explain the importance and process of maintaining the record of sales and payments. 	<ol style="list-style-type: none"> 1. Demonstrate the process of harvesting the flower crop following the recommended harvesting technique, ensuring no damage to flowers. 2. Demonstrate the process of carrying out precooling of flowers to remove the field heat. 3. Show how to sort and grade the harvested flowers on the basis of applicable parameters such as appearance, size, stem thickness etc. 4. Demonstrate the process of applying the relevant treatment in the storage area to remove any pests, insects and rodents. 5. Demonstrate the process of preparing and applying the preservative solution on flowers to protect their freshness. 6. Show how to condition the flowers and pack them safely. 7. Demonstrate the use of relevant e- payment methods to process the payments. 8. Prepare a sample record of sales and payments.

UNIT 5.1: Harvesting of Flowers

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of harvesting the flower crop following the recommended harvesting technique, ensuring no damage to flowers.
2. Demonstrate the process of applying the relevant treatment in the storage area to remove any pests, insects and rodents.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which can explain the purpose of harvesting and grading of flower crops.

Activity

Purpose: To understand about techniques of harvesting different flower crops.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this group discussion for about 20-25 minutes. Rest of the activities can be planned throughout the day.

Prepare two groups of participants and perform a healthy group discussion on different types of processes for harvesting the flower crops. Show some videos to participants about the automation or mechanization in harvesting of flower crops in foreign countries. With the help of any video in Indian context demonstrate the recommended harvesting technique, ensuring no damage to flowers. Do ask them to find out process of applying the relevant treatment in the storage area to remove any pests, insects and rodents & how to tackle the risk of any emergency situation. Photo album on various storage of harvested flower crops can be prepared as a group activity.

Expected outcomes:

- Introduction to techniques of harvesting
- Awareness on maintenance of storage area and prevention of rodents and various pest.

Say 

- Thank you to everyone for their participation.
- Have a discussion with the participants to find out how they feel about the activity and what they learned.

Ask 

- Ask the participants whether they have harvested flowers in commercial flower field.
- Ask the participants whether they know storage area pests, insects.

Explain 

- Explain the maturity indicators of different commercial flower crops in India.

Elaborate 

- How to identify mature flowers for different market and reason behind it.
- Elaborate the methods of harvesting that prevents flower damage.

Activity for participants 

- Plan this activity for at least 20-30 minutes. Ask participants to prepare flow chart on different pests and insects cause damage on flower crops in storage. Prepare a report on treatment to be followed to control any pests, insects and rodents.

Notes for Facilitation 

- Help the participants to complete all the tasks involved in the participant hand book.
- You can invite any flower crop farm owner who knows all the harvesting operations.
- Focus on ensuring pictorial presentation of learning. Constantly motivate each student to participate.

Exercise

Key Solutions to PHB Exercise

A. Short Questions

1. Maturity indicator for orchid

- Dendrobium flower fully matures only 3 or 4 days after it opens. Flowers are harvested when they are fully open as the flowers cut prior to their maturity will wilt before reaching the wholesaler. Harvesting the spike when 75 per cent of the flowers are open and remaining buds are unopen.
- In Dendrobium, spikes of orchids are harvested when a few buds on the top remain unopen. The premium quality spikes are those having a length of 60 cm and bearing 10 - 12 florets each. In Cymbidium, two buds open stage or 70% bloom stage.
- In Phalaenopsis, 40-60 cm long spikes containing at least 8-10 flowers are harvested when all flowers are fully open. In Cattleya, fully open flowers on a spike of 25- 40cm length depending on the type are harvested.
- In Oncidiums, when more than 80 per cent flowers on the spikes are fully open on a spike length of 60 cm with many florets. Vandas are harvested when all flowers are already open, depending on types 10 to 16 flowers on a stem length of 50- 60cm.

2. Techniques of harvesting of flowers

- Flower stems should be cut with sharp knives or secateurs. Hardwood stems should always be given slanting cut to expose maximum surface area to ensure rapid water absorption.
- Harvest in the morning or evening. Remove foliage on stems that will be below water. Never lay flowers on the ground or dirty surface. Disinfect cutting tools frequently, or at least 2 times each day.
- Grade and bunch flowers immediately after harvest. Bring flowers into the shade and place in clean buckets of clean warm water (acidified) and a biocide. Avoid over-filing containers with flowers.

3. Maturity indicators of Chrysanthemum

Types of Chrysanthemum	Period of Harvest
Standard variety	When 40-50% of the bloom is fully open.
Dwarf variety	When 80-85% of the blooms has opened
Spray variety	When 40-50% of the bloom has opened.
Single	When the maximum number of flowers open, but before the pollen shed from the outer row of the disc florets.
Anemone	Before the central cushion in the top most flowering fully developed.

B. State whether True or False (T/F)

1. False
2. True
3. False
4. True

C. Fill in the Blanks

1. Shady area
2. Knives or Secateur

D. Multiple Choice Questions

1. c) 6.5 cm
2. c) 40-50% of the bloom is fully open

UNIT 5.2: Sorting and Grading of Flowers

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Show how to sort and grade the harvested flowers on the basis of applicable parameters such as appearance, size, stem thickness etc.

Resources to be used

Available objects such as participant's handbook, white board, duster, marker etc.
Power points slides, pictures/posters e.g., which shows sorting and grading of different flowers.

Activity

Purpose: To understand about techniques of grading.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this group activity for about 40-50 minutes. Rest of the activities can be planned throughout the day.

Prepare 4 to 5 groups of participants and perform a healthy debate competition on importance of grading of flowers after harvesting.

With the help of videos show how to sort and grade the harvested flowers on the basis of applicable parameters such as appearance, size, stem thickness etc. Arrange a visit to any nearby floriculture park or Polyhouse cultivation of flower crop to understand various steps involved in sorting and grading of flowers. Do ask them to find out crop wise economics dealing with sorting & grading. Ask them to discuss all the parameters adding value to end product. You act as a moderator and drive the discussion to achieve set outcome. Then try to align the thoughts and discuss the both sides of coin.

Expected outcomes:

- Skilling on sorting and grading.
- Knowledge of basics of applicable parameters while grading the flowers such as appearance, size, stem thickness etc.

Say 

- Thank you to everyone for their participation.
- Review the presentation of each group.

Ask 

- Ask the participants whether they have visited grading unit of flower crops.
- Ask the participants whether they know procedure of sorting.

Explain 

- Explain the purpose of sorting in flower crop.

Elaborate 

- Elaborate procedure of sorting of flowers on the basis of different parameters such as appearance, size, stem thickness etc.

Activity for participants 

- Plan this activity for at least 20-30 minutes. Ask participants to prepare flow chart which are the different pests and insects cause damage on flower crops. Prepare a report on treatment to be followed to control any pests, insects and rodents.

Notes for Facilitation 

- Help the participants to complete all the tasks involved in the participant hand book.
- Provide all the notes related to sorting and grading.

Exercise

Key Solutions to PHB Exercise

A. Short Questions

1. Temperature and humidity for storage

Temperature

- It is important to cool harvested flowers to remove field heat. For convenience only, flowers to be sold on that same day can be placed outdoors.
- Those intended for market at another time should be moved to a cooler as soon as possible with temperatures as close to 33°F (most flowers), 41-43°F (some flowers such as zinnias and gerberas) or 5°F (chilling sensitive flowers) in order to best preserve quality.
- Most flowers will retain their quality if stored at temperatures near the freezing point (33°F). Others, such as those originating from subtropical and tropical regions, develop chilling injury if stored at temperatures below 50°F.

Humidity

- Relative Humidity is another factor that affects uptake of solution. There were several recommendations in the literature for suggested relative humidity ranging from 75% to 99%. High relative humidity reduces transpiration and keeps flowers from drying out.

2. Grades in gerbera and orchid

Grading in Gerbera

Grade No.	Stem Length (cm)	Flower Diameter (cm)	Flower Colour	Preference (%)
1	More than 60 cm	More than 12 cm	Pink	40
2	50-60	11-10	Reddish orange	20
3	40-50	10-9	Orange	20
4	40-30	9-8	Red	15
5	Below 30	8-7	Yellow	5

Grading in Orchid

- Generally, based on spathe size, straightness of stem, freshness, colour, etc. Grading according to uSA and Holland based on No. of flowers/spike.

Grade	No. of flowers/spike
A	3-5
B	6-8
C	9-11
D	>11

3. Criterias of flower grading

- Grading refers to categorization of flowers on the basis of their quality. Each bunch should be of same size, weight and quality before marketing them.
- Mostly grading is done on the basis of appearance, harvesting maturity, blemishes or injuries due to disease, attack of insects or pests, colour and size of the bud, straightness, strength and length of the stem.

B. State whether True/False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. 40 to 90 cm
2. Grading

D. Multiple Choice Questions

1. c) Anthurium
2. d) All of the above

UNIT 5.3: Post-Harvest Management and Record Maintenance

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of carrying out precooling of flowers to remove the field heat.
2. Demonstrate the process of preparing and applying the preservative solution on flowers to protect their freshness.
3. Show how to condition the flowers and pack them safely.
4. Demonstrate the use of relevant e-payment methods to process the payments.
5. Prepare a sample record of sales and payments.

Resources to be used

Available objects such as participant's handbook, white board, duster, marker etc.
Power points slides, pictures/posters e.g., showing relevant visuals of various post-harvest practices followed in flower crops.

Activity

Purpose: To acquaint participants about different preservative solution used for flower crops.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan a debate competition for about 20-25 minutes. Rest of the activities can be planned throughout the day.

Prepare 4 to 5 groups of participants and perform a healthy debate competition on importance of carrying out precooling of flowers to remove the field heat. Show some videos to participants to demonstrate the process of preparing and applying the preservative solution on flowers to protect their freshness & how to condition the flowers and pack them safely? Do arrange a visit to Floriculture Park to see storage units for the harvested flower crops and precooling systems. Do ask them to find out the use of relevant e-payment methods to process the payments. Give them a group activity to prepare a sample record of sales and payments. You act as a moderator and drive the discussion to achieve set outcome. Then try to align the thoughts and discuss the both sides of coin.

Expected outcomes:

- Skilling in preparation of preservative solution & precooling of flowers after harvesting.
- Knowledge enhancement on packaging material used for flower crop.
- understanding on e-payment methods to process the payments and record of sales and payments.

Say

- Thank you to everyone for their participation.
- Describe the objective of above activity.

Ask

- Ask participants about conditioning of flowers.
- Ask the participants whether they have visited any commercial flower packaging unit.

Explain

- Explain what is precooling and procedure for performing precooling of flowers.
- Explain the purpose of record maintenance.

Elaborate

- Elaborate the different e-payment techniques to handle the payments.
- Elaborate the importance of field heat removal.

Activity for participants

- This pen and paper activity is for preparing participants to learn importance of record maintenance. Plan this activity for at least 20-30 minutes.
- Ask the participants to prepare sample of record maintenance sheet of sales and payments.

Notes for Facilitation

- Explain the various e-payment methods to participants.
- Explain the various packaging material used for flower crops and give them general idea about packaging required according to market.
- Help participants to prepare sample sheet of record.
- Motivate the participants by involving them in sense of participation and realization of the
- importance of their work.

Exercise

Key Solutions o PHB Exercise

A. Short Questions

1. Different segments of marketing

- Based on the flower type, the market has been segmented as,
- Cut Flowers and Loose Flowers
- On the basis of sector, the market has been segmented as,
- Retail and Institutional
- On the basis of distribution channel, the market has been segmented as,
- unorganised Retail, Florists, Supermarkets and Hypermarkets, Online and Others
- On the basis of application the market has been segmented as,
- Aesthetic and Decorative Applications, Flavours and Fragrances, Natural Colours, Medicines and Others

2. Transport of flowers by air

- Over 95% of the exported cut flowers are transported by air which makes securing air cargo space a priority. To cushion this, large exporters have been able to exercise some control over space through joint ventures with freight forwarders.
- The freight forwarders inspect and document flower and temperature conditions, palletize packed flowers, store them in cold storage facilities at the airport, clear them through export customs, obtain phytosanitary certification, and load the cargo onto commercial or charter flights. Some forwarders also offer cooled transport for growers.
- Cargo handling agents deliver direct services to the airlines, and are responsible for all cargo-related service requirements between the time an aircraft arrives at a terminal gate and the time it departs on its next flight. Fast, efficient and accurate ground handling services are vital minimizing the turnaround time (the time during which the aircraft must remain parked at the gate).
- Since flowers are highly perishable by nature, speed of delivery is of the utmost importance, as are appropriate temperature control measures during transit.
- For cargo handling companies it is important to invest in adequate infrastructure facilities, such as cold stores and pre-cooling facilities, testing and cargo handling and internal container depots suitable for floriculture products.

3. Record maintenance

- Assists you in preparing your financial statements quickly and accurately. Provides information to enable the control of cash in the business. Provides management information to base business decisions on. Contributes promptly to assessing the financial situation of the business at any time.
- Saves a lot of time and effort. Keeps a good track of the costs of staff and their performance. Measures the business performance against the projections that were originally set down in the business plan.
- Highlight areas where problems could arise and enable remedies to be put in place. Fulfils the obligations as to taxation law. Assists you in calculating how much tax you have to pay. Provides valuable information and details for the future sale of your business where that is required.

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. 95 %
2. Perishable

D. Multiple Choice Questions

1. a) 20
2. b) 91x43x15 cm



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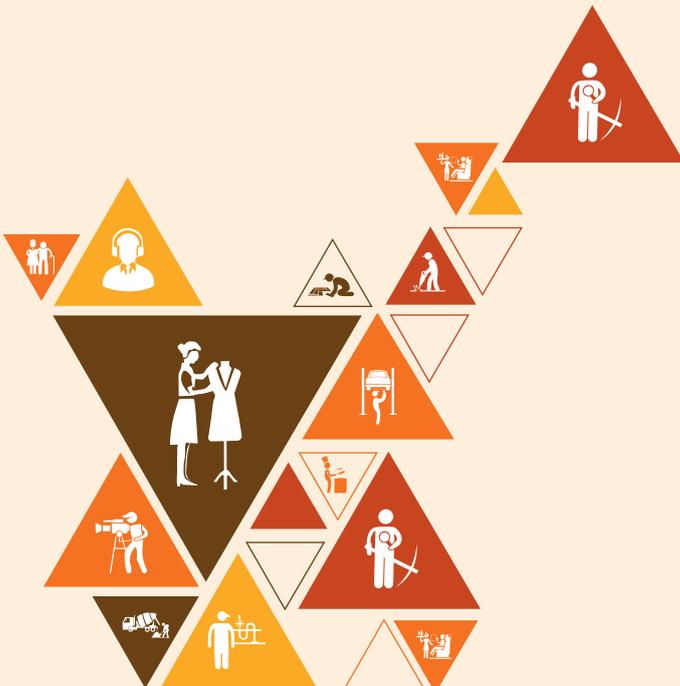
6. Basic Entrepreneurial Activities for Small Enterprise

Unit 6.1 - Demand and Supply

Unit 6.2 - Agricultural Entrepreneurship / Business Opportunities.

Unit 6.3 - Basic Resources of Agriculture Production

Unit 6.4 - Preparing to be an Entrepreneur



AGR/N9908

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Explain the process of planning the agricultural enterprise/ business.
2. Explain the process of managing the agricultural production process.
3. Explain the process of managing the post-production and marketing processes.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain how to analyze the demand and supply of the relevant agricultural produce in the market. 2. Describe the process of identifying the target customers and assess their needs and expectations with respect to the quality and price of the product. 3. Explain how to identify various types of agricultural entrepreneurship/ business opportunities. 4. Explain how to prepare a basic business plan for agricultural entrepreneurship/ business activities. 5. State the appropriate sources of funding for the agricultural entrepreneurship/ businesses. 6. State the relevant government schemes and programs. 7. Explain the importance of ensuring compliance with the government structural reforms and framework, along with the applicable rules and regulations. 8. List various resources required for agricultural production. 9. Describe the process of planning agricultural production and the use of relevant technologies to enhance production. 10. Explain the importance of ensuring no cause adverse impact on the environment and produce during production. 11. State the recommended practices to be followed for efficient input resource management. 12. Describe the process of optimizing the production processes and output through the amalgamation of existing practices with smart technologies. 	<ol style="list-style-type: none"> 1. Demonstrate how to analyze the demand and supply of the relevant agricultural produce in the market. 2. Prepare a sample basic business plan for agricultural entrepreneurship/business activities. 3. Demonstrate how to calculate the costs incurred and determine the price of the product for profitability. 4. Prepare a sample marketing plan considering the 4Ps i.e., product, price, promotion, and place and 4As i.e., acceptability, affordability, accessibility, and awareness. 5. Demonstrate the process of using the relevant digital services such as ecommerce, e-payments, electronic recordkeeping, etc.

Theory	Practical
<ol style="list-style-type: none"> 13. Explain the recommended sustainability practices to be followed during agricultural production to prevent and deal with deforestation, loss of biodiversity, soil degradation, etc. 14. Explain how to collect information related to the whole sale and retail price of agricultural produce. 15. Explain how to calculate the economics of the produce viz. production cost, price of the produce, B:C Ratio etc. 16. Explain the relevant government schemes with the provision of subsidies/funds for the promotion of agricultural produce. 17. Describe the process of selecting appropriate marketing channels for marketing agricultural produce, and the applicable requirements and constraints. 18. List the relevant buyers of different types of agricultural produce. 19. Explain how to identify and manage various risks to production and postproduction processes. 20. Explain how to undertake outreach programs to promote agricultural products and services, and expand agri-business. 21. Explain the 4Ps i.e., product, price, promotion, and place and 4As i.e., acceptability, affordability, accessibility, and awareness considered while preparing and executing a marketing plan. 22. Explain the use of the relevant digital services such as e-commerce, e-payments, electronic recordkeeping, etc. 23. Explain the importance of using efficient post-production logistics. 24. Explain the importance of maintaining various records accurately. 	

UNIT 6.1: Demand and Supply

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate how to analyze the demand and supply of the relevant agricultural produce in the market.

Resources to be used

Available objects such as participant's handbook, white board, duster, marker etc.
Power points slides, pictures/posters e.g., showing relevant visuals of statistical data of demand and supply.

Activity

Purpose: To acquaint the participants about different agricultural produce in market.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 30-40 minutes.

Prepare a group of 4-5 participants. Ask participants to discuss on demand of various agricultural produce in their region. Demonstrate how to analyze market demand and supply for various agricultural products.

Expected outcomes:

- Knowledge enhancement

Say

- Thank you to everyone for their participation.
- Discuss with the participants to share their feelings about this exercise and what new things they have learned in this exercise.

Ask

- Ask participants about whether they know which agricultural produce have more demand in their locality.

Explain

- Explain what market is.
- Explain the impact of technology on agricultural produce.

Elaborate

- Elaborate how does demand and supply determine the price of agricultural products.

Activity

- Plan this activity for 20-30 minutes. Ask participants to prepare a survey of demand and supply of agricultural produce in their region. Assist participants in preparing for this survey.

Notes for Facilitation

- Help the participants to complete all the tasks involved in the participant hand book.
- Where possible, display the work of group within the classroom.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Technology advancements in production, communication, and transportation have an effect on a number of demand and supply factors. What effects on supply and demand can we anticipate as these technologies develop in many of our product categories and geographical sectors?

The focus of this page is on relating the trend of advancing technologies to the "implications" of those advances. The relationship is discussed in terms of determinants of demand and supply. Some of the implications may be viewed as negative, while other implications maybe considered positive.

2. Determinants of Supply

Resource or Input Costs

An increase in the cost of livestock feed will cause me to sell the livestock at an earlier time and at a lower weight thereby reducing my output of "pounds of livestock" is the example of input cost.

Production Technology

An advance in the technology used to produce a product will lead to an increase in the production of that product; as food processing became more automated, What impact is production technology having on the quantity of the goods available in your market?

Taxes and Subsidies

A supplier will reduce production if the cost of production rises as the result of a tax or other government-imposed cost on the production process

A supplier will increase production if a government program subsidizes the producer's income or otherwise pays a portion of the supplier's production cost.

3. Consumer tastes and preferences - is the consumer interested in Product A or Product B. For example, will the consumer prefer a food product wherein the consumer can identify who, where, and how the underlying agricultural commodities were produced, or will the consumer be satisfied with a food product without knowing who, where or how it was produced?

Number of buyers in the market - An increased number of interested buyers or consumers will lead to an increased demand for the product.

D. State whether True or False

1. False
2. True
3. True

C. Fill in the Blanks

1. Interested buyers or consumers
2. Increase

D. Multiple Choice Questions

1. c) All of the above
2. c) Both a and b

UNIT 6.2: Agricultural Entrepreneurship / Business Opportunities

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Prepare a sample basic business plan for agricultural entrepreneurship/business activities.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals various business in agriculture.

Activity

Purpose: To acquaint the participants about agricultural business.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 15-20 minutes.

Divide the participants in two groups and ask them to discuss on ideas related to agricultural business.

Ask participants to identify the profitable agricultural enterprises or activities that are currently being carried out in their locality.

Expected outcomes:

- Introduction to business opportunities in agriculture.
- Confidence building

Say

- Thank you to everyone for their participation.
- Discuss with participants to share their ideas about agricultural entrepreneurship.

Ask

- Ask them whether they have visited any business setup.

Explain

- Explain participants about agriculture business is based on many factors like the size of the land, fertility of the land, type of soil, weather of the region etc.

Elaborate

- Elaborate points to keep in mind during the business planning.
- Elaborate relevant government schemes and programs for entrepreneurship.

Activity

Plan this activity for at least 60 minutes. Ask participants to choose an agriculture business idea they admire and create their own business plan for it as if they were starting it from scratch and prepare report.

Notes for Facilitation

- Help participants to prepare a sample business plan.
- Constantly motivate each participants for their business idea.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Insurance protection for food crops, oilseeds and annual horticultural/ commercial crops notified by state government.
uniform maximum premium for all farmers : Kharif season - 2% of sum insured, Rabi Season 1.5% of sum insured and Annual commercial/horticultural crops - 5% of sum insured.
2. Insurance protection for notified food crops, oilseeds and annual horticultural/ commercial crops.
uniform maximum premium for all farmers like PMFBY : Kharif season - 2% of sum insured, Rabi Season 1.5% of sum insured and Commercial/horticultural crops 5% of sum insured.
3. Agricultural farm business are organic farming, poultry farming, organic fertilizer, flower business, fertilizer distribution, mushroom farming, sunflower farming, dairy farming and hydroponic retail store business.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Commercial cash crop
2. Domestic business

D. Multiple Choice Questions

1. d) All of the above
2. c) Both a and b

UNIT 6.3: Basic Resources of Agriculture Production

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate how to calculate the costs incurred and determine the price of the product for profitability.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals

Activity

Purpose : To acquaint the participants about cost incurred in agriculture.

Resources : Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology : Group discussion for about 15-20 minutes.

Prepare a group of 4-5 participants. Give an example of how to compute the costs incurred and estimate the product's pricing for profitability. Ask them to discuss on different costing structure on agricultural business and different types of cost.

Expected outcomes :

- Knowledge enhancement
- Confidence building

Say

- Thank you to everyone for their participation.
- Describe objectives of above activity.

Ask

- Ask participants about what cost is.
- What does product profitability mean?

Explain

- Explain the different types of cost.
- Explain how to do a product profitability analysis of any commodity.

Elaborate

- Elaborate how to calculate the costs incurred in agriculture production.

Activity

This pen and paper activity is for preparing participants to calculate prize of product. Plan this activity for at least 20-30 minutes.

- Guide participants to finalize the product prize by considering input factors involved in product preparation, add up all direct and indirect cost then subtract that number from your product revenue.

Notes for Facilitation

- Help participants to calculate the costs incurred and determine the price of the product.
- Assist all groups to systematically arrange collected information and analyze them when required.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. The effects of soil erosion go beyond the loss of fertile land. It has led to increased pollution and sedimentation in streams and rivers, clogging these waterways and causing declines in fish and other species. And degraded lands are also often less able to hold onto water, which can worsen flooding. Sustainable land use can help to reduce the impacts of agriculture and livestock, preventing soil degradation and erosion and the loss of valuable land to desertification. The health of soil is a primary concern to farmers and the global community whose livelihoods depend on well managed agriculture that starts with the dirt beneath our feet.

2. Cover Crops

By sowing cover crops off-season, farmers protect their fields from soil erosion. The technique also helps in building up the organic matter when cover crops are used for green manure, which decreases expenses on fertilizers. Besides, cover cropping tackles weeds and retains soil moisture.

Zero Tillage

The no-tilling approach suggests sowing right into the crop residue with the least soil and biota disturbance. Since planters or drillers incorporate seeds immediately after digging, no-till prevents soil compaction, minimizes operation time and fossil emissions, contributing to economic and ecological stability.

3. The basic resources for agriculture are sunlight, soil and water, besides the seeds and animal breeds, and human Endeavour. Another important input is the agro technique. Agricultural production is adversely affected if any of these factors is limited, or disturbed. Obviously, scientific study enables technological innovations to manipulate these factors to maximize production. Increasingly nowadays, application of science and technology also involves preventing or at least minimizing wasteful use of precious resources. Various resources are Soil, water, seeds and agro techniques

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. No tillage
2. Crop rotation

D. Multiple Choice Questions

1. a) Overgrazing
2. d) Both a and b

UNIT 6.4: Preparing to be an Entrepreneur

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Prepare a sample marketing plan considering the 4Ps i.e., product, price, promotion, and place and 4As i.e., acceptability, affordability, accessibility, and awareness.
2. Demonstrate the process of using the relevant digital services such as e-commerce, e-payments, electronic recordkeeping, etc.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of success story of entrepreneur.

Activity

Purpose : To acquaint the participants about 4Ps of marketing product, price, promotion, and place.

Resources : Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology : Group discussion for about 15-20 minutes.

Prepare 4 groups of participants. Allot each group the 4Ps .e. product, price, promotion, place and 4As i.e., acceptability, affordability, accessibility, and awareness and encourage them for group discussion after that tell them to prepare a sample marketing plan.

Expected outcomes :

- Knowledge enhancement on marketing plan.

Say

- Thank you to everyone for their participation.
- Discuss with the participants to share what new things they have learned in this exercise.

Ask

- Ask them about importance of digital services.
- Ask them whether they know any e-payment method.

Explain



- Explain the process of using the various digital services used in day to day life.
- Explain participants about marketing plan and its purpose.

Elaborate



- Elaborate how digital service can be used in a wide variety of ways to address inefficiency in farming operations across crop type.
- Elaborate the types and process of e-commerce.

Activity



Plan this activity for at least 20-30 minutes. Ask participants to prepare a sheet of various e-commerce, e-payments, and electronic recordkeeping services. Also ask them to prepare report on commonly used e-payment method.

Notes for Facilitation



- Help the participants to complete all the tasks involved in the participant hand book.
- Motivate participants for digital payment.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Explain the 4 P's

- i. Product - A product can be: A tangible good and an intangible service
Whatever your product is, it is critical that you have a clear understanding of what you are offering, and what its unique characteristics are, before you begin with the marketing process.
- ii. Price
Once all the elements of Product have been established, the Price factor needs to be considered. The Price of a Product will depend on several factors such as profit margins, supply, demand and the marketing strategy.
- iii. Promotion
Once you are certain about your Product and your Price, the next step is to look at ways to promote it. Some key elements of promotion are advertising, public relations, social media marketing, email marketing, search engine marketing, video marketing and more.
- iv. Place
According to most marketers, the basis of marketing is about offering the right product, at the right price, at the right place, at the right time. For this reason, selecting the best possible location is critical for converting prospective clients into actual clients.

2. Types of E-commerce

- Business to Business (B2B): Both the transacting parties are businesses.
- Business to Consumer (B2C): Businesses sell electronically to end-consumers
- Consumer to Consumer (C2C): Consumers come together to buy, sell or trade items to other consumers.
- Consumer-to-Business (C2B): Consumers make products or services available for purchase to companies looking for exactly those services or products.
- Business-to-Administration (B2A): Online transactions conducted between companies and public administration.
- Consumer-to-Administration (C2A): Online transactions conducted between individuals and public administration.

3. Types of risk in agriculture business

- i. Production risk derives from the uncertain natural growth processes of crops and livestock.
- ii. Price or market risk refers to uncertainty about the prices producers will receive for commodities or the prices they must pay for inputs
- iii. Financial risk results when the farm business borrows money and creates an obligation to repay debt.
- iv. Institutional risk results from uncertainties surrounding Government actions.
- v. Human or personal risk refers to factors such as problems with human health or personal relationships that can affect the farm business.

B. State whether True or False (T/F)

1. False
2. False
3. True

C. Fill in the Blanks

1. Single platform
2. unified national market

D. Multiple Choice Questions

1. c) Pradhan Mantri Jan Dhan Yojana
2. d) All of the above



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Transforming the skill landscape

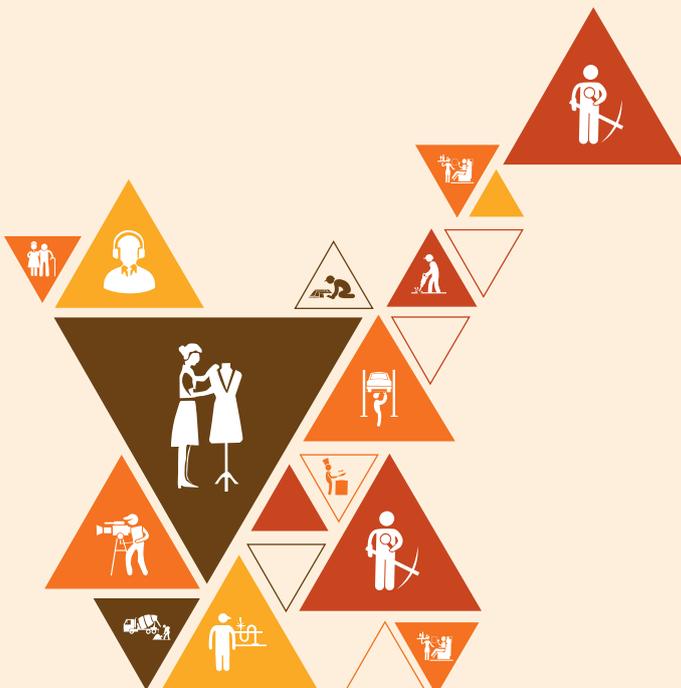


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7. Engagement in Collective Farming/ Activities

unit 7.1 - Formation of PGs/ FIGs/ SHGs and its Operations



AGR/N9922

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Describe the process of creating PGs/ FIGs/ SHGs and preparing for its operations.
2. Demonstrate the process of conducting group meetings and training sessions.
3. Demonstrate the process of carrying out collective farming/activities.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the process of creating PGs/ FIGs/ SHGs and preparing for its operations. 2. Explain the process of conducting group meetings and training sessions. 3. Explain the process of carrying out collective farming/activities. 4. Explain the process of preparing for the Producer Groups (PGs)/Farmers Interest Groups (FIGs)/ Self-Help Groups (SHGs) operations such as fundraising, induction of Subject Matter Experts (SMEs), investing in Information and Communication Technology (ICT) products, etc. 5. Explain how to obtain access to the relevant government development programs and funds. 6. Explain the process of commodity convergence with the relevant developmental programs. 7. Explain the importance of planning optimal production to meet the market and household food security needs. 8. Explain the importance of setting the group objectives and deciding the group income-generating enterprises/ activities, methods of operation, benefits, etc. 9. Explain the importance of organizing the PG/ FIG/ SHG meetings and training sessions to resolve common concerns and get information about the latest developments in the field of work. 10. Explain the benefits of various capacity building exercises such as skill development and training programs. 11. Explain the importance and process of conducting field trials to identify and resolve problems encountered by farmers in the field operations. 12. Explain the concept of the group owned bank to provide quality seeds, fertilizers, pesticides, tools and equipment to the member farmers. 	<ol style="list-style-type: none"> 1. Role play to illustrate how to conduct the initial group meetings to introduce the members, discuss the group objectives, group income generating enterprises/ activities, methods of operation, etc. 2. Role play to illustrate how to organize field trials to identify and resolve problems encountered by group members in the field operations.

Theory	Practical
<p>13. Explain the process of using the group's credit facility.</p> <p>14. Explain various core collective farming activities such as procuring inputs in bulk, large-scale farming, etc.</p> <p>15. Explain the concept and benefits of forming forward and backward linkages.</p> <p>16. State the relevant value addition practices such as processing, packing, upgrading the quality, etc.</p> <p>17. Explain the benefits of connecting with similar groups to address common problems on a large scale.</p>	

UNIT 7.1: Formation of PGs/ FIGs/ SHGs and its Operations

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Role play to illustrate how to conduct the initial group meetings to introduce the members, discuss the group objectives, group income generating enterprises/ activities, methods of operation, etc.
2. Role play to illustrate how to organize field trials to identify and resolve problems encountered by group members in the field operations.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of bed preparation for sowing and fertilizer application.

Activity

Purpose:

To acquaint the participants about importance of group meetings.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 20-30 minutes.

Arrange a group discussion basic idea of collective farming. Some participants will represent government scheme to promote collective farming activities. Another team can have a presentation on various Farmer Interest Group (FIG) in their area.

Discuss with the participants about group objectives, group income generating enterprises/ activities, methods of operation, etc. of any known Producer Group (PG). Demonstrate how to conduct field trials to analyse and fix challenges experienced by group members during field activities.

Expected outcomes:

- Confidence building
- Group involvement

Say

- Thank you to everyone for their participation.
- Describe the objectives of farmer interest group.

Ask

- Ask participants whether they have visited any farmer interest group working in agriculture field.
- Ask participants that whether they have observed how FIG helps in prosperity improvement of farmer.

Explain

- Explain the participants about various income generating activities carried out in collective farming which helps in improving living standard of farmer.
- Explain the participants how members of producer group can easily solve the issues while working in the field.

Elaborate

- There are multiple Producer Group, Farmer Interest Group and Self Help Group which are working together for different purpose. Ask participants to go through them and share their experience.
- Elaborate how problem solving capacity of different groups increasing due to collective activity.

Activity

You may plan this activity for 20-30 minutes.

- Based on participatory approach compare the pre and post covid effects on agriculture marketing and how group farming activity channelize different marketing options.
- For further details you can go for video link which are provided in participatory handbook.

Notes for Facilitation

- Indicate potential of various groups which are working under agriculture sector.
- Assist all groups to systematically arrange collected information and analyse them whenever required.
- Where possible arrange a group visit to display how group farming activities are performed.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Process for setting of producers group

- understanding post farm-gate situation in the block
- Work on the Business Model and Business Opportunity
- Sharing the idea and confirmation with CLF/ GPLF
- Formation of Producers Groups
- Finalization and Submission of Business Plan to CLF
- Release of Fund to PG
- Monitoring

2. Importance of value addition in agriculture

- Agriculture deals a large group of crops having great medicinal, nutritional, health promoting values.
- India as second largest producer of fruits and vegetables, only 10 per cent of that produce is processed, but other developed and developing countries where 40-80 per cent produce is value added.
- Horticultural crops provide varied type of components, which can be effectively and gainfully utilized for value addition like pigment, amino acids, oleoresins, antioxidants, flavors, aroma etc.
- Post-harvest losses in horticultural produce are 5 to 30 per cent which amounts to more than 8000 crore rupees per annum. If we subject our produce to value addition the losses can be checked.
- Horticultural crops are right material for value addition because they are more profitable, has high degree of process ability and richness in health promoting compounds and higher potential for export.

3. Farmers in India remain poor as they are not able to obtain better prices in spite of the hard work they do in order to reap harvests. They are not in a position to determine the price for their own produce. The need of the hour is to establish commodity groups, farmers interest groups and farmers federation so that they gain the confidence to fix price for their produce.

A Farmer Interest Group (FIG) is a self-managed, independent group of farmers with a shared goal and interest. The members work together to achieve this goal by pooling their existing resources, gaining better access to other resources and to share in the resulting benefits.

B. State whether True/False (T/F)

1. True
2. True
3. False

C. Fill in the Blanks

1. Farmer Interest Groups (FIG)
2. Group formation

D. Multiple Choice Questions

1. d) All of the above
2. d) Only a

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Apply techniques for effective communication with the stakeholders.
2. Explain how to mentor an apprentice.
3. Discuss ways to promote diversity and inclusion at the workplace.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the importance of verbal and non-verbal communication at the workplace. 2. Explain the effective methods of sharing and seeking information and feedback at the workplace. 3. Explain the procedure for completing work-related documentation. 4. Describe the process of mentoring an apprentice at the workplace. 5. Explain the importance of inclusion of all genders and People with Disability (PwD) at the workplace. 6. Explain gender concepts (gender as a social construct, gender sensitivity, gender equality etc.), issues and applicable legislation. 7. Explain ways in which a conducive working environment can be created for all genders and PwD. 8. Define the need for appropriate verbal and non-verbal communication while interacting with all genders and PwD. 9. Explain the applicable PwD related regulations. 10. Explain the procedure to report inappropriate behavior e.g., harassment. 	<ol style="list-style-type: none"> 1. Demonstrate the requisite level of proficiency in verbal and non-verbal communication at the workplace. 2. Demonstrate different approaches to mentoring an apprentice at the workplace. 3. Prepare a sample training schedule for an apprentice. 4. Demonstrate appropriate verbal and non-verbal communication that is respectful of genders and disability.

UNIT 8.1: Effective Communication and Working Environment

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the requisite level of proficiency in verbal and non-verbal communication at the workplace.
2. Demonstrate different approaches to mentoring an apprentice at the workplace.
3. Prepare a sample training schedule for an apprentice.
4. Demonstrate appropriate verbal and non-verbal communication that is respectful of genders and disability.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant video of different communication methods.

Activity

Purpose: To acquaint the participants about verbal and non-verbal communication with respect to genders and disability.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for about 30-40 minutes.

Tell the participants that you are going to give them a series of instructions and you want them to follow them as fast as they can.

State the following actions as you engage in them:

- Put your hand to your nose.
- Clap your hands.
- Stand up.
- Touch your shoulder.
- Sit down.

Put your hand to your mouth (but while saying this one, put your hand to your nose). Observe how many participants copied what you did instead of what you said. After that discuss on how body language can influence our understanding and our reactions. It can reinforce what we hear or it can interfere with the verbal communication we receive.

This will help participants to understand verbal and non-verbal communication.

Expected outcomes:

- understanding verbal and non-verbal communication

Say 

- Thank you to everyone for their participation
- Discuss with the participants to share their feelings about this exercise and what new things they have learned in this exercise.

Ask 

- Ask participants about their experience of above activity.
- Ask participants about need of apprentice at the workplace.

Explain 

- Explain how to improve communication skills at workplace.
- Explain different perspective for mentoring an apprentice at workplace.

Elaborate 

- Elaborate the type of instruction that is provided during an apprenticeship and provide a schedule.
- Elaborate how to create gender equality in the workplace.

Activity 

Ask participants about the wages paid for men and women in your area and ask them the importance of paying equal wages for all the genders. Allot task of packaging of flower crops to participants and check their proficiency in work after that have a healthy debate on gender equality.

Ask participants to prepare a report on disability Act in India.

Notes for Facilitation 

- Assist all the participants in performing all the activities.
- Provide a complete set of notes on gender inclusion and disability at workplace.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. What are the types of communication?

Verbal communication is the interchange of ideas, feelings, and information through voice or spoken word. On the other hand, non-verbal communication refers to the exchange of messages that do not involve spoken words.

2. Focus on diversity during your recruitment process and create fair compensation and promotion procedures. Offer flexible and supportive employee benefits. Create a diversity and inclusion training program. Hold managers accountable. Build an inclusive company culture

3. To report inappropriate behaviour at work submits an employee complaint form to your manager. You should take the issue to your direct superior in cases where he/she isn't the culprit of the issue. File a formal complaint with Human Resources. If the perpetrator of misconduct refuses to comply, you can file a formal complaint with your HR department. Start by approaching the human resource department of your company. It will be in a position to explain where you stand legally and will help resolve the issue.

B. State whether True/False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Communication
2. Eye contact

D. Multiple Choice Questions

1. d) Both a and b
2. d) All of the above



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Transforming the skill landscape

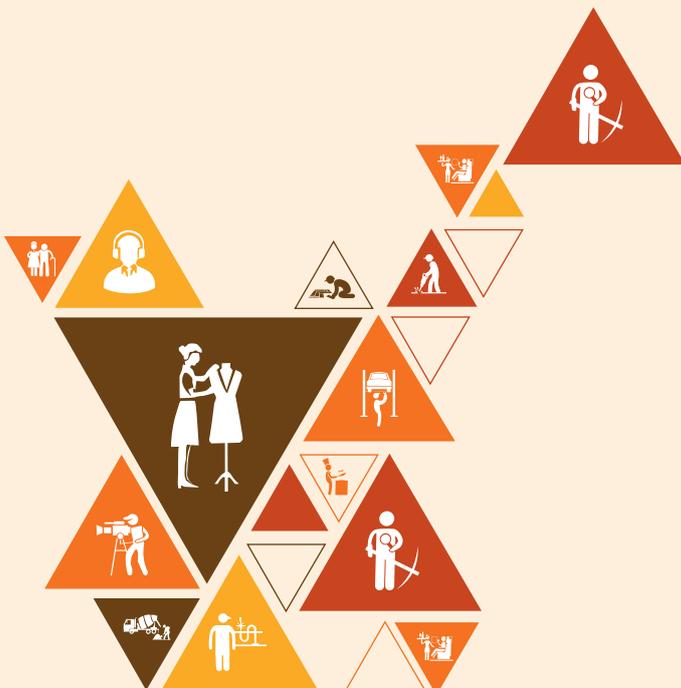


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9. Hygiene and Cleanliness

Unit 9.1 - Personal Health and Hygiene at Workplace



AGR/N9903

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Discuss how to adhere to personal hygiene practices.
2. Demonstrate ways to ensure cleanliness around the workplace.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the requirements of personal health, hygiene and fitness at work. 2. Describe common health-related guidelines laid down by the organizations/ Government at the workplace. 3. Explain the importance of good housekeeping at the workplace. 4. Explain the importance of informing the designated authority on personal health issues related to injuries and infectious diseases. 	<ol style="list-style-type: none"> 1. Demonstrate personal hygiene practices to be followed at the workplace. 2. Demonstrate the correct way of washing hands using soap and water, and alcohol-based hand rubs. 3. Demonstrate the steps to follow to put on and take off a mask safely. 4. Show how to sanitize and disinfect one's work area regularly. 5. Demonstrate adherence to the workplace sanitization norms. 6. Show how to ensure the cleanliness of the work area.

UNIT 9.1: Personal Health and Hygiene at Workplace

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate personal hygiene practices to be followed at the workplace.
2. Demonstrate the correct way of washing hands using soap and water, and alcohol-based hand rubs.
3. Demonstrate the steps to follow to put on and take off a mask safely.
4. Show how to sanitize and disinfect one's work area regularly.
5. Demonstrate adherence to the workplace sanitization norms.
6. Show how to ensure the cleanliness of the work area.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant video of hand cleaning procedure.

Activity

Purpose: To acquaint the participants about personal hygiene practices.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for about 20-30minutes.

This activity is on individual basis to elaborate procedure for hand wash. You have to show them proper method of hand cleaning then ask them to perform the same. In this activity you put glitter on hands of each participants. The glitter represent number of germs present on hand and ask participants to clear that all glitter.

Steps for washing our germy, glittery hands:

Ask your participants to suggest how long they should wash their hands

Have them demonstrate how they wash their hands

Talk about who they think does it the best

Sprinkle glitter into their hands

Ask them to rub their hands together to spread the glitter all over

Let them try to wash it all off and time how long it takes

Show early finishes any glitter they have missed

Send them back for more washing

Share ideas about what they have learned

The aim is to teach the participants that proper hand washing takes 20 to 30 seconds and requires covering all parts of your hand. Otherwise, germs will still be there.

Expected outcomes:

- Knowledge enhancement

Say 

- Thank you to everyone for their participation
- Discuss with the participants to share their feelings about this exercise and what new things they have learned in this exercise.

Ask 

- Ask participants about the participants' personal hygiene routines.
- Ask participants about if they are familiar with various masks.

Explain 

- Explain the importance of using a mask.
- Explain the purpose of workplace sanitization.

Elaborate 

- Elaborate the steps to follow to put on and take off a mask safely.
- Elaborate the different practices to be followed to maintain cleanliness of the work area.

Activity 

Plan this activity for 20-30 minutes. Ask participants to make their own hygiene displays, divide your participants into small groups, hand out poster paper and art supplies, and get your participants to make them. Give each group a “hygiene duty” to represent on their poster. When finished, groups can present their finished posters to the class. While explaining their posters, they’ll be processing important information in their own language. This will help your participants to become more independent and take ownership of their personal hygiene.

Notes for Facilitation 

- Help the participants to complete all the exercises involved in the participant hand book.
- You can ask participants to identify various hygiene practices and follow them in day to day life.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Shower or bath every day and use soap or a body wash to make sure you are clean and to remove germs from your body. Make sure you wash your clothing regularly and wear fresh, clean clothes to work each day. Crumpled, old and smelly clothes are never welcomed in the workplace. Make sure your nails are clean and kept tidily cut. Brush your teeth every morning as part of your daily grooming routine to help reduce the risk of tooth decay, oral diseases and bad breath.
2. Effective housekeeping can help control or eliminate workplace hazards. If the sight of paper, debris, clutter and spills is accepted as normal, then other more serious hazards may be taken for granted. Housekeeping is not just cleanliness. It is a process to create more productive people and more productive companies through motivation, education, and practice. One of the basic elements of good housekeeping is to check that the tools and equipment are functional. Inspection of tools should be done periodically in order to detect faulty equipment. Well-maintained tools and machinery prevent accidents from happening. Housekeeping is essential to protecting the health and safety of employees and customers. Safe housekeeping practises can prevent injuries such as trips and falls.
3. The first and foremost safety tip is to keep your workstation clutter-free. Clutter will not only hinder your ability to work efficiently but it also poses a serious threat to your safety. One of the safety training modules covered at your workplace would be the fire drill, to get you accustomed in finding your way towards emergency exits. Familiarize yourself with the hazard zones of your workplace and take prompt action if you find something wrong in such high-risk zones. It is important to identify areas that can accumulate dust and clean those areas regularly using industrial grade vacuum cleaners. Protective gears protect employees from exposure to harmful substances. Protective gear includes but not limited to helmets, protective clothing, safety goggles, gloves etc.

B. State whether True/False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. 30
2. Hygiene

D. Multiple Choice Questions

1. d) Both a and b
2. a) Crumpled cloths



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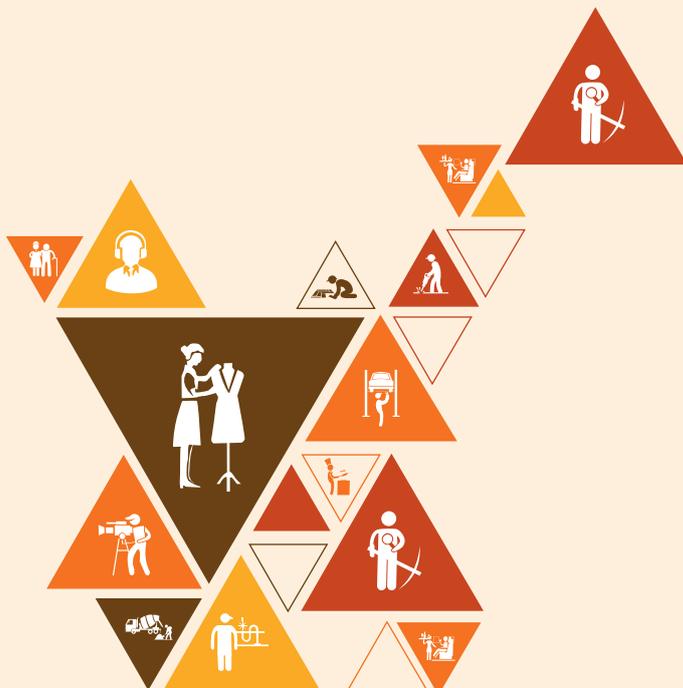
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10. Safety and Emergency Procedures

Unit 10.1 - Safety Guidelines and Checks

Unit 10.2 - Hazards at Workplace



AGR/N9903

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Describe how to adhere to safety guidelines.
2. Show how to administer appropriate emergency procedures.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. List the PPE required at the workplace. 2. Describe the commonly reported hazards at the workplace. 3. Describe the hazards caused due to chemicals/pesticides/fumigants. 4. Describe the basic safety checks to be done before the operation of any equipment/machinery. 5. Describe the common first aid procedures to be followed in case of emergencies. 6. State measures that can be taken to prevent accidents and damage s at the workplace. 7. Explain the importance of reporting details of first aid administered, to the reporting officer/doctor, in accordance with workplace procedures. 8. State common health and safety guidelines to be followed at the workplace. 	<ol style="list-style-type: none"> 1. Check various areas of the workplace for leakages, water-logging, pests, fire, etc. 2. Demonstrate how to safely use the PPE and implement it as applicable to the workplace. 3. Display the correct way of donning, doffing and discarding PPE such as face masks, hand gloves, face shields, PPE suits, etc. 4. Sanitize the tools, equipment and machinery properly. 5. Demonstrate the safe disposal of waste. 6. Demonstrate procedures for dealing with accidents, fires and emergencies. 7. Demonstrate emergency procedures to the given workplace requirements. 8. Demonstrate the use of emergency equipment in accordance with manufacturers' specifications and workplace requirements. 9. Demonstrate the administration of first aid. 10. Prepare a list of relevant hotline/ emergency numbers.

UNIT 10.1: Safety Guidelines and Checks

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate how to safely use the PPE and implement it as applicable to the workplace.
2. Display the correct way of donning, doffing and discarding PPE such as face masks, hand gloves, face shields, PPE suits, etc.
3. Sanitize the tools, equipment and machinery properly.
4. Demonstrate the administration of first aid.
5. Prepare a list of relevant hotline/ emergency numbers.
6. Demonstrate emergency procedures to the given workplace requirements.
7. Demonstrate the use of emergency equipment in accordance with manufacturers' specifications and workplace requirements.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant images of different personal protective equipment.

Activity

Purpose : To acquaint the participants about ways to maintain workplace safety.

Resources : Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology : Group discussion for about 20-30 minutes.

Prepare the participants for healthy group discussion. Make a groups of 4-5 participants and allot them one personal protective equipment's (PPE). Ask them to discuss about their role, use and how it helps in protection. Show participants various tools and equipment and explain how to sanitise them.

Expected outcomes :

- Knowledge about personal protective equipment
- Knowledge enhancement in first aid

Say

- Thank you to everyone for their participation.
- Describe the objective of above activity.

Ask

- Ask participants about their experience of using face mask.
- Ask participants whether they know any emergency numbers.
- Ask participants if they are aware of the first aid kit.

Explain

- Explain proper ways of donning, doffing and discarding various personal protective equipment (PPE).
- Explain the importance of sanitizing equipment and machinery at workplace.
- Explain different first aid treatment in emergencies.

Elaborate

- Elaborate how to sanitize the tools, equipment and machinery properly.
- Elaborate the use of various emergency equipment and emergency procedures at workplace.

Activity

This activity may be planned for 30-40 minutes. Ask participants about their experience of using first aid kit in emergency. Discuss about emergency equipment's and how to use different emergency equipment.

Notes for Facilitation

- Assist all groups to systematically arrange collected information and analyse them when required.
- Constantly motivate each student to participate. Arrange award for group involvement, presentation skills, use of tools etc.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. The foundation for a safe work environment is an effective accident prevention and wellness program. Educate employees and management staff about safety standard. Personal protection equipment is essential and should be enforced at hiring, meetings, and with spontaneous monitoring. Take time to teach employees how to properly use goggles, face protection, gloves, hard hats, safety shoes, and earplugs or ear muffs. After initial training, reinforce safety measures at every opportunity, i.e. staff meetings, supervision, and education. Reward employees who abide by setting standards or staying injury free for a specified amount of time.

You can prevent accidents in the workplace by maintaining a clean, organized environment. Make cleaning procedures a part of employees' regular responsibilities. Ensure work areas are free of clutter, spills and tripping hazards like loose rugs or wiring. A safety officer is responsible for determining risks, developing a safety plan, implementing safety procedures and enforcing policies. They can also make sure your company complies with all state and federal safety regulations for your industry.

2. Check that the machine is complete, with all safeguards fitted, and free from defects. The term 'safeguarding' includes guards, interlocks, two-hand controls, light guards, pressure-sensitive mats etc. Produce a safe system of work for using and maintaining the machine. Maintenance may require the inspection of critical features where deterioration would cause a risk. They should also look at the residual risks identified by the manufacturer in the information/instructions provided with the machine and make sure they are included in the safe system of work. Ensure every static machine has been installed properly and is stable. Choose the right machine for the job and do not put machines where customers or visitors may be exposed to risk.
3. Helmets are used to reduce the force of lateral impact resulting from a blow which may be received off-centre, from the side, or to the top of the head. Hats are considered for general use and offer protection against low-voltage electrical conductors up to 2,200 volts (phase to ground). Bump caps provide excellent protection against accidental impact with fixed objects, such as exposed pipes or beams. To protect from pesticides wearing PPE can significantly reduce the potential for dermal, inhalation, eye, and oral exposure, and thereby significantly reduce the chances of a pesticide poisoning.

B. State whether True/False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. Liability
2. Work

D. Multiple Choice Questions

1. c) Both a and b
2. d) All of the above

UNIT 10.2: Hazards at Workplace

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Check various areas of the workplace for leakages, water-logging, pests, fire, etc.
2. Demonstrate the safe disposal of waste.
3. Demonstrate procedures for dealing with accidents, fires and emergencies.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant pictures of hazards at workplace.

Activity

Purpose: To acquaint the participants about waste disposal.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for about 15-20 minutes.

Make groups of 4-5 participants. Arrange a group discussion on importance and various methods of waste disposal. You act as a moderator and drive the discussion to achieve set outcome. Then try to align the thoughts and discuss the both sides of coin. Demonstrate various procedures for dealing with accidents, fires and emergencies.

Expected outcomes:

- Introduction and knowledge enhancement of waste disposal methods.

Say

- Thank you to everyone for their participation.

Ask

- Ask participants about whether they have seen any leakage pest attack at workplace.
- Ask participants about whether they know how to use fire extinguisher.

Explain

- Explain different areas of the workplace for water-logging and fire.
- Explain the purpose of safe disposal of waste.

Elaborate

- Elaborate procedures of different methods of waste disposal.
- Elaborate procedures for dealing with accidents and other emergencies.

Activity

Plan this activity for 20-30 minutes. Plan a group activity in which one group is attacked by fire and the other participants assist them in escaping; you have to assist them in completing this activity successfully. The purpose of this activity is to teach participants how to act in the situation when a fire attack.

Notes for Facilitation

- Indicate potential source of information to each of the group.
- Assist all groups to systematically arrange collected information and analyse them when required.
- You may invite fire brigade officer to give instructions on what to do if we get trapped in a fire.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Different types of chemical hazards are asphyxiants, corrosives, irritants, sensitizers, carcinogens, mutagens, teratogens, reactive and flammable.
2. A pesticide is any substance that is used to prevent, destroy, or repel pests from causing damage. Most pesticides have a major site of action in the nervous and endocrine systems, making them potentially toxic to humans with serious direct or indirect adverse health effects. Pesticides can cause short-term adverse health effects, called acute effects, as well as chronic adverse effects that can occur months or years after exposure.
3. Examples of acute health effects are stinging eyes, rashes, blisters, blindness, nausea, dizziness, diarrhoea and death.

B. State whether True/False (T/F)

1. True
2. True
3. True

C. Fill in the Blanks

1. Pesticide
2. Fumigants

D. Multiple Choice Questions

1. d) Both a and b
2. d) Both a and b



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11. Process of Carrying out Cultivation of Rose Flower

Unit 11.1 - Site Selection

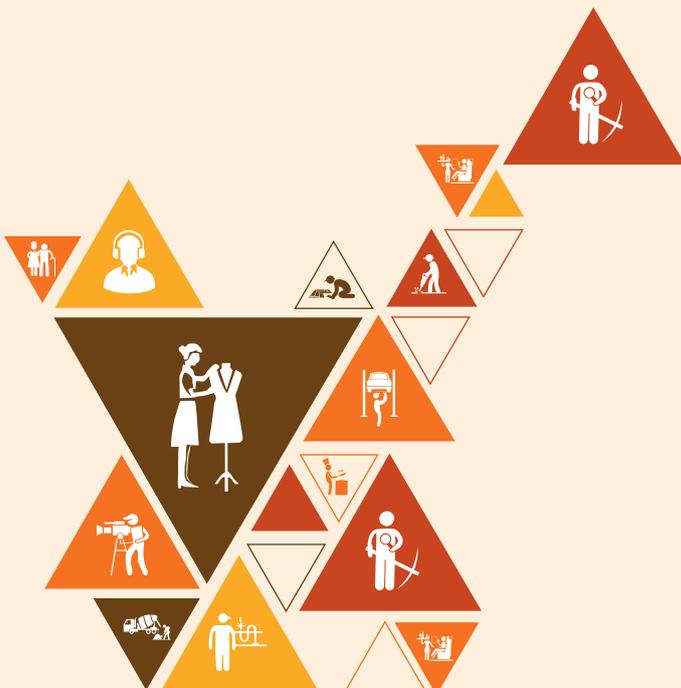
Unit 11.2 - Varietal Selection and Propagation Methods

Unit 11.3 - Irrigation, NUtrient and Weed Management

Unit 11.4 - Pruning and other Intercultural Operations

Unit 11.5 - Pest and Disease Management

Unit 11.6 - Harvesting and Post-Harvest Management



AGR/N0719

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Describe the process of selecting the site and preparing the soil.
2. Describe the process of selecting the rose variety and propagation method.
3. Demonstrate the process of harvesting and transplanting the saplings.
4. Describe the process of maintaining the rose plants.
5. Demonstrate the process of carrying out harvesting and post-harvest management.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the criteria for selecting a site for rose crop cultivation. 2. State the recommended soil characteristics required for the cultivation of rose. 3. Explain the criteria for selecting an appropriate variety of roses to be grown according to the region. 4. Describe different methods of propagating rose saplings, such as seeding, budding, cutting, etc. 5. Explain different signs of pests and disease infestation in rose plants and their recommended treatment. 6. Explain the importance and process of pruning rose plants. 7. Explain the importance and process of carrying out weeding to remove unwanted plants growing among rose plants. 8. State the recommended quantity of water to irrigate the rose plants and the applicable irrigation schedule. 9. State the recommended organic and inorganic fertilisers to be used for the rose crop. 10. Explain the importance and process of defoliation to induce flowering in rose plants. 11. Explain the indicators of the readiness of rose flowers for being harvested. 12. Explain the use of appropriate implements such as secateurs for harvesting the rose flowers. 13. Explain the importance of ensuring no damage to flowers during harvesting. 	<ol style="list-style-type: none"> 1. Demonstrate how to mix sand and farmyard manure in the soil in the quantity recommended for the rose flower crop. 2. Demonstrate the process of harvesting the rose saplings from the nursery bed when they are ready for being transplanted. 3. Demonstrate the process of transplanting rose saplings in the field at the recommended planting density, protecting them from damage. 4. Demonstrate the process of applying the recommended organic and inorganic fertilisers to the rose saplings appropriately and water them with the required quantity immediately after transplanting. 5. Demonstrate the process of applying the recommended pesticide or insecticide as per the prescription. 6. Demonstrate the process of carrying out pruning of rose plants using the appropriate implements. 7. Demonstrate the process of carrying out weeding regularly to remove unwanted plants growing among rose plants. 8. Show how to water the rose plants with the recommended quantity as per the irrigation schedule. 9. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity. 10. Demonstrate the process of carrying out defoliation according to the rose variety to induce flowering.

Theory	Practical
<p>14. State the recommended temperature and humidity for storing the harvested rose flowers.</p> <p>15. Explain the applicable criteria for sorting and grading the harvested rose flowers.</p>	<p>11. Demonstrate the process of harvesting rose flowers, ensuring no damage to the flowers and plants.</p> <p>12. Show how to collect the harvested rose flowers in appropriate baskets or crates.</p> <p>13. Show how to sort and grade rose flowers on the basis of applicable parameters.</p> <p>14. Demonstrate the process of preparing and applying the preservative solution to the rose flowers to preserve their freshness.</p> <p>15. Demonstrate the process of bunching and packing rose flowers.</p> <p>16. Prepare a sample manual and/ or electronic record of harvesting and processing of rose flowers using the physical registers and/ or the relevant computer application.</p>

UNIT 11.1: Site Selection

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate how to mix sand and farmyard manure in the soil in the quantity recommended for the rose flower crop.
2. Demonstrate the process of transplanting rose saplings in the field at the recommended planting density, protecting them from damage.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of different organic manure mixtures.

Activity

Purpose: To acquaint the participants about potting mixture preparation.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: individual activity and demonstration for about 60 minutes.

Ask participants to find out nutrient composition of farmyard manure and find out other organic manures which can be used in soil mixture preparation. Prepare a report on different readymade soil mixtures available in market. Demonstrate how transplant the rose saplings in the field at the appropriate planting density and how to protect saplings from damage in field.

Expected outcomes:

- Skilling in soil mixture preparation before planting.
- Knowledge about sapling transplanting[add]

Say

- Thank you to everyone for their participation.
- Review the report of each participants and enrich the same with your valuable information.

Ask

- Ask the participants whether they have visited any commercial rose crop field.
- Ask participants whether know factors considered while selecting a site.

Explain

- Explain participants about role and importance of farmyard manure in soil mixture in terms of soil texture and nutrient composition.
- Explain participants about correct stage of transplanting.

Elaborate

- Elaborate the recommended quantity of sand and farmyard manure in soil for healthy crop growth of rose flower crop.
- Elaborate the process of transplanting rose plant in the field at recommended spacing.

Activity

This pen and paper activity is for preparing participants to learn about planting density of rose. Plan this activity for at least 20-30 minutes.

Ask participants to find out planting density of rose which vary according to varieties, growth habit. Ask participants to a search on website how proper spacing avoid damage to the crop in terms of attack of pest and diseases.

Notes for Facilitation

- Encourage participants for group discussion to ask question so that they can clear their doubts.
- Provide complete notes on protection of crops from damage.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Rose prefers bright sunshine for the whole day, if not at least for the normal part of the day i.e., the forenoon. Sunshine for six hours is ideal for better growth and flowering. The plants should be free from shades of trees and protected from the strong winds. As light raises the leaf temperature, the leaves respond by opening the stomata to allow a higher evaporation in order to cool down. This process also increases the water transport, enabling nutrients, necessary for plant growth, to be distributed through the plant.
2. Plough the land 4-5 times thoroughly during May followed by 15 days exposure to sun rays. For rose cultivation, pits of size 45 cm X 45 cm X 30 cm are prepared for plantation of rose plantlets. After exposure to sun rays for 15 days the pits are refilled with soil-manure mixture in the following composition.
3. Site selected should receive good amount of sunshine as plenty of sunshine is required for the proper growth of the plants. Crop field should a little away from the other plantations and plants to avoid root competition. Presence of moisture increases the occurrence of powdery mildew adversely affecting the plants and flower quality. Therefore plants should not be grown in shades. Plants can be easily damaged by strong winds and thereby needed to be protected from the direct wind. Planting windbreak trees without interfering the sunlight can be useful. Roses are also highly susceptible to water logged condition hence, proper drainage is very important.

B. State whether True or False (T/F)

1. False
2. True
3. False

C. Fill in the Blanks

1. 45cm x 45cm x 30 cm
2. 16-17 °C

D. Multiple Choice Question

1. a) 15-27 °C
2. a) 8 hours

UNIT 11.2: Varietal Selection and Propagation Method

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of harvesting the rose saplings from the nursery bed when they are ready for being transplanted.
2. Demonstrate the process of applying the recommended organic and inorganic fertilisers to the rose saplings appropriately and water them with the required quantity immediately after transplanting.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant video of propagation method.

Activity

Purpose: To acquaint the participants about techniques of sapling harvesting.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for about 15-20 minutes.

Arrange a visit to nearby rose nursery and ask participants to perform harvesting activity and observe factors to be considered while harvesting like days after planting and plant height. After that ask them to prepare a visit report.

Expected outcomes:

- Efficient sapling handling.
- Knowledge enhancement

Say

- Thank you to everyone for their participation.
- Discuss the objective of above activity.

Ask

- Ask the participants whether they have any experience handling sapling of different varieties.
- Assess the participants' knowledge of the ideal irrigation timing.
- Ask participants on whether fertilising saplings is suitable.

Explain

- Explain participants about the need of providing water to saplings at the appropriate time.
- Explain participants about process various organic fertilizer used immediately after transplanting.

Elaborate

- Elaborate different methods and process of watering the rose plants.
- Application of recommended organic and inorganic fertilisers to the rose saplings.

Activity

This pen and paper activity is for preparing participants to learn efficient management of fertilizer. Plan this activity for at least 20-30 minutes.

Ask participants to gather a list of several organic and inorganic fertilisers and evaluate the composition of the nutrients in each one. Find out what nutrients a sapling needs as well as which fertilisers are best for them.

Notes for Facilitation

- Help the participants to complete all the tasks involved in the participant hand book.
- Discuss with them regarding the process of harvesting of sapling and its care.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. *Pusa Alpina*

- It is a Floribunda type variety of rose. Flowers are compact, light pinkish in colour and have high fragrance. It is a recurrent flowering and floriferous variety. Directly propagated by semi hard wood cuttings. Ideal for loose flower production and the fragrant flowers can be used for garland preparation. Average yield is 70 q/ha.

• *Pusa Mahak*

- It belongs to Hybrid Tea variety of rose. Flowers are dark pinkish in colour. Outstanding fragrance. Recurrent/repeat flowering and floriferous variety. Propagated by semi hard wood cutting. Suitable for garden display and for floral arrangements. 50-60 flowers/plant

2. Steps in budding

- When a rose plant comes into flower small swellings are visible between the stem and stalk of the leaf.
- Select the eyes which are plump and not started to elongate and grow.
- Cut off the portions of the branch with the eyes selected is called as 'bud wood' with a budding knife remove a shield shaped piece of the bark and the eye.
- The Root stock should be kept ready by cutting the branches and side shoots which are not required.
- Make a sharp horizontal cut at a suitable height in the stock and then make a vertical 'T' shaped cut in the stem of the stock.
- The 'eye' should point towards the top and is tied with fibre.

3. Varieties of Hybrid Tea

Red: First Red, Happiness, Raktagandha, Black Lady, Montezuma etc.

Orange: Super Star, Summer Hoilday, President and Grand Gala

Yellow: Gold Medal, Golden Star, Golden Time, Yellow Success, Pusa Sonia.

Scented: Granda, Blue Perfume, Eiffel Tower, Oklahoma

Bi-colour: *Mudhosh, Supriya, Abhisarika, Kiss of Fire, Tata Centenary.*

B. State whether True or False (T/F)

1. True
2. True
3. True

C. Fill in the Blanks

1. Hybrid and Floribunda
2. Mist chamber

D. Multiple Choice Questions

1. b) Hybrid Tea
2. c) Air layering

UNIT 11.3: Irrigation, Nutrient and Weed Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of carrying out weeding regularly to remove unwanted plants growing among rose plants.
2. Show how to water the rose plants with the recommended quantity as per the irrigation schedule.
3. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals various weeds in rose cultivation.

Activity

Purpose:

- To acquaint the participants about effects of weed on crop growth.
- To understand participants about integrated weed management.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for 30-40 minutes.

Tell participants to collect photograph of weeds grown in surrounding area and their local names and prepare a weed album of it. Ask participants to identify weeds having similar growth habit like rose and compete with rose for nutrient and water uptake. [change in location] Show some videos to participants about different methods of irrigation and how to apply organic and inorganic fertilizers to rose plants.

Expected outcomes:

- Efficient weed management in rose crop.
- Awareness about mimicry weed.

Say

- Thank you to everyone for their participation.
- Discuss the objective of above activity.

Ask

- Ask participants to whether they know any weedicide available in market.
- Ask the participants about different irrigation method and most commonly used method for rose.

Explain

- Introduce participants to the different weedicide used to remove weeds in field.
- Explain methods of fertilizer application and its frequency.

Elaborate

- Elaborate the different methods of carrying out weeding regularly.
- Elaborate recommended quantity of water as per the irrigation schedule.

Activity

This pen and paper activity is for preparing participants to learn about water requirement, organic and inorganic fertilizer. Plan this activity for at least 20-30 minutes.

Find out the water requirement of rose crop according to growth stage, season and prepare a irrigation schedule. You must assist participants in preparing the schedule.

Ask participants to collect information on different types of organic, inorganic fertilizer used and methods of fertilizer application in rose.

Notes for Facilitation

- Help participants to prepare power point presentation.
- Encourage participants to undergo filed visits and how they can learn more through these visit.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Irrigation management in rose.

- Frequency and duration of irrigation will depend on weather conditions and soil texture. Roses do best when 50% of available water is depleted between irrigations. Mulches help to decrease water loss from the soil through evaporation and may enhance growth of the root system.
- Twice a week during October to March, Thrice a week during April to June. No irrigation is required during the rainy season. Generally, a rose plant requires water at 8-10 l/m² a day. Water quality should be pH: 6.5 – 7.0, EC 0.5 – 1 ms/ cm.
- After plantation, irrigate the plants with the micro-sprinkler system for four weeks to help uniform root development of the plant, after four weeks that gradually change to drip irrigation. In hot summer sprinkler systems can be used to maintain optimum humidity.

2. Rose Mix can be prepared as:

- Neem cake - 5 kg
- Bonemeal - 5 kg
- Ammophos - 2 kg
- Sulphate of Ammonia - 1 kg
- Superphosphate - 2 kg
- Potassium Sulphate - 1kg

3. Chemical method is economical, convenient and efficient in eradicating weeds by one or two applications. E.g.: 2, 4-D @ 2 kg 1600 litre per hectare (before flowering) controls broad leaved weeds. Nitrofan @ 9 lb/ai / acre gave 95% control. Effective control of broad leaved weeds by spraying with 2,4-D, at the rate of 2 kg/600 l of water/hectare 25–30 days before flowering followed by cultivation of soil to a depth of 6-10 cm. Mulching 2 to 4 inches of organic material like wood chips if found to reduce annual weeds and make hand weeding easier.

D. State whether True or False (T/F)

1. False
2. False
3. False

C. Fill in the Blanks

1. Mulch

2. Glyphosate

D. Multiple Choice Questions

1. 5 kg
2. Oryzalin

UNIT 11.4: Pruning and other Intercultural Operations

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of carrying out pruning of rose plants using the appropriate implements.
2. Demonstrate the process of carrying out defoliation according to the rose variety to induce flowering.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant video of how to do pruning and implements used for it.

Activity

Purpose:

- To acquaint the participants about purpose of pruning and defoliation.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for 30-40 minutes.

Ask participants to collect implements used for pruning and defoliation. Identify rose plant which needs pruning. You need to demonstrate process of carrying out pruning and defoliation in rose after that ask participants to do the same. Ask them to perform same procedure of pruning at home.

Expected outcomes:

- Skilling in pruning of rose crop.
- Awareness about implements used for pruning.

Say

- Thank you to everyone for their participation.
- Evaluate the pruning activity performed by participants.

Ask

- Ask the participants about objective of pruning.
- Ask the participant about their experience of pruning.
- Ask participants about defoliation.

Explain

- Explain the season of pruning and defoliation in rose.
- Explain the purpose of defoliation according to the variety.

Elaborate

- Elaborate participants about steps in pruning.
- Elaborate participants about process of carrying out defoliation to induce flowering.

Activity

This is a self-learning activity to enhance knowledge on intercultural operation followed in rose cultivation.

Let the participants find out various inter cultural operations performed in rose. Prepare a list of rose varieties in which defoliation practice is followed.

After that participants can prepare chart and all can discuss together about it. This exercise can help the participants to get in depth about the various practices followed in rose.

Notes for Facilitation

- Help the participants to complete all the exercises mentioned in the participant's handbook.
- Encourage participants for group discussion.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Remove dead, diseased or damaged wood and branches that grow towards the centre of the plant.
Also remove the weakest crossed branch and sucker growth (growth coming from below the bud union). Shape the plant. Make a cut at 45 degree angle $\frac{1}{4}$ inch above an outward facing bud.
2. All weak shoots are bent down to fill any area void of foliage and thus attain a desirable leaf area index to optimize photosynthetic potential and facilitate the transport of sugar to the developing shoots. Two practical benefits of the arching technique is that the annual cut back is eliminated and roses are grown at working level height. Bending is necessary for keeping enough leaves on the plant which are required for production of carbohydrates.
3. The practice of disbudding applied to roses can produce some impressive results in the size and quality of the bloom. This is how you get those large flowered, long-stemmed roses. When disbudding for one bloom to a stem roses, such as hybrid teas, you remove the side buds that develop at the leaf axels below the main bloom. The disbudding must be done regularly and also as soon as possible in order to avoid large wounds in the upper leaf axil.

B. State whether True or False (T/F)

1. False
2. True
3. False

C. Fill in the Blanks

1. Deadheading
2. Insects

D. Multiple Choice Questions

1. c) 3 %
2. d) All of the above

UNIT 11.5: Pest and Disease Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of applying the recommended pesticide or insecticide as per the prescription.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which can illustrate various pest and diseases of rose.

Activity

Purpose: To identify different pest and diseases of rose crop.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 15-20 minutes.

Expected outcomes:

- Awareness about various pest and diseases.
- Efficient management

Participants can be accompanied to the nearby rose cultivation field, there they can observe different pest and diseases in that field. They can ask few questions to farmer like

- What are the serious pest and diseases of rose?
- How they control pest?
- How to differentiate between bacterial and fungal diseases?
- Which varieties are resistance to pest?

Say

- Thank you to everyone for their participation
- Describe the objectives of the above activity.

Ask

- Ask the participants whether they know difference between insect and pest.
- Ask participants whether they have seen any pests attacking their rose plants at home.

Explain

- Explain the different types of pesticide or insecticide used for rose plant.
- Explain the banned pesticide in India.

Elaborate

- Elaborate the process of applying the recommended pesticide or insecticide as per the prescription.

Activity

This pen and paper activity is for preparing participants to learn control measures of various pest. Plan this activity for at least 20-30 minutes.

- Ask participants to prepare a list according to type of disease and pest attack, which type of control measure to be followed such as spraying, drenching and dusting.
- Prepare a list of trade name of various pesticides or insecticide available in the market

Notes for Facilitation

- Assist all the groups to collect the information and analyse them when required.
- Constantly motivate student to participate.
- Invite any successful rose crop grower to share his experiences.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. The drying up and blackening of pruned shoots start from top to downwards. The stems become black and die. At the point where dry and healthy twigs meet, there appears brown lining and also black spots appear at these places. The conditions favourable for the prevalence of the disease includes application of large fertilizers and manure, excessive irrigation and poor drainage facility, incidence of stem borer, continuous incidence of mites, less light penetration.

Control measure – For control measure the infected portion should be removed and burnt and the cut ends should be painted with Bordeaux paste. Application of optimum dose of fertilizer and by facilitating proper drainage or spray of 3g/ litre of Copper oxychloride (50%).

2. Control measure of Aphid - Affected flowers and buds should be lightly dusted in the mornings or evenings with 9.2% Pyro dust or spray Nuvacron, Metacid etc. Nicotine sulphate solution is, however, specific in controlling aphids. This can be effectively controlled by spraying 0.1% Malathion or Metasystox (0.1- 0.2%) or Rogor (0.1-0.2%).
Control measure of Thrips - Spraying of Metacid, Rogor or Acephate or Profenofos or Ethofenprox or Imidacloprid at 0.05%.
3. Dieback is a very serious disease of roses and appears after pruning. The drying up and blackening of pruned shoots start from top to downwards. The stems become black and die. At the point where dry and healthy twigs meet, there appears brown lining and also black spots appear at these places. The conditions favourable for the prevalence of the disease includes application of large fertilizers and manure, excessive irrigation and poor drainage facility, incidence of stem borer, continuous incidence of mites, less light penetration.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Thrips
2. Rust

D. Multiple Choice Questions

1. b) Die back
2. c) Both a and b

UNIT 11.6: Harvesting and Post-Harvest Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of harvesting rose flowers, ensuring no damage to the flowers and plants.
2. Show how to collect the harvested rose flowers in appropriate baskets or crates.
3. Show how to sort and grade rose flowers on the basis of applicable parameters.
4. Demonstrate the process of preparing and applying the preservative solution to the rose flowers to preserve their freshness.
5. Demonstrate the process of bunching and packing rose flowers.
6. Prepare a sample manual and/ or electronic record of harvesting and processing of rose flowers using the physical registers and/ or the relevant computer application.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of various post-harvest activities.

Activity

Purpose: To acquaint the participants about harvesting techniques of rose flower.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan group discussion for about 15-20 minutes.

Arrange the session in nearby rose field so that participants can perform the various operations like harvesting, sorting and grading.

Ask participants to note down different harvesting stages of rose depend on distance of market. Ask participants to find and prepare a list of sorting and grading standards of rose flower. Demonstrate how to bunch flowers and various packaging material used.

Expected outcomes:

- Awareness about different harvesting stages of rose.
- Efficient sorting and grading.

Say

- Thank you to everyone for their participation.
- Discuss with the participants to share their feelings about this exercise.

Ask 

- Ask the participants to share their experience of field visit.
- Ask the participants whether they know how to do bunching and packaging.
- Ask to how to keep the records.

Explain 

- Introduce participants to the various packaging material used for rose flowers.
- Explain participants about purpose of preservative solution used in rose flowers.

Elaborate 

- Elaborate the different parameters used for grading and sorting.
- Elaborate the various chemical preservative solution.
- Elaborate the computer applications used in record keeping.

Activity 

Ask participants to prepare a sample manual or electronic record of harvesting and processing of rose flowers using the physical registers or computer application and guide them to prepare it successfully.

Notes for Facilitation 

- You can ask participants to identify different packaging material.
- Encourage the participants to undergo field visits and how they can learn more through these visits.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. After initial planting in July- August rose starts blooming from October and the plant will yield on an economic scale for 3 years. Buds must be cut out from the plant by a sharp knife or secateurs during the cool hours to keep them fresh. Roses should be harvested at the tight bud stage when one or two petals begin to unfold. When the bud shows full colour but the petals have not yet started unfolding.
Loose flowers are harvested only when they are fully opened.
2. The graded cut flowers have to be packed in corrugated cardboard boxes. The buds are wrapped with corrugated paper. The size of the boxes varies with the quality and quantity of roses packed. A box of 100 cm length x 32.5 cm width and 6.5 cm height will accommodate 80 roses of 65-70 cm long stem. The inside area of the box is lined with thin polythene film and very fine newspaper. Moist tissue papers are spread out end to end of the box to provide a cushion to blooms. The blooms are generally packed in bundles of 20 each and bundles are tied with string or rubber band
3. All the inferior stems and those infested with pests and diseases are removed. The flowers are sorted to different grades manually or automatic graders. The flowers which are in uniform stem length and developing flower buds should be grouped together at the time of cutting and kept them in separate container. Long stemmed varieties are graded from 40 cm onwards with a difference of 10 cm. The short stemmed varieties are graded from 40-65 cm with a difference of 5 cm. For easy handling the basal foliage and thorns may be removed up to 20 cm at the time of cutting of the flowers.

B. State whether True or False (T/F)

1. False
2. False
3. True

C. Fill in the Blanks

1. 20
2. Tight bud stage

D. Multiple Choice Questions

1. c) 3 °C
2. a) 6-8 hours



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12. Process of Carrying out Cultivation of Gerbera Flowers

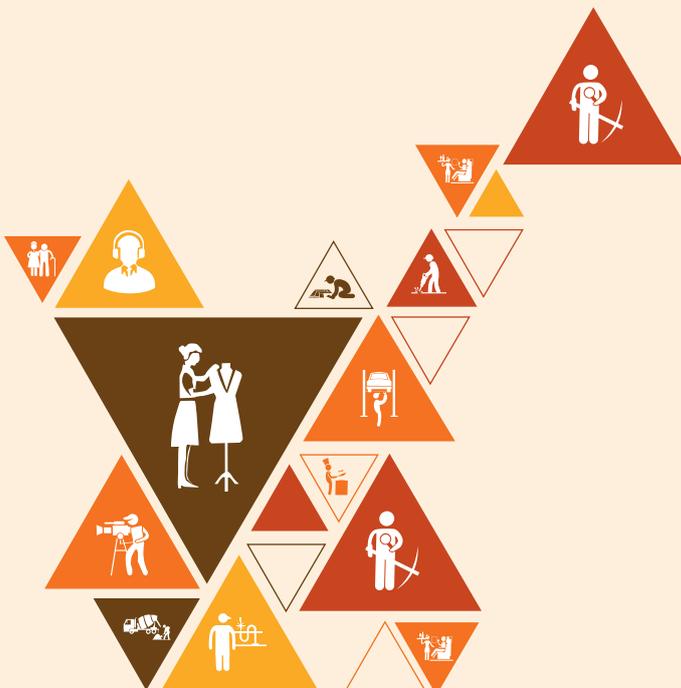
Unit 12.1 - Site Selection

Unit 12.2 - Varietal Selection and Propagation Methods

Unit 12.3 - Planting, Irrigation and Weed Management

Unit 12.4 - Pest and Diseases Management

Unit 12.5 - Fertilizer, Harvesting and Post-Harvest Management



AGR/N0720

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Describe the process of selecting the site and preparing the soil.
2. Describe the process of selecting the gerbera variety and propagation method.
3. Demonstrate the process of propagating, harvesting and transplanting the saplings.
4. Describe the process of maintaining the gerbera plants.
5. Demonstrate the process of carrying out harvesting and post-harvest management.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the criteria for selecting a site for gerbera crop cultivation such as temperature, shading, ventilation, etc. 2. State the recommended soil characteristics required for the cultivation of gerbera. 3. Explain the criteria for selecting the appropriate variety of gerbera to be grown according to the region. 4. Explain the importance of mixing sand and farmyard manure in the soil in the quantity recommended for gerbera flower crop. 5. Describe different methods of propagating gerbera saplings such as seeding, or cutting of side shoots and suckers. 6. Explain the importance of protecting the gerbera saplings from excessive heat and strong winds. 7. State the immediate care to be given to saplings after being transplanted. 8. Describe the process of installing support for gerbera plants and training them. 9. State the recommended irrigation schedule for gerbera plants. 10. Explain the importance and process of weeding out unwanted plants growing among gerbera plants. 11. Explain different signs of pests and disease infestation in gerbera plants and their recommended treatment. 12. Explain the importance of pruning gerbera plants at appropriate intervals. 13. State the recommended organic and inorganic fertilisers to be used for the gerbera crop. 	<ol style="list-style-type: none"> 1. Demonstrate how to disinfect the soil with the recommended chemicals. 2. Demonstrate the process of applying plastic sheet cover on the soil and water it thoroughly after the recommended duration to wash away the disinfectants. 3. Show how to mix sand and farmyard manure in the soil in the quantities recommended for the gerbera flower crop. 4. Demonstrate the process of propagating gerbera saplings in the required quantity in the nursery. 5. Demonstrate the process of harvesting the gerbera saplings from the nursery bed. 6. Demonstrate the process of transplanting gerbera saplings in the field at the recommended planting density. 7. Show how to water the saplings with the recommended quantity and apply fertilisers in an appropriate quantity immediately after transplanting. 8. Demonstrate the process of installing support for the gerbera plants and training them. 9. Show how to water the gerbera plants with the recommended quantity as per the irrigation schedule. 10. Demonstrate the process of carrying out weeding to remove unwanted plants. 11. Demonstrate the process of applying the recommended pesticide or insecticide as per the prescription. 12. Demonstrate the process of carrying out pruning of gerbera plants using the appropriate implements.

Theory	Practical
<p>14. Explain the importance and process of raking the soil in the field to facilitate easy absorption of water and fertilisers, and providing air to the roots.</p> <p>15. State the indicators of the readiness of gerbera flowers for being harvested.</p> <p>16. Explain the use of appropriate implements such as secateurs for harvesting the gerbera flowers.</p> <p>17. Explain the importance of ensuring no damage to flowers during harvesting.</p> <p>18. Explain the importance of maintaining the harvested gerbera flowers in freshly chlorinated water and storing them at the recommended temperature and humidity.</p> <p>19. Explain the applicable criteria for sorting and grading the harvested gerbera flowers.</p> <p>20. Explain the practice of soaking gerbera flower stalks in Sodium Hypochlorite solution for the recommended duration to improve their vase life.</p>	<p>13. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity.</p> <p>14. Show how to rake the soil in the field at the recommended intervals to facilitate easy absorption of water and fertilisers.</p> <p>15. Demonstrate the process of harvesting and collecting gerbera flowers.</p> <p>16. Demonstrate the process of sorting and grading gerbera flowers on the basis of applicable parameters.</p> <p>17. Demonstrate the process of preparing and applying the preservative solution to the gerbera flowers to preserve their freshness.</p> <p>18. Demonstrate the process of bunching the gerbera flowers and packing them using poly pouches and carton boxes in layers.</p> <p>19. Prepare a sample manual and/ or electronic record of harvesting and processing of gerbera flowers using the physical registers and/ or the relevant computer application.</p>

UNIT 12.1 Site Selection

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Show how to mix sand and farmyard manure in the soil in the quantities recommended for the gerbera flower crop.
2. Demonstrate how to disinfect the soil with the recommended chemicals.
3. Demonstrate the process of applying plastic sheet cover on the soil and water it thoroughly after the recommended duration to wash away the disinfectants.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of different manures and procedure of soil disinfestation.

Activity

Purpose: To understand the participants about potting mixture preparation.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion on organic manures for about 15-20 minutes.

Ask participants to research different organic manures that can be utilised to prepare soil mixtures as well as the nutrient composition of farmyard manure after that ask participants to discuss on various organic manures that can be applied and economical for cultivation. Prepare a report on the various ready-made soil mixes that are available. Show some videos to the participants regarding soil disinfestation and have a discussion about it.

Expected outcomes:

- Skilling in soil mixture preparation.
- Introduction to soil disinfestation

Say

- Thank you to everyone for their participation.
- Show your appreciation for the effort they put to perform as a group.

Ask

- Ask participants to find out chemicals used to disinfect soil.
- Ask the participants whether they know how to apply plastic sheet cover on the soil.

Explain



- Explain the various recommended chemicals used in soil disinfestation.
- Explain the purpose of washing away the disinfectants.

Elaborate



- Elaborate the procedure of soil disinfestation.
- Elaborate the process of applying plastic sheet cover on the soil and water it thoroughly after the recommended duration to wash away the disinfectants.

Activity



This activity is for preparing participants to learn about soil treatment. Plan this activity for at least 20-30 minutes.

Ask participants to discuss on different soil treatment used in gerbera flower crop. The best soil treatment for gerbera can then be determined after a group discussion.

Notes for Facilitation



- Encourage participants for group discussion to ask question so that they can clear their doubts.
- Provide complete set of notes on soil disinfestation.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Gerbera grows better in well-drained and porous soil for better root penetration. The gerbera roots can grow up to a depth of 50 - 70 cm. pH required is 5.5 to 6.5
2. Gerbera can tolerate a minimum of 12°C and the maximum of 35 °C temperatures. The optimum night and day temperature range for production of quality flowers is 12 to 18°C and 20-27°C, respectively. The bud initiation stops if the temperature drops below 12°C. High temperatures above 35°C causes bud abortion. The plant should receive light intensity in the range of 35,000 to 40,000 lux.
3. Formalin or formaldehyde @1lit in 10 lit of water is sprinkled 1-2lt/m² on the growing medium layer and covered it with plastic. After one week the plastic should be removed. Hydrogen peroxide@ 35 ml/litre of water (3.5% solution). 1 litre of solution is applied to 1 metre square bed. On the next day gerbera seedlings can be planted.

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. 50 -70 cm
2. 35 °C

D. Multiple Choice Questions

1. c) 12 °C
2. a) 5.5 - 6.5

UNIT 12.2: Varietal Selection and Propagation Methods

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of propagating gerbera saplings in the required quantity in the nursery.
2. Demonstrate the process of harvesting the gerbera saplings from the nursery bed.
3. Demonstrate the process of transplanting gerbera saplings in the field at the recommended planting density.
4. Show how to water the saplings with the recommended quantity and apply fertilisers in an appropriate quantity immediately after transplanting.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant images of gerbera sapling and its harvesting.

Field Visit

- Plan the field visit for practical exposure of participants about gerbera propagation in nursery. The visit may be planned for a day or for 2-3 hours depend on the location.
- Take participants to nearby gerbera plant nursey. If possible arrange practical session with which participants can perform various operations like propagation, watering, harvesting gerbera sapling.

Say

- Thank you to everyone for their participation

Ask

- Ask each participants that write a visit report outlining the main lessons they learned from the nursery visit.

Elaborate

- Elaborate the process of propagation and harvesting of gerbera saplings.
- Elaborate participants in detail about the appropriate planting density for transplanting of gerbera saplings.
- Elaborate the appropriate quantity of water and fertilisers immediately after transplanting.

Activity

This is self-learning activity to enhance knowledge on fertilizers required by sapling after transplanting.

- Let the participants read about different organic and inorganic fertilizers which can be applied to saplings. Content can be retrieved or facilitated from Research Gate, Google Scholar etc.
- After that participants can discuss together about the role of fertilizer on sapling growth. This exercise can help the participants to get in depth about the use of fertilizers.

Notes for Facilitation

- Help the participants to complete all the activities.
- Encourage the participants to ask questions so that they can clear their doubts.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Varieties of gerbera

Colour	Varieties
Red	Red Bull, Ruby Red, Zingaro, Miracle, Yanara, Savannah, Stanza
Yellow	Supernova, Imperial, Dana-ellen, Piton
Pink	Rosalin, Salvador, Pink Elegance, Essence, Prime-rose, Intense
Orange	Dune, Sunset, Sun way, Golianth
White/ Cream	Snow-Flake, Balance, Sylvester, Vital, Shimmer , Dalma, Artist, White house
Peach	Aida, Foske

2. Gerberas are grown on raised bed to assist in easier movement and better drainage. The dimension of bed in which the bed height (45 cm), width of bed (65 cm) and Pathways between beds (30 cm). The proportion of media components is 55-60% soil, 10-15% sand and 30% well decomposed farm yard manure. Rice husk (@ 2.5-4 kg per sq. m) is also added to improve the drainage.
3. Seed is set if cross-pollinated. Sowing of seeds may be done in almost any season. Seeds germinate at 15 to 20°C within two weeks; otherwise, it may take up to 30 days. Plants from seeds will bloom in the second year and produce good flowers from the third year onwards.
Side shoots, with some amount of heel, are utilized. Divisions/ suckers and cuttings are also used.
The plant parts used as explants for micropropagation are Shoot tips, Leaf mid-rib, Capitulum, Flower heads, Inflorescence, and Buds.

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. Tissue Culture
2. Rise husk

D. Multiple Choice Questions

1. a) 30
2. a) Raised bed

UNIT 12.3: Planting, Irrigation and Weed Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of installing support for the gerbera plants and training them.
2. Show how to water the gerbera plants with the recommended quantity as per the irrigation schedule.
3. Demonstrate the process of carrying out weeding to remove unwanted plants.
4. Demonstrate the process of carrying out pruning of gerbera plants using the appropriate implements.
5. Show how to rake the soil in the field at the recommended intervals to facilitate easy absorption of water and fertilisers.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of various operation performed in gerbera cultivation like support to plant, irrigation, weeding etc.

Activity

Purpose: Introduce participants to the various operation performed in gerbera cultivation after transplanting.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for 30-40 minutes.

Participants should split into 5 groups. Give each group one subject to present in front of class. For that ask each group to collect information on their respective subject and present that information in front of class.

The following topics are listed for the presentation:

Irrigation

Weed management

Pruning

Installing support and training of plant

Soil raking

Expected outcomes:

- Knowledge enhancement
- Awareness about various operation performed in gerbera cultivation.

Say

- Thank you to everyone for their participation.
- Discuss the objective of above activity.

Ask

- Inquire about the participants' knowledge of training of gerbera plants.
- Ask the participants whether they know different irrigation methods.

Explain

- Explain participants about purpose and procedure of installing support to the gerbera plants training them.
- Introduce participants to the different weed grown in gerbera cultivation.
- Explain about various tools required for pruning.

Elaborate

- Elaborate the process of weeding to remove unwanted plants.
- Elaborate the irrigation schedule of gerbera crop in different season and pruning of gerbera plants.
- Elaborate how raking the soil will make it easier for water and fertiliser to absorb.

Activity

Plan this activity for 20-30 minutes. Ask the participants to identify the tools required for pruning. Let them try to explain the appropriate use of the same. Explain the principles of pruning gerbera plants.

Notes for Facilitation

- Assist all groups to systematically arrange collected information and analyse them when required.
- Constantly motivate each participants. Arrange award for group presentation based on criteria such as quality, relevancy of content and presentation skills.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Regular weeding should be done every two weeks to keep the gerbera beds weed-free. At the time of weeding rake the soil surrounding the plant every fortnight for absorption of water and fertilisers, and providing air to the roots. use of oxidiazon and oxyflourfen herbicides found beneficial to control weed population.
2. Irrigation water should be checked every two months and optimum level should be maintained. Water quality should be as follows pH: 6.5-7.0, EC: 0.5-1 ms/cm. Immediately after plantation, irrigation should be done by rose-can or sprinkler for three weeks for establishment as well as uniform root development. Irrigation can be given by drip irrigation after the above mentioned period. Generally one dripper per plant with approximately 700 ml per plant/day is required.
3. At the time of planting root-ball should not be disturbed. A third of plug of the Gerbera plant should be above the soil and the remaining two-third below the soil. The crown of seedlings should be 1-2 cm above soil level. Plant spacing should be Row Row = 37.5 - 40 cm. Plant Plant = 30 cm.

B. State whether True or false (T/F)

1. False
2. False
3. True

C. Fill in the Blanks

1. First two months
2. 300-700 ml

D. Multiple Choice Questions

1. c) 30 cm
2. b) oxyflourfen

UNIT 12.4: Pest and Diseases Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of applying the recommended pesticide or insecticide as per the prescription.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which can illustrate various pest and diseases of gerbera.

Activity

Purpose: Introduce participants to various pest and diseases of gerbera crop.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan a group discussion for about 15-20 minutes.

Participants can be taken to a nearby field where gerberas are grown so they can examine various pests and diseases there. They can ask questions to farmers about

What are the serious pest and diseases of gerbera?

How they control pest?

How to identify infested plants?

Which varieties are resistant to pest attack?

After the field visit, ask the participants how many pests and diseases they saw there and discuss about their symptoms.

Expected outcomes:

- Awareness about various pest and diseases.
- Efficient management

Say

- Thank you to everyone for their participation.
- Have a discussion with the participants to find out how they feel about the activity and what they learned.

Ask

- Ask the participants whether they know any pest of gerbera crop.

Explain 

- Explain the different types of pesticide or insecticide used for gerbera plant.
- Explain the banned pesticide in India.

Elaborate 

- Elaborate the process of applying the recommended pesticide or insecticide as per the prescription.

Activity 

This activity is intended to get participants ready to learn about various pest management methods. Plan this activity for at least 20-30 minutes.

Ask participants to create chart that outline the many types of disease and pest attacks, along with the appropriate control measures (such as spraying, drenching, and dusting).

Prepare a list of trade name of various pesticides or insecticide available in the market.

Notes for Facilitation 

- Assist all the groups with collecting and analysing information as needed.
- Provide complete set of notes on this topic.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Root knot Nematode shows symptoms of yellowing of leaves, stunted growth of the plant with reduced leaves size, knots on roots. Water logged conditions in the green house and muddy water during the rainy season are favourable conditions for nematode growth. Soil application of neem cake 30 to 50 gm per plant or carbofuron granules 10 gm per sq. m, drenching with methyl parathion 2 ml or benomyl 3 gm or hydrogen peroxide with Silver 3ml or nematogaurd (Pacealomyces) 5 gm can be done to control the nematode.
2. White powdery fungal growth observed on the leaf lamina. In case of severe attack leaves start curling. For the control spraying of Wetttable Sulphur (SP) 1.5 gm or Karathane (Dinocap) (SP) 0.4 ml or Index (Myclobutanil) (SP) 0.5 gm or Rubigan (Fenremol) (SP) 1 ml or Hydrogen peroxide (SP) 2 ml per lit of water can be used.
3. Crown rot results in wilting disease of gerbera, crown of the plant becomes black. Root rot shows initially dropping of younger leaves, finally wilting of the plant occurs and root skin is easily removed.

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. *Meloidogyne incognita*
2. Water logged

D. Multiple Choice Questions

1. c) Leaf minor
2. d) Both a and b

UNIT 12.5: Fertilizer, Harvesting and Post-Harvest Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity.
2. Demonstrate the process of harvesting and collecting gerbera flowers.
3. Demonstrate the process of sorting and grading gerbera flowers on the basis of applicable parameters.
4. Demonstrate the process of preparing and applying the preservative solution to the gerbera flowers to preserve their freshness.
5. Demonstrate the process of bunching the gerbera flowers and packing them using poly pouches and carton boxes in layers.
6. Prepare a sample manual and/ or electronic record of harvesting and processing of gerbera flowers using the physical registers and/ or the relevant computer application.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant pictures of various post-harvest activities.

Activity

Purpose: To understand the participants about harvesting techniques of gerbera flower.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan group discussion for about 15-20 minutes.

Make arrangements for the session to take place at a nearby gerbera field so that participants can engage in activities like harvesting, sorting, and grading based on various parameter.

After that, encourage participants for group discussion on how different stages of gerbera picking differ depending on how near to the market. Let participants to create a list of grading and sorting standard followed in gerbera.

Expected outcomes:

- Knowledge of the various gerbera harvesting stages.
- Efficient sorting and grading of flowers.

Say

- Thank you to everyone for their participation.

Ask

- Ask the participants to share their experience of field visit.
- Ask the participants whether they know how to do bunching and packaging.
- Ask participants to how to keep the records.

Explain

- Introduce participants to the various packaging material used for rose flowers.
- Explain participants about purpose of preservative solution used in rose flowers.
- Explain participants about different organic and inorganic fertilisers applied to gerbera crop.

Elaborate

- Elaborate the various chemical preservative solution used to increase the vase life pf flower.
- Elaborate the different of parameters used for grading and sorting.
- Elaborate how to prepare a physical register for harvesting and processing of gerbera flowers.

Activity

Plan this activity for 20-30 minutes. Ask participants to create a sample manual or electronic record of the collection and processing of gerbera flowers using physical registers or a computer programme. Assist them in successfully preparing it.

Notes for Facilitation

- Encourage the participants to undergo field visits and how they can learn more through these visits.
- You can ask participants to collect information on different packaging material.



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13. Process of Carrying out Cultivation of Chrysanthemum Flowers

Unit 13.1 - Site Selection

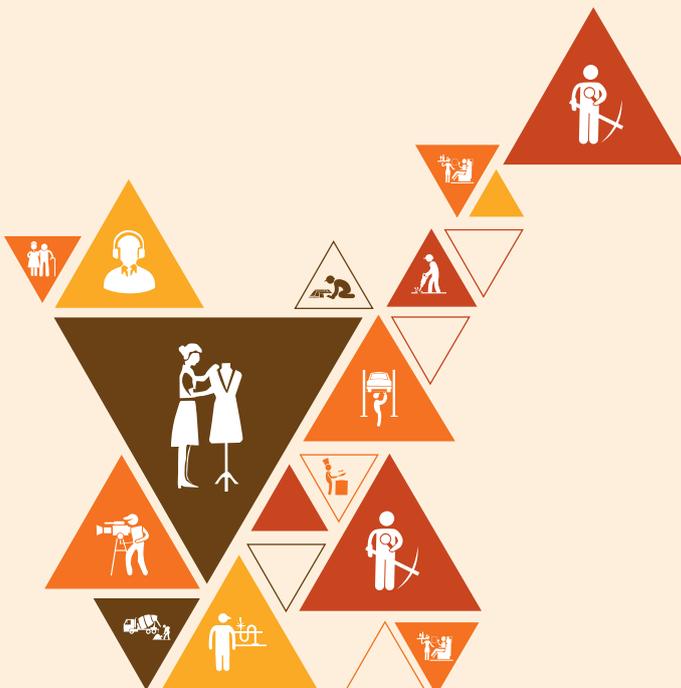
Unit 13.2 - Varietal Selection and Propagation Methods

Unit 13.3 - Irrigation, Fertilizer and Weed Management

Unit 13.4 - Pinching and other Intercultural Operations

Unit 13.5 - Pest and Disease Management

Unit 13.6 - Harvesting and Post-Harvest Management



AGR/N0721

Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Describe the process of selecting the site and preparing the field.
2. Describe the process of selecting the chrysanthemum variety and propagation method.
3. Demonstrate the process of propagating, harvesting and transplanting the saplings.
4. Describe the process of maintaining the chrysanthemum plants.
5. Demonstrate the process of carrying out harvesting and post-harvest management.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the criteria for selecting a site for chrysanthemum crop cultivation such as temperature, relative humidity, adequate exposure to sunlight, etc. 2. State the recommended soil characteristics required for the cultivation of chrysanthemum. 3. Explain the criteria for selecting the appropriate variety of chrysanthemum to be grown according to the region. 4. Explain the importance of mixing sand and farmyard manure in the soil in the quantity recommended for the chrysanthemum flower crop. 5. Describe different methods of propagating chrysanthemum saplings such as terminal cutting or suckers. 6. Explain the importance of protecting the chrysanthemum saplings from excessive heat and strong winds. 7. State the immediate care to be given to saplings after being transplanted. 8. State the recommended irrigation schedule for chrysanthemum plants. 9. Explain the importance and process of weeding out unwanted plants growing among chrysanthemum plants. 10. Explain different signs of pests and disease infestation in chrysanthemum plants and their recommended treatment. 11. Explain the importance of pruning chrysanthemum plants at appropriate intervals. 12. State the recommended organic and inorganic fertilisers to be used for the Chrysanthemum crop. 	<ol style="list-style-type: none"> 1. Demonstrate the process of carrying out ploughing and harrowing in the field using the relevant farm machineries and applying farmyard manure in the recommended quantity. 2. Demonstrate the process of applying the recommended chemicals to the soil as per the prescription to disinfect the soil. 3. Demonstrate the process of applying plastic sheet cover on the soil and water it thoroughly after the recommended duration to wash away the disinfectants. 4. Demonstrate the process of installing the appropriate irrigation or fertigation system in the field. 5. Show how to create drains in the field for effective drainage of water. 6. Demonstrate how to propagate chrysanthemum saplings in the required quantity in the nursery. 7. Demonstrate the process of harvesting the chrysanthemum saplings from the nursery bed when they are ready for being transplanted. 8. Show how to transplant chrysanthemum saplings in the field at the recommended planting density. 9. Show how to water the saplings with the recommended quantity and apply fertilisers in an appropriate quantity immediately after transplanting. 10. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity at appropriate intervals.

Theory	Practical
<p>13. Explain the importance and process of raking the soil in the field to facilitate easy absorption of water and fertilisers, and providing air to the roots.</p> <p>14. Explain the indicators of the readiness of chrysanthemum flowers for being harvested.</p> <p>15. Explain the use of appropriate implements such as secateurs for harvesting the chrysanthemum flowers.</p> <p>16. Explain the importance of ensuring no damage to flowers during harvesting.</p> <p>17. Explain the importance of maintaining the harvested chrysanthemum flowers in freshly chlorinated water and storing them at the recommended temperature and humidity.</p> <p>18. Explain the applicable criteria for sorting and grading the harvested chrysanthemum flowers.</p>	<p>11. Demonstrate the process of applying the recommended pesticide or insecticide as per the prescription.</p> <p>12. Show how to water the chrysanthemum plants with the recommended quantity as per the irrigation schedule and prevailing weather conditions.</p> <p>13. Show how to drain out any water accumulated in the field.</p> <p>14. Demonstrate the process of carrying out pinching to induce the growth of lateral branches and installing appropriate support to train the plants.</p> <p>15. Demonstrate the process of carrying out disbudding, removing buds from the stems of plants and leaving only terminal buds to ensure the growth of large blooms.</p> <p>16. Demonstrate the process of carrying out pruning of chrysanthemum plants using the appropriate implements at regular intervals, removing the side suckers.</p> <p>17. Demonstrate the process of carrying out weeding at the recommended intervals to remove unwanted plants growing among the chrysanthemum plants.</p> <p>18. Show how to harvest and collect chrysanthemum flowers ensuring no damage to them and plants.</p> <p>19. Demonstrate how to sort and grade chrysanthemum flowers on the basis of applicable parameters.</p> <p>20. Demonstrate the process of preparing and applying the preservative solution on the chrysanthemum flowers to preserve.</p>

UNIT 13.1: Site Selection

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of carrying out ploughing and harrowing in the field using the relevant farm machineries and applying farmyard manure in the recommended quantity.
2. Demonstrate the process of applying the recommended chemicals to the soil as per the prescription to disinfect the soil.
3. Demonstrate the process of applying plastic sheet cover on the soil and water it thoroughly after the recommended duration to wash away the disinfectants.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of farm machineries.

Field Visit

Plan the field visit so that participants will have hands-on experience with the machinery needed for field preparation on a chrysanthemum plot. Depending on the location, the visit may be scheduled for a full day or for 2-3 hours.

You must set up a demonstration of soil mixing with farmyard manure. Invite participants to do so as well.

Ask

- Ask the participants to prepare a visit report and indicate key learning points of field preparation.
- Ask the participants whether they have seen any farm machine used for field preparation.

Explain

- Explain participants about chemicals used to disinfect the soil.
- Explain participants about need of fumigation while land preparation.

Elaborate

- Elaborate procedure of applying chemicals to the soil at recommended dose.
- Elaborate the disinfestation of soil and procedure of applying plastic sheet cover on the soil.

Activity

Let the participants read about disinfestation and its impact on soil properties through research paper. Plan this activity for 40-50 minutes.

For details participants can refer to <https://apsjournals.apsnet.org/doi/10.1094/PDIS-09-21-2023-FE>.

Notes for Facilitation

- Indicate potential source of information to participants.
- Assist all participants to systematically arrange collected information and analyse them when ever required.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Artificial lighting is provided to the chrysanthemums after planting, in order to initiate the vegetative growth. Fluorescent or incandescent or high-pressure mercury lamps are used for providing artificial light in the greenhouses. For providing long days, the lights were kept on for four hours usually from 10 p.m. to 2 a.m. on every night; so that long continuous dark period is interrupted and it was divided into two night portions, none of which is long enough (9½ hours) to initiate flower buds.
After attaining sufficient vegetative growth, short days are provided to induce the flowering in treated plants. Short day treatment consisted of complete shading of potted plants or beds for 14h continuous hours i.e. from 5 p.m. to 7 a.m. every day, this treatment is continued till the floral buds of the forced plant started showing colour. Shading was done by facilitating the black alkathene sheet with 150 gauge thickness.
2. Clay and clay loam soils retain too much of moisture and thereby hinder proper aeration, resulting in rotting of roots. Sandy soils drain too quickly and require frequent irrigation and also suffer from loss of nutrients due to leaching. Sandy loam soils are ideal for chrysanthemum growing. Chrysanthemum thrive best in slightly acidic soil with pH ranging between 6.2 and 6.7
3. Photoperiod required for long day conditions with 13 hours light & 11 hours darkness during vegetative stage (upto 4-5 weeks from planting) and short day conditions with 10 hours light & 14 hours darkness during flower bud initiation stage.

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. Black alkathene
2. Sandy loam

D. Multiple Choice Questions

1. b) 20-28 °C
2. c) 6.2-6.7

UNIT 13.2: Varietal Selection and Propagation Methods

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate how to propagate chrysanthemum saplings in the required quantity in the nursery.
2. Demonstrate the process of harvesting the chrysanthemum saplings from the nursery bed when they are ready for being transplanted.
3. Show how to transplant chrysanthemum saplings in the field at the recommended planting density.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant images of different propagation methods.

Activity

Purpose: To understand participants about propagation techniques followed in chrysanthemum.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 30-40 minutes.

Visit a nearby chrysanthemum nursery to see how the plants are propagated. Ask participants to observe several propagation methods and the various materials needed for them.

Expected outcomes:

- Skilling in propagation.
- Knowledge enhancement

Do

- Ask participants to prepare field visit report and try to highlight special propagation methods followed in chrysanthemum. Also with this collect information on mother plant used for propagation.

Elaborate

- Elaborate the sapling harvesting stage and procedure of harvesting the chrysanthemum saplings from the nursery bed.
- Elaborate the planting density and how to transplant chrysanthemum saplings.

Activity 

Ask participants to prepare a list of planting density of different varieties of chrysanthemum. Hand out chrysanthemum seeds if possible, instruct participants to plant the seeds in their own homes, and instruct them to keep track of the process from seed to sapling.

Notes for Facilitation 

- Motivate the participants by involving them in sense of participation and realization of the
- importance of their work.
- Provide complete set of notes on propagation method.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Arka Swarna - It is found superior in respect to plant height, number of flowers per plant, flower size, flower weight, flower yield per plant and flowering duration. This is suitable for cut flower and loose flower purposes.
Pankaj - It is high yielding and produces 140 flowers with a yield of 363 g per plant. Its attractive flowers on stiff stalk make them suitable for cut flower purpose.
2. Cuttings of 5-7 cm in length are taken from healthy stock plants in June. The cuttings are prepared removing basal leaves and reducing the leaf area of remaining leaves to half. The basal portions (less than half inch) of cuttings are dipped in rooting hormone (1000 ppm indole butyric acid (IBA) or in seradex/keradex (rooting hormone) for better rooting. Sometimes the lower portion of cuttings is treated with some copper fungicide to avoid fungal growth. These rooted cuttings are ready for planting in the field.
3. Blooming seasons of chrysanthemum are summer, rainy season, sept.-oct. (autumn), oct.-nov. (autumn), nov.-dec. (winter), dec.-jan. (winter), spring.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Indole butyric acid (IBA)
2. Kirti

D. Multiple Choice Questions

1. c) Sensation
2. d) Winter

UNIT 13.3: Irrigation, Fertilizer and Weed Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of installing the appropriate irrigation or fertigation system in the field.
2. Show how to drain out any water accumulated in the field.
3. Show how to water the saplings with the recommended quantity and apply fertilisers in an appropriate quantity immediately after transplanting.
4. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity at appropriate intervals.
5. Show how to water the chrysanthemum plants with the recommended quantity as per the irrigation schedule and prevailing weather conditions.
6. Show how to create drains in the field for effective drainage of water
7. Demonstrate the process of carrying out weeding at the recommended intervals to remove unwanted plants growing among the chrysanthemum plants.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which illustrate different irrigation methods.

Activity

Purpose: Introduce participants to different irrigation methods.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan group discussion for about 15-20 minutes.

Ask participants to collect information on irrigation methods which can be used in chrysanthemum cultivation field and how to drain out excess water. Divide participants in 4-5 groups and you have to initiate a healthy debate by giving them different irrigation methods. You have to assist them in discussion and debate. Demonstrate various chrysanthemum practises such as fertiliser application, irrigation, and weeding.[add]

Expected outcomes:

- Efficient use of different irrigation methods.
- Awareness about fertigation.

Say

- Thank you to everyone for their participation.

Ask

- Ask participants whether they know about fertigation system.
- Ask participants to search various fertilizers used in chrysanthemum cultivation.
- Inquire about the occurrence of weeds in the region from the participants.

Explain

- Introduce participants to the various organic and inorganic fertilizers.
- Explain participants about the different weeds which causes damage to chrysanthemum growth.

Elaborate

- Elaborate procedure of applying the organic and inorganic fertilisers in the recommended quantity at appropriate intervals.
- Elaborate participants how to make drains in the field for efficient water drainage.
- Elaborate the process of carrying out weeding at the recommended intervals to remove unwanted plants growing among the chrysanthemum plants.

Activity

This pen and paper activity is for preparing participants to learn about organic and inorganic fertilizer. Plan this activity for at least 40-50 minutes.

Ask participants to prepare a chart on different types of organic, inorganic fertilizer used and methods of fertilizer application in chrysanthemum. Ask them to show the participants that chart and explain it.

Notes for Facilitation

- Help the participants to complete all the tasks involved in the participant hand book.
- Assist all the participants to systematically arrange collected information and analyse them when required.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Nitrogen is required at an early stage and the plants need P throughout the growth period. As the buds appear, the proportion of K should be increased and N should be reduced. It requires 25 t of Farm Yard Manure along with 250, 120, 25 kg NPK/ha. Half of the N and the entire quantity of P and K are to be applied basal by just before planting. The other half of N is to be applied 30 days after planting the suckers. The same dose can be repeated if a ratoon crop is raised and hoeing should be done once in a month.
2. Weeds should be avoided in the greenhouse as well as fields. They reduce moisture and nourishment from plants. After cuttings are established, carefully scratch the ground to uproot the weeds when they are small. 2-3 hand weeding are required for proper growth of the plant. First weeding should be done one month after planting. Herbicide can also be applied to control weeds from the field.
3. The plants need adequate water during active vegetative growth when new leaves are being formed. Hence chrysanthemum are to be irrigated twice a week and in the first two weeks and subsequently at a weekly interval. Drip irrigation with 8-9 litres of water/m²/day.

B. State whether True or False (T/F)

1. True
2. True
3. True

C. Fill in the Blanks

1. 8-9 litre
2. 30

C. Multiple Choice Questions

1. d) 25 t/ha
2. a) 8-9 litres

UNIT 13.4: Pinching and other Intercultural Operations

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of carrying out pinching to induce the growth of lateral branches and installing appropriate support to train the plants.
2. Demonstrate the process of carrying out disbudding, removing buds from the stems of plants and leaving only terminal buds to ensure the growth of large blooms.
3. Demonstrate the process of carrying out pruning of chrysanthemum plants using the appropriate implements at regular intervals, removing the side suckers.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of various operations like pinching, disbudding, pruning etc.

Activity

Purpose: Introduce participant's to the intercultural operations followed in chrysanthemum.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for 40- 50 minutes.

Give participants pruning tools if you can. Find the chrysanthemum plant that has to be pruned. You must first demonstrate how to prune chrysanthemum plant before asking participants to do. If they have chrysanthemum plants, ask them to use the same pruning technique at home. Demonstrate various intercultural operations like disbudding, removing side suckers and supporting plants.

Expected outcomes:

- Skilling in pruning of chrysanthemum crop.
- Awareness about implements used for pruning.

Say

- Thank you to everyone for their participation.
- Assess the pruning work that the participants did.

Ask 

- Ask the participant about their experience of pruning.
- Ask the participants whether they know difference between pruning and pinching.
- Ask participants about what side suckers are.

Explain 

- Describe the reason behind encouraging the development of lateral branches and provide suitable support to train the plants.
- Explain participants about purpose of different intercultural operation followed in chrysanthemum.

Elaborate 

- Elaborate the participants about procedure and methods of pruning at regular interval.
- Describe in detail to participants how to remove buds from stems but the terminal buds in order to promote the development of larger flowers.

Activity 

This is a self-learning activity to enhance knowledge on intercultural operation followed in chrysanthemum cultivation.

- Let the participants find out various inter cultural operations performed in chrysanthemum. Prepare a list of chrysanthemum varieties in which disbudding and pinching practices are followed.
- After that participants can discuss together about it. This exercise can help the participants to get in depth about the various practices in chrysanthemum.

Notes for Facilitation 

- Help the participants to complete all the tasks involved in the participant hand book.
- Encourage participants for group discussion.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Only soft vegetative shoot tips 1.5 to 3 cm long are removed. Pinching is most essential for small flowered chrysanthemum. First pinching is done when the plants reach a height of 15-20 cm with 3-4 pairs of leaves. A second pinching may be necessary if the plants make straggly and lean growth.
2. During the vegetative growth phase, plants grow upward. New suckers continue to develop from base of plants. For proper and vigorous growth of plants, suckers are removed from time to time. It is practiced to allow single stem to develop up to a certain height. Without de-suckering the main plant will lose vigour and becomes weak.
3. Many of the standard type varieties are disbudded in which the largest terminal bud is reserved and all auxiliary buds are removed. Disbudding of spray varieties is very easy because in this case only the large apical bud is removed and the auxiliary buds are allowed to develop. For taking three blooms per plant, three lateral strong shoots are allowed to grow and others are removed. Dis-shooting is practiced to reduce the number of branches for improving the size and form of the flower.

B. State whether True or False (T/F)

1. True
2. True
3. False

C. Fill in the Blanks

1. Stopping
2. Spray

D. Multiple Choice Questions

1. a) 15-20 cm
2. c) Both a and b

UNIT 13.5: Pest and Disease Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of applying the recommended pesticide or insecticide as per the prescription.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which can illustrate various pest and diseases of chrysanthemum.

Activity

Purpose: Introduce participants to various pest and diseases of chrysanthemum crop.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for 1 or 2 hr depending upon the location.

Participants can be accompanied to the nearby chrysanthemum cultivation field, there they can observe different pest and diseases in that field. They can ask few questions to farmer like

- What are the serious pest and diseases of chrysanthemum?
- How they control pest?
- How to differentiate symptoms of pest and diseases?
- Which varieties are resistance to insect?

Expected outcomes:

- Efficient management
- Awareness about various pest and diseases.

Say

- Thank you to everyone for their participation.
- Describe the objectives of the above activity.

Ask

- Ask the participants about their experience of preparing pesticide or insecticide concentration.
- Ask the participants whether they know any bio-pesticide.

Explain 

- Explain the different types of pesticide or insecticide used for rose plant.

Elaborate 

- Elaborate the procedure of applying the recommended pesticide or insecticide as per the prescription.

Activity 

This pen and paper activity is for preparing participants to learn control measures of various pest. Plan this activity for at least 20-30 minutes.

Ask participants to prepare a chart according to type of disease and pest attack, which type of control measure to be followed such as spraying, drenching and dusting.

Prepare a list of trade name of various pesticides or insecticide available in the market.

Notes for Facilitation 

- Assist all the groups to collect the information and analyse them when required.
- Constantly motivate student to participate.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

- Control measure for Aphid - Spraying of Monocrotophos @0.05% or Phosphamidon @0.02% at 15-20 days interval controls the aphid population effectively. Grubs and adults of Coccinellid beetles prey upon the aphids and effectively wipe out their population.
Control measure for Thrips - Spraying Monocrotophos (0.04%) twice or thrice at 15 days interval control thrips population. Drenching the soil with insecticide also helps in reducing the population.
- Control measure for powdery mildew - Apply preventive fungicides at the first sign of disease with the active ingredients copper, pyraclostrobin, propiconazole, sulfur and thiophanate methyl according to label instructions.
Control measure for Graymold - Provide good air circulation and keep humidity low by a combination of heating and venting. Apply preventive fungicides as soon as disease is detected. Fungicides with the active ingredients chlorothalonil, dichloran, mancozeb, copper sulfate pentahydrate, and thiophanate methyl are registered for Botrytis control.
- Bacterial blight (*Erwinia carotovora*) is easily spread on infested tools, hands, or plants. It shows symptoms of water-soaked lesions on stems, darkening and death of buds and stems, blackening of terminals, and wilt and collapse of upper portions of the plants. Bacterial blight survives in crop debris.

B. State whether True or False (T/F)

- True
- False
- False

C. Fill in the Blanks

- Leaf folder
- Water soaked lesion

D. Multiple Choice Questions

- a) Roots
- d) Both a and b

UNIT 13.6: Harvesting and Post-Harvest Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Show how to harvest and collect chrysanthemum flowers ensuring no damage to them and plants.
2. Demonstrate how to sort and grade chrysanthemum flowers on the basis of applicable parameters.
3. Demonstrate the process of preparing and applying the preservative solution on the chrysanthemum flowers to preserve their freshness.
4. Demonstrate the process of bunching the chrysanthemum flowers and packing them using appropriate packing material such as bamboo baskets or gunny bags.
5. Prepare a sample manual and/ or electronic record of harvesting and processing of chrysanthemum flowers using the physical registers and/ or the relevant computer application.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of various post-harvest activities.

Activity

Purpose: To understand the participants about techniques of harvesting.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan group discussion for about 15-20 minutes.

Arrange the visit in nearby chrysanthemum field so that participants can perform the various operations like harvest and post-harvest activities like sorting, grading, bunching and packaging. Demonstrate the technique of preparing and applying a preservative solution to chrysanthemum flowers in order to preserve them fresh.

After that ask participants to discuss on different harvesting stages of chrysanthemum for the purpose of loose flower and cut flower. Ask participants to prepare a list of sorting and different grading standards of cut flowers.

Expected outcomes:

- Introduction to different harvesting stages of chrysanthemum.
- Efficient sorting and grading.

Say

- Thank you to everyone for their participation.
- Discuss with the participants to share their feelings about this exercise.

Ask 

- Ask the participants to share their experience of field visit.
- Ask the participants whether they know any packaging material used for flower crops.

Explain 

- Introduce participants to the various packaging material used for chrysanthemum flowers.
- Explain participants about how to increase vase life of flower.
- Explain participants about criteria of sorting and grading of chrysanthemum

Elaborate 

- Elaborate the different chemical preservative solution available to in market and possible techniques might be used to lengthen the vase life of flowers.
- Elaborate the importance of preparing a manual or electronic using the physical registers or the relevant computer application.

Activity 

Ask participants to prepare a sample manual or electronic record of harvesting and processing of chrysanthemum flowers using the physical registers or computer application and guide them to prepare it successfully.

Notes for Facilitation 

- Encourage the participants to undergo field visits and how they can learn more through these visits.
- Provide complete set of notes of post-harvest management.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Disappearance of green colour in the centre of the flowers and the centre petals are fully expanded this is an indication of for harvesting of flower. Spray types should be cut when the central flower is open and the surrounding flowers are well developed and the varieties which shed pollen badly will have to be cut before they become unsightly.
2. Chrysanthemum cut flowers can be wrapped in plastics and stored dry for 6 to 8 weeks at a temperature of 0.5°C. Temperature for truck shipments across the country ranged between 2°C and 4°C. Chrysanthemum can be stored for 3-6 weeks period at 0-3°C.
3. To increase the vase life of cut flowers dipping of the stem for a very short period (5 seconds) in 1200-4800 ppm silver nitrate or soaking the stems in 1000 ppm silver nitrate for 10 minutes. Addition of 2 % sucrose to silver nitrate was found beneficial. It increased the vase-life from 12 days to 20 days. Pulsing : Sucrose 4 % for 24 hrs. (Vase life: 18 days), Wrapping material : Polysleeves with holes (50 gauge thickness) (Shelf life: 9.25 days)

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. 0-3 °C.
2. 2 °C and 4 °C.

D. Multiple Choice Questions

1. b) 3-4
2. d) All of the above



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14. Process of Carrying out Cultivation of Orchid Flowers

Unit 14.1 - Site Selection

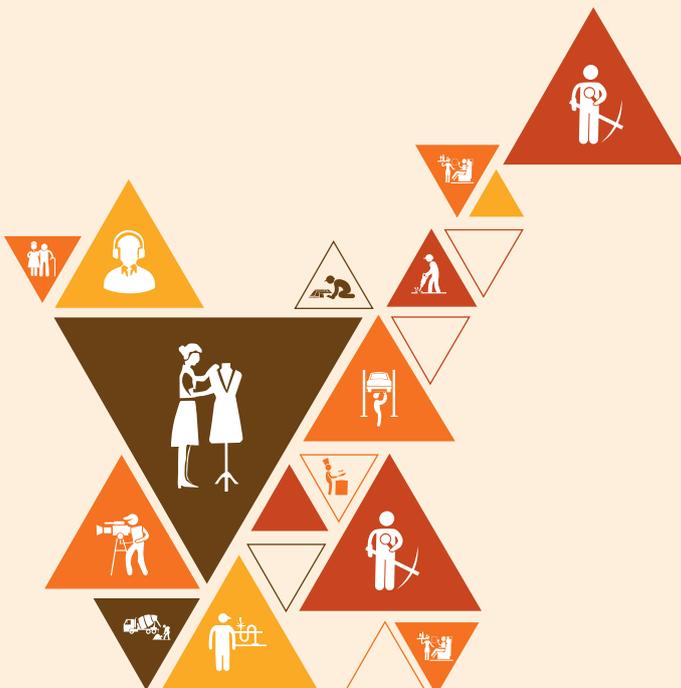
Unit 14.2 - Varietal Selection and Propagation Methods

Unit 14.3 - Irrigation, Fertilizer and Weed Management

Unit 14.4 - Potting and other Intercultural Operations

Unit 14.5 - Pest and Disease Management

Unit 14.6 - Harvesting and Post-Harvest Management



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Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Describe the process of selecting the site and preparing for orchid flower cultivation.
2. Demonstrate the process of propagating orchid plants.
3. Describe the process of maintaining the orchid plants.
4. Demonstrate the process of carrying out harvesting and post-harvest management.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the criteria for selecting a site for orchid crop cultivation such as moderate temperature and humidity along with good ventilation, and moderate sunlight exposure, etc. 2. List various inputs required for orchid flower cultivation. 3. Explain the criteria for selecting the appropriate variety of orchids to be grown according to the region. 4. Explain the importance of ensuring drainage holes in the pots for the drainage of excess water. 5. State the recommended depth and density for planting orchid seeds in pots. 6. State the appropriate temperature and humidity to be maintained to induce the germination of orchid seeds. 7. Explain the importance of protecting the orchid plants from strong winds and direct sunlight. 8. State their prescribed quantity of recommended organic and inorganic fertilisers to be used with orchid plants. 9. Explain the use of recommended growth regulators. 10. List various signs of pests and disease in orchid plants. 11. State the water requirements of orchid plants and the recommended irrigation schedule. 12. Explain the importance of ensuring no accumulation of water in the orchid plant pots to prevent root rot. 13. Explain the importance of removing the dead leaves from orchid plants and weeds from the pots. 	<ol style="list-style-type: none"> 1. Demonstrate how to prepare a green shade net house or polyhouse to provide sunlight to orchid plants through shades. 2. Demonstrate how to prepare the growth media using the recommended materials and fill in the pots with its recommended quantity. 3. Demonstrate the process of planting the orchid seeds in pots at the recommended depth and density. 4. Demonstrate the process of installing support in the pots such as bamboo sticks to help the orchid plants grow vertically. 5. Demonstrate the process of applying the recommended organic and inorganic fertilisers to orchid plants in the prescribed quantity. 6. Show how to spray the recommended pesticide or insecticide on orchid plants as per the prescription. 7. Show how to water the orchid plants with the recommended quantity as per the irrigation schedule. 8. Demonstrate how to remove the dead leaves from orchid plants and weeds from the pots. 9. Demonstrate the process of harvesting the orchid flowers with or without stalk as per the requirement and collecting them in baskets or crates, ensuring no damage to the flowers. 10. Demonstrate the process of sorting and grading the harvested orchid flowers on the basis of applicable parameters.

Theory	Practical
<p>14. Explain the importance of maintaining orchid plants in moderate temperature, recommended humidity and good air circulation.</p> <p>15. Explain the indicators of the readiness of orchid flowers for being harvested.</p> <p>16. Explain the use of appropriate implements such as secateurs to harvest orchid flowers with or without stalk, ensuring no damage to flowers and stalk.</p> <p>17. Explain the applicable criteria for sorting and grading the harvested orchid flowers.</p> <p>18. Explain the practice of soaking orchid flower stalks in Sodium Hypochlorite solution for the recommended duration to improve their vase life.</p>	<p>11. Show how to prepare and apply the preservative solution on the orchid flowers to preserve their freshness.</p> <p>12. Demonstrate the process of bunching the orchid flowers and packing them using appropriate packing material such as bamboo baskets or gunny bags.</p> <p>13. Prepare a sample record of harvesting and processing of orchid flowers.</p>

UNIT 14.1: Site Selection

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate how to prepare a green shade net house or poly-house to provide sunlight to orchid flower plants through shades.
2. Demonstrate how to prepare the growth media using the recommended materials and fill in the pots with its recommended quantity.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of various structures for orchid cultivation.

Activity

Purpose: To acquaint participants about preparation of growing structures.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 30-40 minutes.

Divide participants in 4-5 groups. Ask participants to search for various growing structures, their construction and how to use them for orchid cultivation. Following that, encourage participants to discuss growing media and the types of pots needed for orchid cultivation. Ask them to find out which type of growing structures used in their region.

Expected outcomes:

- Awareness various growing structures.
- Efficient use of shade net house.

Say

- Thank you to everyone for their participation.
- Review the presentation of each group and enrich the same with your comments.

Ask

- Ask the participants whether they how to select polyhouse or greenhouse according to topography.
- Ask participants about various media used for orchid cultivation.

Explain

- Explain participants about temperature, sunlight, shade requirement of different types of orchid.
- Explain participants growth media used for orchid cultivation.

Elaborate

- Elaborate preparation of various growing structures like poly-house or shade net house.
- Elaborate how to combine growth media for different types of orchid and filling the pot with appropriate quantity.

Activity

Plan this activity for 20-30 minutes. Ask participants to prepare a chart of various propagation media according to moisture retention, watering frequency, stability and availability. You need to arrange orchid saplings and several growth media, then instruct participants to plant the sapling in different growth media and see which media showed growth of healthy plants.

Notes for Facilitation

- Encourage participants for group discussion to ask question so that they can clear their doubts.
- Provide complete notes on growing structures.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Orchids require humidity between the range of 60% to 80%. When humidity is considerably low the floor walls can be sprayed with water to improve the humidity condition inside the structure. Phalaenopsis require relative humidity upto 60-80% whereas dendrobium requires 50-60%.
2. Different media used for orchid cultivation are coconut husk, bricks pieces, charcoal, perlite, pumice, leaf mould, vermiculite and sphagnum moss.
3. Orchids need an abundance of light and can withstand direct sun on their leaves early in the morning or late in the afternoon. Orchid require shading between 11am to 3pm where the light intensity is too high. Generally, during bright sunny days 50% shade net whereas during cloudy days 25% shade net is used.

The optimum requirement of light intensity is as follows:

Growing period: 5000 - 8000 lux

Flowering period: 8000 - 15000 lux

B. State whether True or False (T/F)

1. True
2. True
3. True

C. Fill in the Blanks

1. Sponge rock
2. 60 -80%

D. Multiple Choice Questions

1. a) 5000 - 8000 lux
2. d) Perlite

UNIT 14.2: Varietal Selection and Propagation Methods

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of planting the orchid seeds in pots at the recommended depth and density.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant images of seeds of various varieties of orchid.

Activity

Purpose: To understand the propagation of orchid.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan group discussion for about 15-20 minutes.

Distribute seeds of chrysanthemum to participants and instruct them to plant them in different depths in pots while keeping a record of the seed's growth. You must instruct them on the proper depth of sowing with this sow other seeds at various depths. Then, discuss about how seed germination is affected by sowing depth.[add]

Expected outcomes:

- Awareness about seed sowing depth.
- Efficient skilling in sowing.

Say

- Thank you to everyone for their participation.
- Discuss with the participants about their understanding.

Elaborate

- Elaborate the sowing depth of different species and varieties of orchid.
- Elaborate various methods of orchid propagation other than seeds.

Notes for Facilitation

- Evaluate each participant's performance in terms of their comprehension of the exercise.
- Invite any successful coconut grower cu to share his experiences

Activity

Plan this activity for 20-30 minutes. Instruct participants to research the proper way for planting orchid seeds, as well as other orchid propagation methods. Plan a discussion session about it after that.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Cymbidium commonly known as boat orchids. Some species have thin stems but in most species the stems are modified as pseudobulbs. The sepals and petals are usually thin and fleshy, free from, and more or less similar to each other. Hybrids of Cymbidium are Jungfrau 'Snow Queen', James Toya, Lilian Stewart 'Coronation' and Lilian Stewart 'Party Dress'.

Vandas are found throughout the Eastern Hemisphere, with the highest concentration in Southeast Asia. While some grow in mountainous areas, most are lowland plants that live in warm and humid conditions with bright sunlight. Vandas can be large or small plants with flowers of corresponding size in a variety of colors, many with a powerful fragrance. They are long-lasting and bloom several times throughout the year. Hybrids of Vanda are Hope, Mark Lewis 'Pat Delight', Rasri Gold and Samsai Blue.

2. Stem cuttings - Some orchids like Anaectochilus respond more to vegetative propagation through cutting than any other method. Layering is successful in monopodial like Vanda stem at about 20 – 30 cm below the apex. Some orchids like Dendrobiums produce small plants with roots at the nodes of pseudo bulbs. These are called 'keikis' meaning 'babies'. The older shoots or canes of sympodial Orchids, which are lesser active physiologically, are called back bulbs. These may be severed off the mother plants and kept horizontally over a moist medium. After sometime they will strike roots and sprout. Then they can be separated and planted.
3. Varieties of Dendrobium are Big White, July, Lervia, Gentind Rose, Burana jade and Varieties of Vanda are Charles Goodfellow, Charles Goodfellow, Mimi Polcumer and Dr. Anek.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Moth orchids
2. Cocopeat or coirpithhe

D. Multiple Choice Questions

1. a) Layering
2. a) Cymbidium

UNIT 14.3: Irrigation, Fertilizer and Weed Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of applying the recommended organic and inorganic fertilisers to orchid plants in the prescribed quantity.
2. Show how to water the orchid plants with the recommended quantity as per the irrigation schedule.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant pictures of methods of fertilizer application.

Activity

Purpose: To understand participants about fertilizer management.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 15-20 minutes.

Ask participants to visit nearby market and identify various types of organic and inorganic fertilizer available which can be used for orchid cultivation. After that ask participants to discuss on organic fertilizer which can be alternatively used for inorganic fertilizers. Demonstrate various types of irrigation methods used in orchid cultivation.

Expected outcomes:

- Efficient management

Say

- Thank you to everyone for their participation.
- Discuss the purpose of above activity.

Ask

- Ask the participants whether they know any organic fertilizer.
- Ask the participants about different irrigation method and most commonly used method for orchid.

Explain

- Explain methods of fertilizer application and according to growing stage of orchid.
- Introduce participants to the different irrigation methods.

Elaborate

- Elaborate the recommended quantity of water as per the irrigation schedule and according to season.

Activity

This pen and paper activity is for preparing participants to learn about water requirement and organic and inorganic fertilizer. Plan this activity for at least 20-30 minutes.

Find out the water requirement of orchid crop according to growth stage, season and prepare a chart of irrigation schedule.

Ask participants to collect information on different types of organic, inorganic fertilizer used and methods of fertilizer application in orchid.

Notes for Facilitation

- Help participants to prepare power point presentation.
- Encourage participants to undergo field visits and how they can learn more through these visits.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Hand weeding is and probably will continue to be one of the main methods of weed control. A large number of selective herbicides have been developed for control of weeds. A selective herbicide is a material that will selectively kill weeds without causing injury to the crop being grown.
 2. Orchids are light feeders and they require nitrogen from beginning to two-third of their life cycle. During rest period, they do not need any fertilizers. A fertilizer mixture containing NPK in the ratio of 1:1:1 is required during early growth at fortnightly intervals. Mature plants need 3:1:1 ratio mixture during pre-flowering stage and 1:2:2 during flowering stage. Besides Organic manures oil cakes (1:10), cattle manure (1:25), cow's urine (1:25 dilution) are also suitable besides bone meal which can be sprayed at intervals of 2 to 3 times a week under tropical condition.
- A fertilizer dose containing 1:1:1 proportion of NPK is beneficial during early growth, 3:1:1 mixture may be used for mature plants as pre flowering and 1:2:2 during flowering stage at fortnightly intervals.

B. Fill in the Blanks

1. 1:1:1
2. Morning hour

C. Multiple Choice Question

1. b) 5-6

D. State whether True or False (T/F)

1. True
2. False

UNIT 14.4: Potting and other Intercultural Operations

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of installing support in the pots such as bamboo sticks to help the orchid plants grow vertically.
2. Demonstrate how to remove the dead leaves from orchid plants and weeds from the pots.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant pictures of various intercultural operation performed in orchid cultivation.

Activity

Purpose: to understand the purpose behind providing support for orchid plants.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for about 30-40 minutes.

You will first demonstrate participants how to provide support to orchid plants before asking them to follow your lead. You must set up some orchid plants that are growing in pots for that. Follow the steps listed below to perform this activity.

How to keep an orchid upright step by step:

Step 1: Insert a stake into the orchid pot.

Step 2: Attach a flower spike to the stake using orchid clips or twist ties.

Step 3: Repeat the process above for any additional flower spikes.

Expected outcomes:

- Awareness about growing orchid plants vertically.

Say

- Thank you to everyone for their participation.
- Evaluate the above activity performed by participants.

Ask

- Ask the participants what happens if you don't use a stake.
- Ask the participants whether they know different types of pots used for orchid cultivation.

Explain

- Explain why orchid plants are grown vertically in the pots by using bamboo sticks.
- Introduce participants to the different species of weeds affecting plant growth of orchid.

Elaborate

- Elaborate the ways to get removal of dead leaves on orchid plants and weeds in pots.

Activity

Plan this activity for 40-50 minutes. Ask participants to collect photograph of weeds grown in their surrounding area and their local names and prepare a weed album of it. Ask participants to identify which weed species compete more with orchid for nutrient and water uptake.

Notes for Facilitation

- Help the participants to complete all the exercises mentioned in the participant's handbook.
- Encourage participants for group discussion.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Cymbidium: Cocochips + cocopeat + brick pieces + rice husk/ leaf moulds/ slow release fertilizer (3: 1: 1: 5g/pot), Dendrobium: Coco peat + brick pieces + tree bark (1: 1: 1), Vanda: Cocochips + brick pieces + leaf fern (1:1:1), Oncidium: Cocochips + brick pieces + leaf moulds (1:1:1), Phalaenopsis: Cocochips + brickpieces + leafmoulds + green moss (1:1:1:1), Cattleya: Cocochips + brick piece + leaf mould/ leaf fern (1:1:1)
2. Place the freshly repotted plant in a bright, but not in sunny position. New root formation will be encouraged if a heating mat is placed underneath the pots. Orchids should not be given water immediately after repotting. Because the damaged parts of roots are better able to heal in growing media that is merely moist and fresh. The minimum moisture encourages the roots to grow. After 8-14 days, the plant may be watered normally and according to its requirements.
3. Carefully loosen the plant in the old pot then shake the plant gently without allowing plant to fall apart. Parts of the roots that look diseased, dried up or shrunken should be cut off with a very sharp knife (disinfect knife with alcohol before cutting). Plants that are too large or very old can be divided when repotting. Place a thin layer of new growing media on top of the drainage layer in the prepared pot. Place the root stock on top of this and surround it with rest of the media. While doing this, occasionally tap the pot against the edge of the table to help the media particles to shake down into all the cracks and spaces. Monopodial orchids should be placed in the centre of the pot. Sympodial orchids can be placed in such a way that the oldest bulb is close to the edge of the pot while the new shoots are in the centre. Allow a space of 1-2 cm around the plant for watering purposes.

B. State whether True or False (T/F)

1. True
2. False
3. True

C. Fill in the Blanks

1. Cool
2. 2-3 years

D. Multiple Choice Questions

1. a) February – June
2. a) Vanda

UNIT 14.5: Pest and Disease Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Show how to spray the recommended pesticide or insecticide on orchid plants as per the prescription.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which can illustrate various pest and diseases of orchid.

Activity

Purpose: To understand participants about different pest and diseases of orchid crop.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 15-20 minutes.

Participants can be accompanied to the nearby orchid cultivation field, there they can observe different pest and diseases in that field. Ask participants to collect photograph of it and their local names and prepare an album of symptoms of pest and disease. Ask participants to identify severe pest of orchid.

Expected outcomes:

- Efficient management of pesticide.
- Knowledge about various pest and diseases.

Say

- Thank you to everyone for their participation.

Ask

- Ask the participants whether they can identify different pest of orchid.
- Ask the participants if they are familiar with any bio-pesticide.

Explain

- Explain the symptoms and control measures of various pest affecting orchid cultivation.
- Explain the different types of pesticide or insecticide used for orchid plant.

Elaborate

- Elaborate the process of applying the recommended pesticide or insecticide as per the prescription.

Activity

This pen and paper activity is for preparing participants to learn control measures of various pest. Plan this activity for at least 20-30 minutes.

- Ask participants to prepare a chart according to type of disease and pest attack, which type of control measure to be followed according to insect and disease.

Notes for Facilitation

- Assist all the groups to collect the information and analyse them when required.
- Constantly motivate student to participate.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Viral disease - Infected plants show poorer growth, small flowers and retarded development into full-grown plants. It also shows discolouration of flowers and chlorotic or necrotic spots on leaves.
Root problems - It generally occurs when there is large fluctuation in quantities of nutrient and water as well as in substrate temperature. Excessive irrigation and poor drainage can also cause root necrosis. If roots are unable to provide water and nutrients to plants edges of the leaves become weaker and dull coloured.
2. Mites - The red spider mites are found underneath the leaves. They suck the sap from the leaves, causing slight deformation and silvery discolouration of the leaves.
Caterpillar - Feeding damage symptoms seen on the flower petals and tender leaves. Caterpillar droppings will be visible on the flower as well as media, as the larvae hide in the media or leaf sheaths during the day time.
3. Large fluctuations in the moisture content or the EC can cause damage to roots, thereby enabling moulds to attack the tissue. In the event of problems with roots, the EC should be maintained at a sufficiently low level, pot temperature should be maintained at sufficiently high level and substrate should temporarily be kept somewhat drier.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Wet
2. Root necrosis.

D. Multiple Choice Questions

1. a) *Pseudomonas cattleyae*
2. c) Bacterial soft rot

UNIT 14.6: Harvesting and Post-Harvest Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of harvesting the orchid flowers with or without stalk as per the requirement and collecting them in baskets or crates, ensuring no damage to the flowers.
2. Demonstrate the process of sorting and grading the harvested orchid flowers on the basis of applicable parameters.
3. Show how to prepare and apply the preservative solution on the orchid flowers to preserve their freshness.
4. Demonstrate the process of bunching the orchid flowers and packing them using appropriate packing material such as bamboo baskets or gunny bags.
5. Prepare a sample record of harvesting and processing of orchid flowers.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant pictures of various post-harvest activities.

Activity

Purpose: To understand the participants about harvesting techniques of orchid flower.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for 1-2 hour depending upon the location.

Arrange the session in nearby orchid field so that participants can perform the various operations like harvesting and post-harvest activities. Demonstrate how to prepare and apply a preservative solution to orchid flowers to keep them fresh.

After that ask participants to discuss on different harvesting stages of various stages of orchid depend on distance of market. Ask participants to prepare a list of grading standards of export orchid.

Expected outcomes:

- Efficient harvesting of orchid flower.
- Knowledge enhancement in sorting and grading.

Say

- Thank you to everyone for their participation.
- Discuss with the participants to share their feelings about this exercise.

Ask

- Ask the participants to share their experience of field visit.
- Ask the participants whether they know how to do grading and packaging.

Explain

- Explain participants about different packaging material used for orchid flowers.
- Introduce participants to preservative solution and its importance.

Elaborate

- Elaborate the different parameters used for grading and sorting.
- Elaborate how to keep records of harvesting and processing of orchid flowers.

Activity

Plan this activity for 20-30 minutes. Ask participants to prepare a sample manual of record keeping of harvesting and processing of orchid flowers using the different record keeping methods and guide them to prepare it successfully.

Notes for Facilitation

- Encourage the participants to undergo field visits and how they can learn more through these visits.
- Constantly motivate each student to participate.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. In Dendrobium, spikes of orchids are harvested when a few buds on the top remain unopen. The premium quality spikes are those having a length of 60 cm and bearing 10 - 12 florets each. In Cymbidium, two buds open stage or 70% bloom stage. In Cattleya, fully open flowers on a spike of 25- 40cm length depending on the type are harvested. Vandas are harvested when all flowers are already open, depending on types 10 to 16 flowers on a stem length of 50- 60cm.
2. Step 1: Spikes are given an angular cut by placing the stems in water. The stems are then graded as per the length of the spike.
Step 2: After grading, the spikes are subjected to 'Pulsing Treatment'. In this treatment spikes are placed in a solution of 8 HQS – Hydroxy Quinoline Sulphate for a period of 2 hours.
Step 3: Followed by placing the stems in 'Holding Solution'. This step is carried out for dispatches to distant markets. The Holding Solution comprises of 8 HQS – Hydroxy Quinoline Sulphate (@ 200 mg / lit) + Silver Nitrate (@ 10 mg / lit) + Sucrose (@ 20 gm / lit).
Step 4: Flower spikes are bunched together. This is followed by covering each bunch with plastic sleeve.
Step 5: The sleeved bunches are packed into corrugated boxes and ready for transport.
3. Orchid flowers are long-lived on the plants, they should not be harvested until needed. If these are to be cut they should be stored at 5-7 °C. At this temperature most orchid flowers can be stored for 10 to 14 days. Plastic film storage is attractive and can be utilized.

B. State whether True or False (T/F)

1. False
2. False
3. True

C. Fill in the Blanks

1. Length
2. Already open

D. Multiple Choice Questions

1. b) 60 cm
2. b) 5-7 °C



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15. Process of Carrying out Cultivation of Marigold Flowers

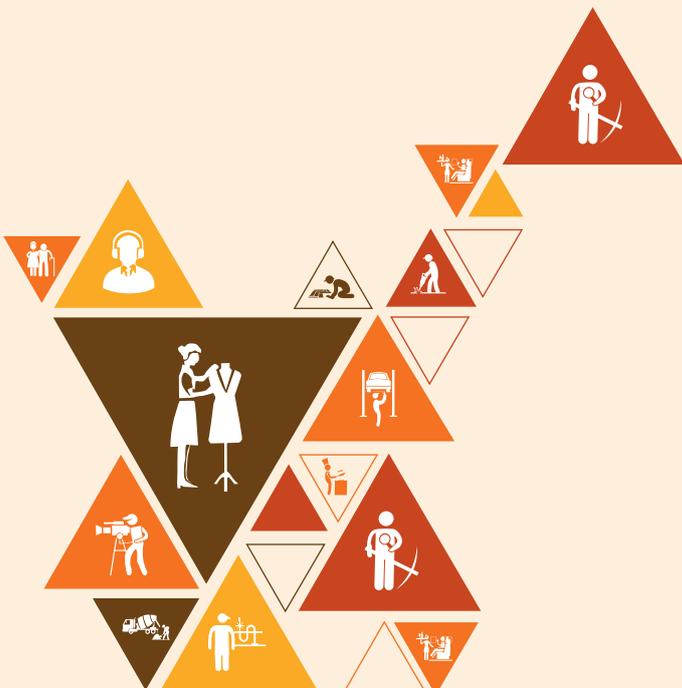
Unit 15.1 - Site Selection

Unit 15.2 - Varietal Selection and Propagation Methods

Unit 15.3 - Irrigation, Fertilizer and Weed Management

Unit 15.4 - Pest and Disease Management

Unit 15.5 - Intercultural Operations, Harvesting and Post-Harvest Management



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Terminal Outcomes

After the completion of this module, the participants will be able to:

1. Describe the process of selecting the site and preparing the field.
2. Describe the process of selecting the marigold variety and propagation method.
3. Demonstrate the process of propagating, harvesting and transplanting the saplings.
4. Describe the process of maintaining the marigold plants.
5. Demonstrate the process of carrying out harvesting and post-harvest management.

Key Learning Outcomes

After the completion of this module, the participants will be able to:

Theory	Practical
<ol style="list-style-type: none"> 1. Explain the criteria for selecting a site for marigold crop cultivation such as recommended temperature, exposure to the sunlight and not being prone to waterlog. 2. Explain the characteristics of soil suitable for marigold cultivation such as the recommended alkalinity, salinity, acidity and pH levels. 3. Explain the importance of creating drains in the field for effective drainage of water. 4. Explain the criteria for selecting an appropriate variety of marigolds to be grown according to the region. 5. Explain the importance of mixing sand and farmyard manure in the soil in the quantity recommended for the marigold flower crop. 6. Explain the criteria for selecting an appropriate variety of marigolds to be grown according to the region. 7. Describe different methods of propagating marigold saplings such as terminal seeding or cuttings. 8. Explain the importance of protecting the marigold saplings from excessive heat/ cold and strong winds. 9. Explain the importance of maintaining the recommended moisture levels in the nursery bed for optimum growth of marigold saplings 10. State immediate care to be given to saplings after being transplanted. 11. State the recommended irrigation schedule for marigold plants. 	<ol style="list-style-type: none"> 1. Demonstrate the process of carrying out ploughing and harrowing in the field, and creating ridges and furrows of recommended dimensions. 2. Demonstrate the process of applying farmyard manure in the field in the recommended quantity. 3. Show how to disinfect the soil using the recommended chemicals as per the prescription. 4. Demonstrate the process of installing the appropriate irrigation or fertigation system in the field. 5. Show how to create drains in the field for effective drainage of water. 6. Demonstrate how to treat the marigold seeds with the recommended pesticide or insecticide before sowing. 7. Demonstrate the process of propagating marigold saplings in the required quantity in the nursery. 8. Show how to harvest the marigold saplings from the nursery bed they when are ready for being transplanted. 9. Demonstrate the process of transplanting marigold saplings in the field at the recommended depth and planting density. 10. Show how to press soil around the root zone to avoid the formation of air pockets. 11. Show how to water the saplings with the recommended quantity and apply fertilisers in an appropriate quantity immediately after transplanting.

Theory	Practical
<p>12. Explain the practice of pinching to induce the growth of lateral branches and installing appropriate support to train the plants.</p> <p>13. Explain the importance and process of weeding out unwanted plants growing among marigold plants.</p> <p>14. Explain different signs of pests and disease in marigold plants and their recommended treatment.</p> <p>15. Explain the importance of removing dead leaves and branches from marigold plants.</p> <p>16. State the recommended organic and inorganic fertilisers to be used for the marigold flower crop.</p> <p>17. State the indicators of the readiness of marigold flowers for being harvested.</p> <p>18. Explain the use of appropriate implements such as secateurs for harvesting the marigold flowers.</p> <p>19. Explain the importance of ensuring no damage to flowers during harvesting.</p> <p>20. Explain the applicable criteria for sorting and grading the harvested marigold flowers.</p>	<p>12. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity.</p> <p>13. Demonstrate the process of applying the recommended pesticide or insecticide as per the prescription.</p> <p>14. Show how to water the marigold plants with the recommended quantity as per the irrigation schedule.</p> <p>15. Demonstrate how to drain out any water accumulated in the field.</p> <p>16. Demonstrate the process of carrying out pinching to induce the growth of lateral branches.</p> <p>17. Show how to remove dead leaves and branches from marigold plants.</p> <p>18. Demonstrate the process of carrying out weeding at the recommended intervals to remove unwanted plants growing among the marigold plants.</p> <p>19. Show how to harvest the marigold flowers with or without stalk as per the market requirements.</p> <p>20. Show how to collect the harvested flowers in appropriate baskets or containers and store them at the recommended temperature and humidity.</p> <p>21. Demonstrate the process of sorting and grading marigold flowers on the basis of applicable parameters.</p> <p>22. Show how to pack the harvested marigold flowers in gunny bags or bamboo baskets.</p> <p>23. Prepare a sample record of harvesting and processing marigold flowers.</p>

UNIT 15.1: Site Selection

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of carrying out ploughing and harrowing in the field, and creating ridges and furrows of recommended dimensions.
2. Demonstrate the process of applying farmyard manure in the field in the recommended quantity.
3. Show how to disinfect the soil using the recommended chemicals as per the prescription.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of farm implements.

Activity

Purpose: To understand different field preparation equipment.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 30-40 minutes.

Plan the field visit so that participants will have hands-on experience with the machinery needed for field preparation on marigold plot. Depending on the location, the visit may be scheduled for a full day or for 2-3 hours.

Plan a group discussion about the lessons learned from this activity after it is finished.

Expected outcome:

- Knowledge enhancement

Say

- Thank you to everyone for their participation.

Ask

- Ask the participants to prepare a visit report and indicate key learning points of field preparation.
- Ask the participants whether they know how to prepare farmyard manure.

Explain

- Explain participants about chemicals used to disinfect the soil.
- Explain participants about need of fumigation while land preparation.

Elaborate

- the process of applying farmyard manure in the field in
- Elaborate procedure of applying chemicals to the soil at recommended dose.

Activity

Let the participants read about soil disinfestation and its impact on soil properties through research paper. After that discuss about its importance Plan this activity for 20-30 minutes. For details participants can refer to <https://apsjournals.apsnet.org/doi/10.1094/PDIS-09-21-2023-FE>.

Notes for Facilitation

- Motivate the participants by involving them in sense of participation and realization of the importance of their work.
- Provide complete set of notes on site selection.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. A sunny location is ideal for marigold cultivation. Marigold can grow in all seasons except in very cold weather, as they are susceptible to frost. For seed germination of marigold optimum temperature ranges 18 °C to 30 °C. Mild climate during growing period (14.5°-28.6°C) greatly improves flowering while higher temperature (26.2°-36.4°C) adversely affects flower production. The optimum temperature range for its profuse growth is 18-20°C. Temperatures above 35°C restrict the growth of the plants, which leads to reduction in flower size and number.
2. Land is ploughed 4-6 times, 45-50 t/ha of farmyard manure is applied at the time of ploughing, ridges are formed and channels formed at convenient size (60 cm apart). Seedlings are transplanted on the sides of the ridges (40 cm).
3. Marigold is a fast growing crop hence requires fertile soil which should be rich in organic content. Loam to clay loam soils are considered good as compared to light and heavy soil. Field should be well drained and have an assured irrigation facility. Acidic and alkali soils should be avoided. French marigold grows best in light soil while the African marigold requires a rich, well manured and moist soil. Soil should be deep fertile friable, having good water holding capacity well drained and near to neutral in reaction viz. pH 7.0-7.5 is most desirable.

B. State whether True or False (T/F)

1. False
2. False
3. True

C. Fill in the Blanks

1. 18 °C to 30 °C
2. 7.0-7.5
3. sunny location

D. Multiple Choice Questions

1. b) 40-50 t/ha
2. a) 18 °C to 30 °C

UNIT 15.2: Varietal Selection and Propagation Methods

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of propagating marigold saplings in the required quantity in the nursery.
2. Show how to harvest the marigold saplings from the nursery bed they when are ready for being transplanted.
3. Demonstrate the process of transplanting marigold saplings in the field at the recommended depth and planting density.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant pictures of propagation methods of various varieties.

Activity

Purpose: To understand participants about propagation methods followed in marigold.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for 1 or 2 hrs depending upon the location.

Visit a nearby marigold nursery to see how the plants are propagated. Ask participants to observe several propagation methods and the various materials needed for them.

Ask participants to prepare filed visit report and try to highlight special propagation methods followed in marigold. Also with this collect information which varieties can be propagated by vegetative method.

Expected outcome:

- Skilling in propagation of marigold
- Knowledge enhancement

Say

- Thank you to everyone for their participation.
- Discuss with the participants about their understanding.

Ask

- Ask participants about their knowledge related to propagation of marigold saplings.
- Ask participants if they aware about how to identify mature seedlings.

Explain

- Explain the various parameters to be assessed while selecting the mature sapling.
- Benefits of maintaining of planting depth and density in field.

Elaborate

- Elaborate the sapling harvesting stage and procedure of harvesting the marigold saplings from the nursery bed.
- Elaborate the planting density and how to transplant chrysanthemum saplings.

Activity

Ask participants to prepare a chart on planting density of different varieties of marigold. If you can, provide marigold seeds, advise participants to plant the seeds in their own houses, and ask them to document the growth of the marigolds from seed to sapling.

Notes for Facilitation

- Motivate the participants by involving them in sense of participation and realization of the
- importance of their work.
- Provide complete set of notes on propagation method.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Marigold is one of the most important flowering annuals cultivated in India. There are different varieties of marigold such as, Pusa Narangi Gaiinda, Pusa Basanti Gaiinda, Pusa Arpita, Pusa Deep, Pusa Bahar, Serakal, Arka Bangara, Arka Agni etc.
2. For taking terminal cuttings we need to have the mother plants from which we can take the soft terminal cuttings of about 5-7 cm length. For the plants are raised initially and after one month pinching is done to encourage the development of lateral branches. Immediately after taking cutting kept it in water and treated with rooting hormone hormones like IAA and IBA before planting. The plug trays are filled with media, such as cocopeat, perlite, vermiculite, vermicompost, sand, FYM, etc. in different proportions. The rooting starts from 10-15 days and get ready for planting in 25-30 days.
3. Marigold is mainly propagated by seeds. Besides; it can also propagated by herbaceous cuttings. Crop raised from seeds is tall, vigorous and heavy bloomer.

B. State whether True or False (T/F)

1. False
2. True
3. False

C. Fill in the Blanks

1. 5-7
2. Vegetative

D. Multiple Choice Questions

1. a) 10-15
2. d) Pusa Deep

UNIT 15.3: Irrigation, Fertilizer and Weed Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of installing the appropriate irrigation or fertigation system in the field.
2. Show how to create drains in the field for effective drainage of water.
3. Show how to water the marigold plants with the recommended quantity as per the irrigation schedule.
4. Demonstrate how to drain out any water accumulated in the field.
5. Demonstrate the process of carrying out weeding at the recommended intervals to remove unwanted plants growing among the marigold plants.
6. Demonstrate the process of applying the recommended organic and inorganic fertilisers in the prescribed quantity.
7. Show how to water the saplings with the recommended quantity and apply fertilisers in an appropriate quantity immediately after transplanting.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which illustrate different irrigation methods.

Activity

Purpose: To acquaint the participants about different irrigation methods.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Debate competition for about 20-30 minutes.

Ask participants to gather data on irrigation techniques that can be employed in marigold cultivation fields and how to remove extra water from the ground that could hinder plant growth. Divide the participants into 4-5 groups and ask them to start a healthy debate by using various irrigation techniques. You must direct them as they make arguments.

Expected outcome:

- Efficient use of irrigation methods.
- Awareness about fertigation system.

Say

- Thank you .to everyone for their participation.
- Describe the objective of the activity.

Ask

- Ask participants whether they know what is fertigation system.
- Ask participants to search various fertilizers used in marigold cultivation.
- Inquire about the occurrence of weeds in the region from the participants.

Explain

- Introduce participants to the various organic and inorganic fertilizers which can be applied to the seedlings and full grown plants.
- Explain participants about the different weeds which causes damage to marigold plant growth and flower yield.

Elaborate

- Elaborate procedure of applying the organic and inorganic fertilisers in the recommended quantity at appropriate intervals.
- Elaborate participants how to make drains in the field for efficient water drainage to avoid root rot.
- Elaborate the process of carrying out weeding at the recommended intervals to remove unwanted plants growing among the marigold plants.

Activity

This pen and paper activity is for preparing participants to learn about water and fertilizer requirement of marigold crop. Plan this activity for at least 40-50 minutes.

- Find out the water requirement and methods of marigold crop according to growth stage, season and prepare a chart of irrigation schedule.
- Ask participants to collect information on different types of organic, inorganic fertilizer used and methods of fertilizer application in marigold also Learn which organic fertilisers are best for marigolds.

Notes for Facilitation

- Evaluate each participants performance in terms of their comprehension of the exercise.
- Invite any successful flower crop grower to share his experiences

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. Well decomposed farm yard manure is given @ 40-50 t/ha at the time of field preparation. Biofertilizers are to be mixed with 100kg of FYM and applied. Application of DNP-G @ 3-4 bags per acre, pH-50 @ 10 Kg / acre, Amino-G @ 10 Kg/acre results better yield and also maintain soil fertility. Spray Bio-max @ 3ml and 5g 19:19:19 per lit of water results better growth and flower production. Incorporate 20 tonnes of Farm Yard Manure during the last ploughing. Apply 20-40 kg N, 80 kgs of P_2O_5 and 80 kgs of K_2O per acre. Half of nitrogen, entire dose of phosphorus and potash should be applied as basal dose, preferably one week after transplanting and rest half nitrogen should be applied one month after the first application.
2. Weeds are a major problem in marigold especially in rainy season crop. If the weeds are not removed in time, a great loss would occur in terms of growth and productivity of marigold. During the entire growth 3-4 manual weeding are required. Weeding should be done as and when necessary. Spray of pendimethiline (stamp) 30 EC @ 3ml/litre of water before transplanting can control the weed up to 25-28 days a from planting followed by two hand weeding then earthing up.
3. Explain irrigation management of marigold.

B. State whether True or False (T/F)

1. False
2. False
3. True

C. Fill in the Blanks

1. Sandy loam soil
2. 4 to 5

D. Multiple Choice Questions

1. b) Flowering
2. a) Sandy loam soil

UNIT 15.4: Pest and Disease Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of applying the recommended pesticide or insecticide as per the prescription.
2. Demonstrate how to treat the marigold seeds with the recommended pesticide or insecticide before sowing.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., which can illustrate various pest and diseases of marigold plant.

Activity

Purpose: To understand the participants about various pest and diseases of marigold crop.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Group discussion for about 15-20 minutes.

Participants can be accompanied to a nearby field where marigolds are grown so they can examine various pests and diseases there. They can question farmers about things like

- What are the serious pest and diseases of marigold?
- Which marigold varieties are resistance to insect?
- How to differentiate symptoms of pest and diseases?
- How they control pest?

Expected outcome:

- Efficient management
- Awareness about various pest and diseases

Say

- Thank you to everyone for their participation.
- Describe the purpose of the above activity.

Ask

- Ask the participants about their experience of preparing pesticide or insecticide concentration.
- Ask the participants whether they know how to do seed treat the marigold seeds.

Explain

- Explain the different types of pesticide or insecticide used for chrysanthemum plant.

Elaborate

- Elaborate the procedure of applying the recommended pesticide or insecticide as per the prescription.
- Elaborate the importance of seed treatment and how to treat the marigold seeds with the pesticide before sowing.

Activity

This pen and paper activity is for preparing participants to learn control measures of various pest. Plan this activity for at least 20-30 minutes.

Ask participants to prepare a chart according to type of disease and pest attack, which type of control measure to be followed such as spraying, drenching and dusting.

Prepare a list of banned pesticide in India.

Notes for Facilitation

- Help the participants to complete all the exercises mentioned in the participant's handbook.
- Encourage participants for group discussion.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. In marigold red spider mite can be controlled by spraying Metasystox 25 EC, or Rogor or Nuvacron 40 EC @ 1 ml/l of water. Mealy bug and thrips can be controlled by sprays of Oxydemeton methyl, Diemthoate 0.05%.
2. Powdery Mildew is caused by *Oidium* sp. *Leveillula taurica*. Whitish, tiny, superficial spots appear on leaves, later on the whole aerial parts of the plant is covered with whitish powder.
Control measure - The disease can be controlled by spraying with Karathane (40 EC) @ 0.5% or dusting with sulphur powder at fortnightly intervals. Foliar application of sulphur compounds, Carbendazim, Triadimefon, Fenerimol, Penconazole and Triforine.
3. Collar rot caused by *Pythium* sp., *Phytophthora* sp. And *Sclerotium rolfsii*. Collar rot is caused either in nursery or in grown-up plants. The symptoms are in the form of black lesions developed on the main stem. Rotting at the collar regions causes death of the plant.
Control measure - Soil sterilization and controlled watering help in reducing the disease incidence. Crop rotation for 3-4 years. Carbendazim @ 1g/l reduces the incidence of disease.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. Whitish
2. Thirps

D. Multiple Choice Questions

1. b) Whitish spot
2. a) Flower Bud Rot

UNIT 15.5: Intercultural Operations, Harvesting and Post-Harvest Management

Unit Objectives

After the completion of this unit, the participants will be able to:

1. Demonstrate the process of carrying out pinching to induce the growth of lateral branches.
2. Show how to remove dead leaves and branches from marigold plants.
3. Show how to press soil around the root zone to avoid the formation of air pockets.
4. Show how to harvest the marigold flowers with or without stalk as per the market requirements.
5. Show how to collect the harvested flowers in appropriate baskets or containers and store them at the recommended temperature and humidity.
6. Demonstrate the process of sorting and grading marigold flowers on the basis of applicable parameters.
7. Show how to pack the harvested marigold flowers in gunny bags or bamboo baskets.
8. Prepare a sample record of harvesting and processing marigold flowers.

Resources to be used

- Available objects such as participant's handbook, white board, duster, marker etc.
- Power points slides, pictures/posters e.g., showing relevant visuals of various post-harvest activities.

Activity

Purpose: To understand the participants about techniques of harvesting.

Resources: Projector, system facilitating power point presentations, microphone, camera, and round tables arranged in u shape for healthy discussion.

Methodology: Plan this activity for 60 minutes.

Arrange the visit in nearby marigold field so that participants can perform the various operations like harvest and post-harvest activities.

After that ask participants to prepare a to collect information on how to harvest then sort and grade marigold flower.

Expected outcome:

- Introduction to harvesting stages of marigold.
- Efficient sorting and grading.

Say

- Thank you to everyone for their participation.
- Discuss with the participants to share their feelings about this exercise.

Ask

- Ask the participants to share their experience of field visit.
- Ask the participants whether they know which type of baskets or containers should be used for packing marigold.
- Inquire about the participants' knowledge of what pinching is.

Explain

- Introduce participants to the purpose of pinching and removing dead leaves and branches from marigold plants.
- Explain participants about how to identify marigold stage of harvesting.
- Explain participants about criteria of sorting and grading of marigold flowers.

Elaborate

- How to do pinching at different stages of growth to induce the growth of lateral branches.
- Elaborate the how to keep record of harvested and processed flowers.

Activity

Ask participants to prepare a sample record of harvesting and processing of marigold flowers using the different record keeping method and you have to guide them to prepare it successfully.

Notes for Facilitation

- Encourage the participants to undergo field visits and how they can learn more through these visits.
- Constantly motivate each student to participate.

Exercise

Key Solutions to PHB Exercises

A. Short Questions

1. To promote growth and for profuse flowering pinching of main shoot 35-40 days after transplanting is essential and second pinching after 25-30 days after first pinching could be practiced to increase the number of flower and reduced the size of flower. However, if the apical portion of shoot is removed early, large numbers of auxiliary shoots arise resulting in well-shaped bushy plant bearing more number of uniform sized flowers. In pinching by removal of apical portion it move energy to promote the number of side branches. Number of side branches directly positive correlated the yield of flowers in African marigold.
2. After transplanting marigold plant take 40-50 days to flower. Marigold flowers are plucked when they have attained full size depending upon variety. Plucking of flowers should be done in cool hours of the day. The field should be irrigated before plucking so that flowers keep well for a longer period after harvest. Plucked flowers are collected in polythene bags or bamboo baskets for carrying to markets. After harvesting flowers should be placed in shade or ventilated place to avoid the building up the heat and moisture. From one plant near about 100 to 150 flowers are obtained. Blooming duration is near about 2.5 - 3 months.6-8 time harvest of flower at 8-10 days interval is required to be done in good managed crop.
3. It means providing support to the tall plants. The African type marigold plants grow tall and needs to be staked with the help of bamboo sticks. Otherwise, lodging and bent stem may affect proper display of the plant.

B. State whether True or False (T/F)

1. False
2. True
3. True

C. Fill in the Blanks

1. 40-50
2. Packing

D. Multiple Choice Questions

1. a)250 ppm
2. a) 100 to 150 flowers



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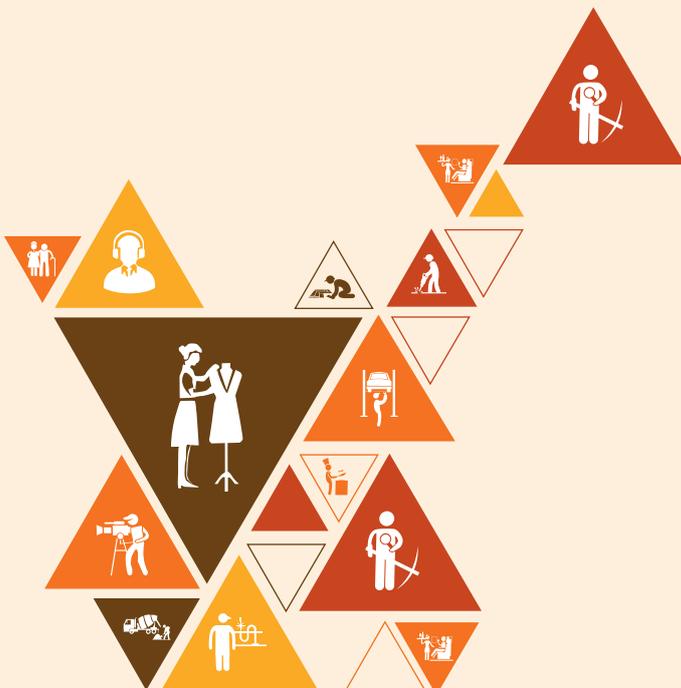
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16. Employability Skills (60 Hours)

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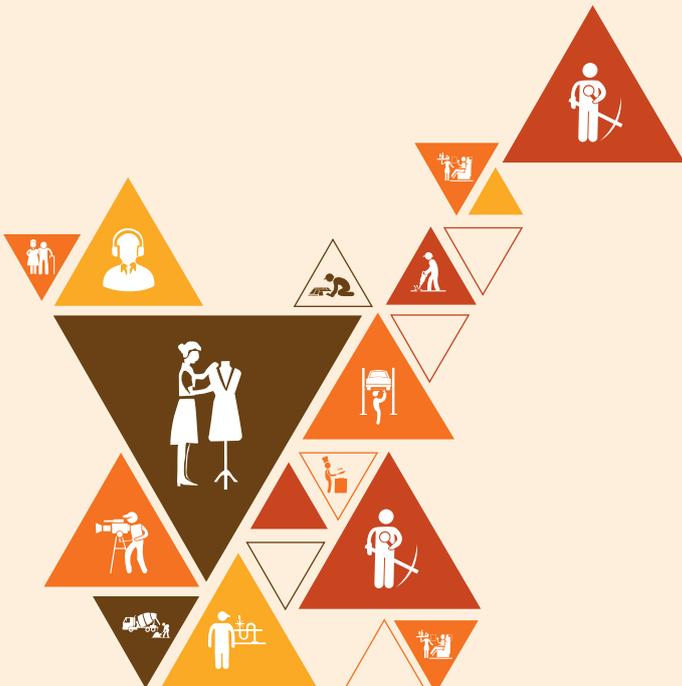
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17. Annexures

Annexure - I - Training Delivery Plan

Annexure - II - Assessment Criteria

Annexure - III - Annexure for QR codes



Annexure I

Training Delivery Plan

Training Delivery Plan			
Program Name:	Floriculturist		
Qualification Pack Name & Ref. ID	AGR/Q0701 NSQF Level: 4		
Version No.	3.0	Version Update Date	17/11/2022
Pre-requisites to Training (If any)	8th Class with 4 Years of relevant experience OR 10th Class Pass and pursuing continuous regular schooling OR 10th Class with 2 Years of relevant Experience OR Certificate-NSQF Level-4(Field Crop/Vegetable) with 6 months of relevant experience)		
Training Outcomes	<ul style="list-style-type: none"> Describe the process of preparing for the cultivation of flower crop. Demonstrate the process of propagating flower plant saplings. Demonstrate the process of harvesting, transplanting and maintaining sapling to grow flowers. Demonstrate the process of carrying out harvesting and post-harvest management of flower crop. Explain the basic entrepreneurial activities for small enterprise. Describe the process of undertaking employability and entrepreneurial practices. Describe the process of engaging in collective farming/activity. Demonstrate various practices to maintain health, hygiene and safety at the workplace. Demonstrate the process of carrying out cultivation of rose flowers. Demonstrate the process of carrying out cultivation of gerbera flowers. Demonstrate the process of carrying out cultivation of chrysanthemum flowers. Demonstrate the process of carrying out cultivation of orchid flowers. Demonstrate the process of carrying out cultivation of marigold flowers. 		

Sr. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Duration
1	Introduction to the role of a Floriculturist T: 4:00 (HH:MM)	Size and scope of agriculture industry	<ul style="list-style-type: none"> Explain size and scope of the agriculture industry and its sub sectors. 	NA	Group activity, Classroom teaching	Participant's handbook, white board, duster, marker, laptop, video films, Power points slides, pictures/posters etc.	T: 2:00
		Role, responsibility and opportunities for floriculturist	<ul style="list-style-type: none"> Discuss role and responsibility. Identify various employment opportunities. 		Debate competition	Participant's handbook, white board, duster, marker, laptop, video films, Power points slides, pictures/posters etc.	T:2:00

2.	Process for Preparing for the Cultivation of Flower Crop T:12:00 P:28:00 (HH:MM)	Criteria for site selection and input requirements and soil management	<ul style="list-style-type: none"> • Demonstrate how to remove waste materials from the field. • Demonstrate how to till the field. • Show how to level the field. • Demonstrate the process of soil fumigation. • Demonstrate the installing of irrigation or fertigation. • Demonstrate the process of applying the appropriate treatment to the soil. 	AGR/ N0701 PC1, PC14, PC18, Ku1, Ku10, Ku13, GS1, GS9	Field visit	Power points slides, pictures/ posters, tractor, leveller, soil sampling equipment, soil testing instruments, spade	T:2:00 P:6:00
		Preparation of ridges and furrow	<ul style="list-style-type: none"> • Demonstrate the process of preparing ridges and furrows of the. 	AGR/ N0701 PC15, Ku11, GS1, GS9	Group discussion, demonstration	Participant's handbook, white board, duster, marker etc. Slides in power point presentation/ videos	T:2:00 P:6:00
		Preparation of sunken and raised bed	<ul style="list-style-type: none"> • Demonstrate the process of preparing sunken, level or raised nursery beds. 	AGR/ N0701 PC15, Ku11, GS1, GS9	Group discussion, demonstration	Participant's handbook, white board, duster, marker etc. Slides in power point presentation/ videos	T:4:00 P:4:00
		Creation of drains in field	<ul style="list-style-type: none"> • Show how to create drains in the field. 	AGR/ N0701 PC17, Ku14, GS1, GS9,	Group discussion, classroom teaching	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Fence management	<ul style="list-style-type: none"> • Show how to erect fences. 	AGR/ N0701 PC18, Ku15, GS1, GS9,	Group discussion, classroom teaching	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
3.	Process of Propagating Flower Plant Saplings T:16:00 P:32:00 (HH:MM)	Seed sorting, treatment	<ul style="list-style-type: none"> • Demonstrate how to sort out seeds. • Demonstrate the process of pre-sowing treatment of seeds. • Demonstrate the preparation of seedbed. • Show how to fill in the polybags and containers. 	AGR/ N0718 PC1, PC4, Ku1, Ku4, GS1, GS9	Debate competition, demonstration	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Seed sowing	<ul style="list-style-type: none"> • Demonstrate the process of sowing seeds in the seedbed, poly bags and containers. 	AGR/ N0718 PC5, PC7, Ku5, Ku7, GS1, GS9	Group discussion, identification of different fertilizers	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00

			<ul style="list-style-type: none"> • Demonstrate the process of applying water and organic or inorganic fertilisers on the sown seeds. 				
		Sapling acclimatization	<ul style="list-style-type: none"> • Demonstrate how to harvest and acclimatise the saplings. • Demonstrate the process of applying water and fertilisers. 	AGR/ N0718 PC8, Ku8, Ku10 GS1, GS9	Group discussion, demonstration	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Propagation methods	<ul style="list-style-type: none"> • Show how to extract stems from the plant. • Demonstrate how to use rooting mixtures and plant growth hormones. • Show how to create root divisions from the plant's root. • Demonstrate the process of using the root divisions to propagate plants. 	AGR/ N0718 PC9, PC19, Ku11, Ku14, GS1, GS9	Group discussion, demonstration	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Rootstock and bud stick preparation	<ul style="list-style-type: none"> • Demonstrate the process of preparing the rootstock for budding. • Show how to cut a bud-stick. • Demonstrate the process of preparing and using bud-scion to propagate plants. 	AGR/ N0718 PC20, PC21, Ku15, Ku16, GS1, GS9	Classroom teaching, demonstration	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Use of pesticides and insecticides	<ul style="list-style-type: none"> • Demonstrate the process of applying the pesticides and insecticides. 	AGR/ N0718 PC22, Ku17, GS1, GS9	Group discussion, demonstration	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:6:00 P:2:00
4.	Process of Harvesting, Transplanting and Maintaining Saplings to Grow Flowers T:16 P:32 (HH:MM)	Harvesting and transplanting	<ul style="list-style-type: none"> • Process of harvesting and collecting the saplings. • Process of transplanting the saplings in the field using the tools. • Show how to water the saplings and apply the organic or inorganic fertilisers. 	AGR/ N0702 PC1, PC8, Ku1, Ku8, GS1, GS9	Group discussion, field activity	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00

			<ul style="list-style-type: none"> Explain the process of installing support. 				
		Fertilizer and irrigation management	<ul style="list-style-type: none"> Explain the process of applying organic and inorganic fertilisers. Discuss how to water the plants. 	AGR/ N0702 PC8, PC9, Ku8, Ku9, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Preparation of pesticide or insecticide	<ul style="list-style-type: none"> Explain about organic preparations and/or pesticides, insecticides or fungicides. 	AGR/ N0702 PC10, PC11, Ku10, Ku11, GS1,GS9	Classroom teaching, demonstration	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Drainage in field	<ul style="list-style-type: none"> Show how to drain out water accumulated in the field 	AGR/ N0702 PC15, Ku15, GS1,GS9	Group discussion, field visit	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Diseases, pest, weed management and pruning	<ul style="list-style-type: none"> Explain the process of pruning. Show how to identify disease and pest infestation and take precautions. Explain the process of weeding and how to apply the mulch 	AGR/ N0702 PC13,PC15, Ku12, Ku15, GS1,GS9	Field visit	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:2:00 P:6:00
		Resource optimisation and recycling of waste	<ul style="list-style-type: none"> Demonstrate practices to optimise the usage of resources. Demonstrate the process of recycling and disposing of waste. 	AGR/ N0702 PC16, PC19, Ku16, Ku20, GS1,GS9	Debate competition and discussion	Participant's handbook, white board, duster, marker, power points slides, pictures/posters etc.	T:6:00 P:2:00
5.	Process of Carrying out Harvesting and Post-Harvest Management of Flower Crop T:8:00 P:32:00(HH:MM)	Harvesting of flowers	<ul style="list-style-type: none"> Demonstrate the process of harvesting the flower crop. 	AGR/ N0703 PC1, PC3, Ku1, Ku2, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Storage	<ul style="list-style-type: none"> Demonstrate the process of applying treatment in the storage area. 	AGR/ N0703 PC6, PC7, Ku4, Ku5, GS1,GS9	Group discussion, classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00

		Sorting and grading of flowers	<ul style="list-style-type: none"> Show how to sort and grade the harvested flowers. 	AGR/ N0703 PC5, Ku3, GS1,GS9	Group discussion, identification	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 1:00 P:7:00
		Flower packaging, transport	<ul style="list-style-type: none"> Demonstrate the process of precooling of flowers. Demonstrate the preparing and applying the preservative solution. Show how to condition the flowers and pack them 	AGR/ N0703 PC4, PC5, PC8,PC14 Ku6,Ku8, GS1,GS9	Debate competition and discussion	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		E-payment and record maintenance	<ul style="list-style-type: none"> Demonstrate the use of e-payment methods. Prepare a sample record of sales and payments. 	AGR/ N0703 PC15, PC16, Ku9,Ku10, GS1,GS9	Group discussion, individual activity	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:1:00 P:7:00
6.	Basic Entrepreneurial Activities for Small Enterprise T:12 P:28 (HH:MM)	Demand and supply	<ul style="list-style-type: none"> Demonstrate how to analyze the demand and supply. 	AGR/ N9908 PC1, PC13, Ku1, Ku11, GS1,GS8	Group discussion, classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
Agricultural entrepreneurship / business opportunities.		<ul style="list-style-type: none"> Prepare a sample basic business plan for agricultural entrepreneurship/ business activities. 	AGR/ N9908 PC14, PC22, Ku12, Ku14, GS1,GS8	Classroom teaching, individual activity	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00	
Basic resources of agriculture production		<ul style="list-style-type: none"> Demonstrate how to calculate the costs incurred and determine the price of the product. 	AGR/ N9908 PC17, Ku15, GS1,GS8	Classroom teaching, group discussion	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00	
Preparing to be an entrepreneur		<ul style="list-style-type: none"> Prepare a sample marketing plan considering the 4Ps and 4As. 	AGR/ N9908 PC23, PC25 PC27, Ku16, Ku24, GS1,GS8	Group discussion, debate competition	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00	
Digital services		<ul style="list-style-type: none"> Demonstrate the process of using the digital services. 	AGR/ N9908 PC24, Ku22, GS1,GS8	Group discussion, classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:4:00 P:4:00	

7.	Engagement in Collective Farming/ Activities T:8:00 P:20:00 (HH:MM)	Formation of PGs/ FIGs/ SHGs	<ul style="list-style-type: none"> • Role play to illustrate how to conduct the initial group meetings. 	AGR/ N9922 PC1,PC2, Ku1,Ku7, GS1,GS7	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Group income generation	<ul style="list-style-type: none"> • Group income generating enterprises/ activities, methods of operation, etc. 	AGR/ N9922 PC3, PC11, Ku5, GS1,GS7	Group discussion, classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Field trials	<ul style="list-style-type: none"> • Role play to illustrate how to organize field trials. 	AGR/ N9922 PC12, PC19, Ku8,Ku12, GS1,GS7	Group activity and discussion	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Resolve problems in field operation	<ul style="list-style-type: none"> • Resolve problems encountered by group members in the field operations. 	AGR/ N9922 PC20, PC21, Ku13, Ku14, GS1,GS7	Group discussion	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:2:00
8.	Effective Communication at Workplace T:4:00 P:12:00 (HH:MM)	Effective communication	<ul style="list-style-type: none"> • Demonstrate the requisite level of proficiency in verbal and non-verbal communication. • Demonstrate approaches to mentoring an apprentice. 	AGR/ N9918 PC1,PC17, Ku1,Ku17, GS1,GS15	Individual activity, demonstration	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Communication that is respectful of genders and disability	<ul style="list-style-type: none"> • Prepare a sample training schedule for an apprentice. • Demonstrate verbal and non-verbal. 		Group discussion and debate	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
9.	Hygiene and Cleanliness T:2:00 P:2:00 (HH:MM)	Personal health and Hygiene at workplace	<ul style="list-style-type: none"> • Demonstrate personal hygiene practices • Demonstrate the correct way of washing hands. • Demonstrate the steps to follow to put on and take off a mask. • Show how to sanitize and disinfect. • Demonstrate adherence to the workplace sanitization norms. 	AGR/ N9903 PC1,PC4, Ku1,Ku7, GS1,GS9	Individual activity, discussion	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:2:00

			<ul style="list-style-type: none"> Show how to ensure the cleanliness of the work area. 				
10.	Safety and Emergency Procedures T:2:00 P:10:00 (HH:MM)	Safety guidelines and checks	<ul style="list-style-type: none"> Demonstrate how to safely use the PPE and implement it. Display the correct way of donning, doffing and discarding PPE. Sanitize the tools, equipment and machinery. Demonstrate the administration of first aid. Prepare a list of relevant hotline/ emergency numbers. Demonstrate emergency procedures. Demonstrate the use of emergency equipment. 	AGR/ N9903 PC5, PC15, Ku8, Ku17, GS1, GS9	Group discussion, demonstration	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:1:00 P:5:00
		Safety hazards at workplace	<ul style="list-style-type: none"> Check various areas of the workplace for leakages, water-logging, pests, fire, etc. Demonstrate the safe disposal of waste. Demonstrate procedures for dealing with accidents, fires and emergencies. 	AGR/ N9903 PC16,PC20, KU11, GS1,GS9	Group discussion, classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:1:00 P:5:00
11.	Process of Carrying out Cultivation of Rose Flower T:12 P:32 (HH:MM)	Site selection	<ul style="list-style-type: none"> Demonstrate how to mix sand and farmyard manure. Demonstrate the process of transplanting rose saplings. 	AGR/ N0719 PC1, PC4, Ku1, Ku2, GS1, GS9	Individual activity, demonstration	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Varietal selection and propagation methods	<ul style="list-style-type: none"> Demonstrate the process of harvesting the rose saplings. Demonstrate the process of applying the organic and inorganic fertilisers and water them. 	AGR/ N0719 PC5, PC9, Ku3, Ku5, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Irrigation, nutrient and weed management	<ul style="list-style-type: none"> Demonstrate the process of weeding. Show how to water the rose plants. 	AGR/ N0719 PC13, PC15 Ku8, Ku10, GS1, GS9	Individual activity, classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:5:00

			<ul style="list-style-type: none"> • Demonstrate the process of applying the organic and inorganic fertilisers. 				
		Pruning and other intercultural operations	<ul style="list-style-type: none"> • Demonstrate the process of pruning of rose. • Demonstrate the process of defoliation. 	AGR/ N0719 PC12, PC16, Ku7, Ku11, GS1,GS9	Individual activity, demonstration	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:5:00
		Pest and disease management	<ul style="list-style-type: none"> • Demonstrate the process of applying the pesticide or insecticide. 	AGR/ N0719 PC10, PC11, Ku6, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:5:00
		Harvesting and post-harvest management	<ul style="list-style-type: none"> • Demonstrate the process of harvesting rose flowers. • Show how to collect the harvested rose. • Show how to sort and grade. • Demonstrate the process of applying the preservative solution. • Demonstrate the bunching and packing rose flowers. • Prepare a sample manual and/ or electronic record. 	AGR/ N0719 PC17, PC25, Ku12, Ku16, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:5:00
12.	Process of Carrying out Cultivation of Gerbera Flowers T:12:00 P:32:00 (HH:MM)	Site selection	<ul style="list-style-type: none"> • Show how to mix sand and farmyard manure in the soil. • Demonstrate how to disinfect the soil. • Demonstrate the process of applying plastic sheet cover on the soil. 	AGR/ N0720 PC1, PC5, Ku1, Ku6, GS1, GS9	Group discussion and debate	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Varietal selection and propagation methods	<ul style="list-style-type: none"> • Demonstrate the process of propagating gerbera saplings. • Demonstrate the process of harvesting the gerbera. • Demonstrate the process of transplanting gerbera saplings. • Show how to water the saplings. 	AGR/ N0720 PC6, PC12, Ku6, Ku10, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00

		Planting, irrigation and weed management	<ul style="list-style-type: none"> • Demonstrate the process of installing support. • Show how to water the gerbera plants. • Demonstrate the process weeding. • Demonstrate the process of pruning of gerbera plants. • Show how to rake the soil in the field. 	AGR/N0720 PC13, PC15, PC18, Ku11, Ku15, GS1, GS9	Group discussion, classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Pest and diseases management	<ul style="list-style-type: none"> • Demonstrate the process of applying the pesticide or insecticide. 	AGR/N0720 PC16, PC17, Ku13, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Fertilizer, Harvesting and Post-Harvest Management	<ul style="list-style-type: none"> • Demonstrate the process of applying the recommended organic and inorganic fertilisers. • Demonstrate the process of harvesting and collecting. • Demonstrate the process of sorting and grading. • Demonstrate the process of preparing and applying the preservative solution. • Demonstrate the process of bunching and packing. 	AGR/N0720 PC19, PC28, Ku15, Ku24, GS1,GS9	Field visit, group discussion	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Record maintenance	<ul style="list-style-type: none"> • Prepare a sample manual and/ or electronic record. 	AGR/N0720 PC29, Ku25, GS1, GS9	Group discussion and classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:2:00
13.	Process of Carrying out Cultivation of Chrysanthemum Flowers T:12:00 P:32:00 (HH:MM)	Site selection	<ul style="list-style-type: none"> • Demonstrate the process of ploughing and harrowing. • Demonstrate the process of applying the chemicals to the soil to disinfect the soil. • Demonstrate the process of applying plastic sheet cover on the soil. 	AGR/N0721 PC1, PC8, Ku1, Ku5, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P: 6:00

	Varietal selection and propagation methods	<ul style="list-style-type: none"> • Demonstrate how to propagate chrysanthemum saplings. • Demonstrate the process of harvesting the chrysanthemum saplings. • Show how to transplant chrysanthemum saplings. 	AGR/ N0721 PC9, PC15, Ku6, Ku9, GS1, GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
	Irrigation, fertilizer and weed management	<ul style="list-style-type: none"> • Demonstrate the process of installing the irrigation or fertigation system in the field. • Show how to drain out water accumulated. • Show how to water the saplings and apply fertilisers after transplanting. • Demonstrate the process of applying the organic and inorganic fertilisers. • Show how to water the chrysanthemum. • Show how to create drains in the field. • Demonstrate the process of weeding. 	AGR/ N0721 PC16, PC17, Ku10, Ku11, Ku14, Ku18, GS1,GS9	Debate competition and classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
	Pinching and other intercultural operations	<ul style="list-style-type: none"> • Demonstrate the process of carrying out pinching and installing support. • Demonstrate the process of carrying out disbudding,. • Demonstrate the process of carrying out pruning, removing the side suckers 	AGR/ N0721 PC22, PC24, Ku9, Ku12, Ku13, Ku16, GS1, GS9	Individual activity and demonstration	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
	Pest and disease management	<ul style="list-style-type: none"> • Demonstrate the process of applying the pesticide or insecticide. 	AGR/ N0721 PC18,PC19, Ku15, GS1,GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 5:00

		Harvesting and post-harvest management	<ul style="list-style-type: none"> Show how to harvest and collect chrysanthemum flowers. Demonstrate how to sort and grade rs. Demonstrate the process of preparing and applying the preservative solution. Demonstrate the process of bunching and packing. Prepare a sample manual and/ or electronic record. 	AGR/ N0721 PC26, PC33, Ku20, Ku26, GS1, GS9	Field visit, discussion	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 3:00
14.	Process of Carrying out Cultivation of Orchid Flowers T:12:00 P:32:00 (HH:MM)	Site selection	<ul style="list-style-type: none"> Demonstrate how to prepare a green shade net house or poly-house. Demonstrate how to prepare the growth media. 	AGR/N0722 PC1,PC5, Ku1,Ku8, GS1,GS9	Discussion, classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
		Varietal selection and propagation methods	<ul style="list-style-type: none"> Demonstrate the process of planting the orchid seeds in pots. 	AGR/ N0722 PC6,PC9, Ku8,Ku10, GS1,GS9	Group discussion and demonstration	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
		Irrigation, fertilizer and weed management	<ul style="list-style-type: none"> Demonstrate the process of applying the organic and inorganic fertilisers. Show how to water the orchid plants. 	AGR/ N0722 PC11, PC19, Ku11, Ku15, Ku16, GS1,GS9	Field visit, demonstration	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
		Potting and other intercultural operations	<ul style="list-style-type: none"> Demonstrate the process of installing support. Demonstrate how to remove the dead leaves and weeds. 	AGR/ N0722 PC10,PC18, Ku9,Ku17, GS1,GS9	Individual activity, group discussion	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
		Pest and disease management	<ul style="list-style-type: none"> Show how to spray the pesticide or insecticide on orchid plants as per the prescription. 	AGR/ N0722 PC14, PC15, Ku13, Ku14, GS1,GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 5:00
		Harvesting and post-harvest management	<ul style="list-style-type: none"> Demonstrate the process of harvesting the orchid flowers. Demonstrate the process of sorting and grading. 	AGR/ N0722 PC20, PC27, Ku18 Ku24, GS1,GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 3:00

			<ul style="list-style-type: none"> • Show how to prepare and apply the preservative solution. • Demonstrate the process of bunching packing. • Prepare a sample record of harvesting and processing of orchid flowers. 				
15.	Process of Carrying out Cultivation of Marigold Flowers T:12:00 P:32:00 (HH:MM)	Site selection	<ul style="list-style-type: none"> • Demonstrate the process of carrying out ploughing and harrowing in the field. • Demonstrate the process of applying farmyard manure. • Show how to disinfect the soil. 	AGR/ N0723 PC1,PC8, Ku1,Ku6, GS1,GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
		Varietal selection and propagation methods	<ul style="list-style-type: none"> • Demonstrate the process of propagating marigold saplings. • Show how to harvest the marigold saplings. • Demonstrate the process of transplanting marigold saplings 	AGR/ N0723 PC9,PC15, Ku7,Ku15, GS1,GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
		Irrigation, fertilizer and weed management	<ul style="list-style-type: none"> • Demonstrate the process of installing the e irrigation or fertigation system. • Show how to create drains in the. • Show how to water the marigold. • Demonstrate how to drain out any water. • Demonstrate the process of weeding. • Demonstrate the process of applying the organic and inorganic fertilisers. • Show how to water the saplings and apply fertilisers after transplanting. 	AGR/ N0723 PC16,PC18, PC21, PC22, Ku16, Ku18, Ku21, GS1,GS9	Debate Competition and classroom teaching	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00

		Pest and disease management	<ul style="list-style-type: none"> • Demonstrate the process of applying the pesticide or insecticide. • Demonstrate how to treat the marigold seeds with the d pesticide or insecticide. 	AGR/ N0723 PS19,PS20, Ku19, GS1,GS9	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 6:00
		Intercultural operations, harvesting and post-harvest management	<ul style="list-style-type: none"> • Demonstrate the process of carrying out pinching s. • Show how to remove dead leaves and branches. • Show how to press soil around the root zone. • Show how to harvest the marigold flowers. • Show how to collect the harvested flowers. • Demonstrate the process of sorting and grading. • Show how to pack the harvested marigold. 	AGR/ N0723 PC33, GS1, GS9,	Field visit	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T:2:00 P:6:00
		Pest and disease management	<ul style="list-style-type: none"> • Revision for identification of pest & diseases of Marigold. • Revision on application of Insecticides how to do safe spraying ? 	AGR/ N0723 PS19,PS20, Ku19, GS1,GS9	Recap session	Participant's handbook, white board, duster, marker, Power points slides, pictures/posters etc.	T: 2:00 P: 2:00

16..	Employability Skills (60hrs)	Introduction to Employability Skills	<ul style="list-style-type: none"> Describe importance of Employability Skills Prepare a note on different industries, trends, required skills 	DGT/VS Q/ N0102	Classroom lecture, Team Activity	White-Board and, Markers, Chart Paper and Sketch pens, LCD Projector	1:30
		Constitutional Values: Citizenship	<ul style="list-style-type: none"> Detail the principles of constitution of India Identify the various environmentally sustainable practices 		Classroom lecture, Team Activity	Laptop, PPT, White board Markers, note pad, pen etc.	1:30
		Becoming a Professional in the 21st Century	<ul style="list-style-type: none"> Discuss relevant 21st century skills required for employment Practice critical thinking and decision making skills 		Classroom lecture, Team Activity	Laptop, PPT, White board Markers, note pad, pen etc.	2:30
		Basic Skills-I	<ul style="list-style-type: none"> Read English text with appropriate articulation Practice basic English words, sentences, punctuation Demonstrate active listening and reading skills 		Classroom lecture, Team Activity, Role play, video session	Laptop, PPT, White board Markers, note pad, pen etc.	5:00
		Basic Skills-II		Practical, demonstration, role play	5:00		
		Career Development and Goal Setting	<ul style="list-style-type: none"> Identify well-defined short- and long-term goals Explain how to build a career pathway Conduct job market 	DGT/V SQ /N010 2	Class room lecture, discussion, demonstration, practical	Laptop, PPT, White board Markers, note pad, pen etc.	2:00

			<ul style="list-style-type: none"> research Discuss how to set career goals. 				
		Communication Skills	<ul style="list-style-type: none"> Explain the importance of communication at workplace Demonstrate effective communication strategies Demonstrate how to communicate effectively using verbal and nonverbal communication 	DGT/V SQ /N010 2	Class room lecture, discussion, demonstration, practical	Laptop, PPT, White board Markers, note pad, pen, audio visual aids etc.	5:00
		Diversity and Inclusion	<ul style="list-style-type: none"> Explain the need of diversity at workplace Identify the various PwD policies applicable at workplace Discuss the significance of the POSH Act 	DGT/V SQ/ N0102	Class room lecture, Inter-active discussion	Laptop, PPT, White board Markers, note pad, pen, audio visual aids etc.	2:30
		Financial and Legal Literacy	<ul style="list-style-type: none"> Discuss various financial institutions, products, and services Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax deductions 	DGT/V SQ/ N0102	Class room lecture, demonstrations, group discussion, practical	Laptop, PPT, White board Markers, note pad, pen, audio visual aids etc.	5:00
		Essential Digital Skills-I	<ul style="list-style-type: none"> Detail the use and features of various MS Office tools, like MS Word, MS Excel, MS PowerPoint, etc. Demonstrate how to operate digital devices Create an e-mail id and follow e- mail etiquette to exchange e -mails Describe the role of digital technology in day-to-day life and the workplace 	DGT/V SQ/ N0102	Class room lecture, discussion, Demonstration, practical, learning by doing	Laptop, PPT, White board Markers, note pad, pen, audio visual aids etc.	6:00
		Essential Digital Skills-II	<ul style="list-style-type: none"> Practice Digital skills 		Demonstration, practical, learning		4:00

				by doing		
	Entrepreneurship	<ul style="list-style-type: none"> Describe the types of entrepreneurship and enterprises Describe the 4Ps Of Marketing- Product, Price, Place and Promotion and Apply the mas Per requirement Create a sample Business plan, For the selected business 	DGT/VSQ /N0102	Class room lecture, discussion, Demonstration, practical	Laptop, PPT, White board Markers, note pad, pen, audio visual aids etc.	7:00
	Customer Service	<ul style="list-style-type: none"> Identify types of customers and how to deal with them Identify methods to get customer feedback and how to implement them Explain various tools used to collect customer feedback Discuss the significance of maintaining hygiene and dressing appropriately 	DGT/ VSQ/N 0102	Class room lecture, activity, role play, video session	Laptop, PPT, White board Markers, note pad, pen, audio visual aids etc.	5:00
	Apprenticeships and Jobs	<ul style="list-style-type: none"> Practice personal grooming strategies Illustrate the use of online platforms for job hunting Detail the concept of Apprenticeship Demonstrate how to enroll for Apprenticeship programs. Draft a professional Curriculum Vitae (CV) Role play a mock interview 	DGT/ VSQ/N 0102			8:00

Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

(For Updated 'Assessment Criteria', please refer to Qualification Pack of this Job role available at <https://www.nqr.gov.in/>)

Assessment Criteria for Floriculturist	
Job Role:	Floriculturist
Qualification Pack	AGR/Q0701
Sector Skill Council	Agriculture Skill Council of India

Sr. No.	Guidelines for Assessment
1.	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2.	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3.	Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4.	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5.	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criterion.
6.	To pass the Qualification Pack, every trainee should score a minimum of 50% of aggregate marks to successfully clear the assessment.
7.	In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
AGR/N0701.Prepare for the cultivation of flower crop	30	40	-	30	100	10
AGR/N0718.Propagate flower plant saplings	30	40	-	30	100	10
AGR/N0702.Harvest, transplant and maintain saplings to grow flowers	30	40	-	30	100	15
AGR/N0703.Carry out harvesting and post-harvest management of flower crop	30	40	-	30	100	15
AGR/N9908.Undertake basic entrepreneurial activities for small enterprise	30	40	-	30	100	10
AGR/N9922.Engage in collective farming/activity	30	40	-	30	100	5
AGR/N9903.Maintain health and safety at the workplace	40	25	-	35	100	5
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	5
Total	240	295	-	215	750	75

Elective: 1 Rose

Annexure III

Annexure of QR Codes for Floriculturist

Chapter No.	Unit No.	Topic	QR Code Links	QR code (s)
Chapter - 1 Introduction	Unit 1.1 - Size and Scope of Agriculture Industry	Flower Farming Business	https://www.youtube.com/watch?v=57aWvwke2G0	 Flower Farming Business
Chapter - 2 Process for Preparing for the Cultivation of Flower Crop	Unit 2.1 - Site Selection, Input Requirements and Soil Management	Soil Sampling by "V" Method	https://youtu.be/RavNWfdU8IO	 Soil Sampling by "V" Method
Chapter - 3 Process of Propagating Flower Plant Saplings	Unit 3.1 - Seedbed Preparation and Fertilizer Management	Irrigation for Seedlings in Floriculture	https://youtu.be/7q5dlqOi37M	 Irrigation for Seedlings in Floriculture
Chapter - 4 Process of Harvesting, Transplanting and Maintaining Saplings to Grow Flowers	Unit 4.1 - Transplanting of Sapling, Fertilizers and Water Management	Vermicompost Production	https://youtu.be/HySDWOdWfoQ	 Vermicompost Production
Chapter - 5 Process of Carrying out Harvesting and Post-Harvest Management of Flower Crop	Unit 5.1 - Harvesting of Flowers	Plantion & Growth of Flower Crop	https://youtu.be/3bj-gipK5Zk	 Plantion & Growth of Flower Crop
		Technologies in Floriculture across the World	https://youtu.be/fHKSrHJsvzo	 Technologies in Floriculture across the World
Chapter - 6 Basic Entrepreneurial Activities for Small Enterprise	Unit 6.2 - Agricultural Entrepreneurship / Business Opportunities	Floriculture Business in India	https://youtu.be/6YKzwnroZRc	 Floriculture Business in India

Chapter No.	Unit No.	Topic	QR Code Links	QR code (s)
Chapter - 7 Engagement in Collective Farming/ Activities	Unit 7.1 - Formation of PGs/ FIGs/ SHGs and its Operations	Collective Farming: Self Help Group	https://youtu.be/IAbQOKH9T8	 Collective Farming: Self Help Group
Chapter - 8 Effective Communication at Workplace	Unit 8.1 - Effective Communication and Working Environment	Effective Communication	https://youtu.be/l6IAhXM-vps	 Effective Communication
Chapter - 9 Hygiene and Cleanliness	Unit 9.1 - Personal Health and Hygiene at Workplace	Polyhouse Cleaning & Hygiene	https://youtu.be/CHDXlcETBoA	 Polyhouse Cleaning & Hygiene
Chapter - 10 Safety and Emergency Procedures	Unit 10.1 - Safety Guidelines and Checks	Donning of Disposable Gloves & Safety Measures	https://youtu.be/3l-kKVNrEMo	 Donning of Disposable Gloves & Safety Measures
Chapter - 11 Process of carrying out Cultivation of Rose Flower	Unit 11.6 - Harvesting and Post-Harvest Management	Care of Roses during Pre-Harvesting and Post-Harvesting	https://youtu.be/3bj-gjpK5Zk	 Care of Roses during Pre-Harvesting and Post-Harvesting
Chapter - 12 Process of Carrying out Cultivation of Gerbera Flowers	Unit 12.1 - Site Selection Unit 12.2 - Varietal Selection and Propagation Methods Unit 12.3 - Planting, Irrigation and Weed Management Unit 12.4 - Pest and Diseases Management	Life Cycle of Gerbera	https://youtu.be/gXskpeW8ELA	 Life Cycle of Gerbera
Chapter - 13 Process of Carrying out Cultivation of Chrysanthemum Flowers	Unit 13.1 - Site Selection	Chrysanthemum Cultivation Site	https://youtu.be/Q8dhqwM-GRI	 Chrysanthemum Cultivation Site

Chapter No.	Unit No.	Topic	QR Code Links	QR code (s)
Chapter - 14 Process of Carrying out Cultivation of Orchid Flowers	Unit 14.4 - Potting and other Intercultural Operations	Potting and Care of Orchids	https://youtu.be/OSrkcua1n80	 Potting and Care of Orchids
Chapter - 15 Process of Carrying out Cultivation of Marigold Flowers	Unit 15.2 - Varietal Selection and Propagation Methods	Marigold Propagation	https://youtu.be/jv6jC1bQBkI	 Marigold Propagation



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