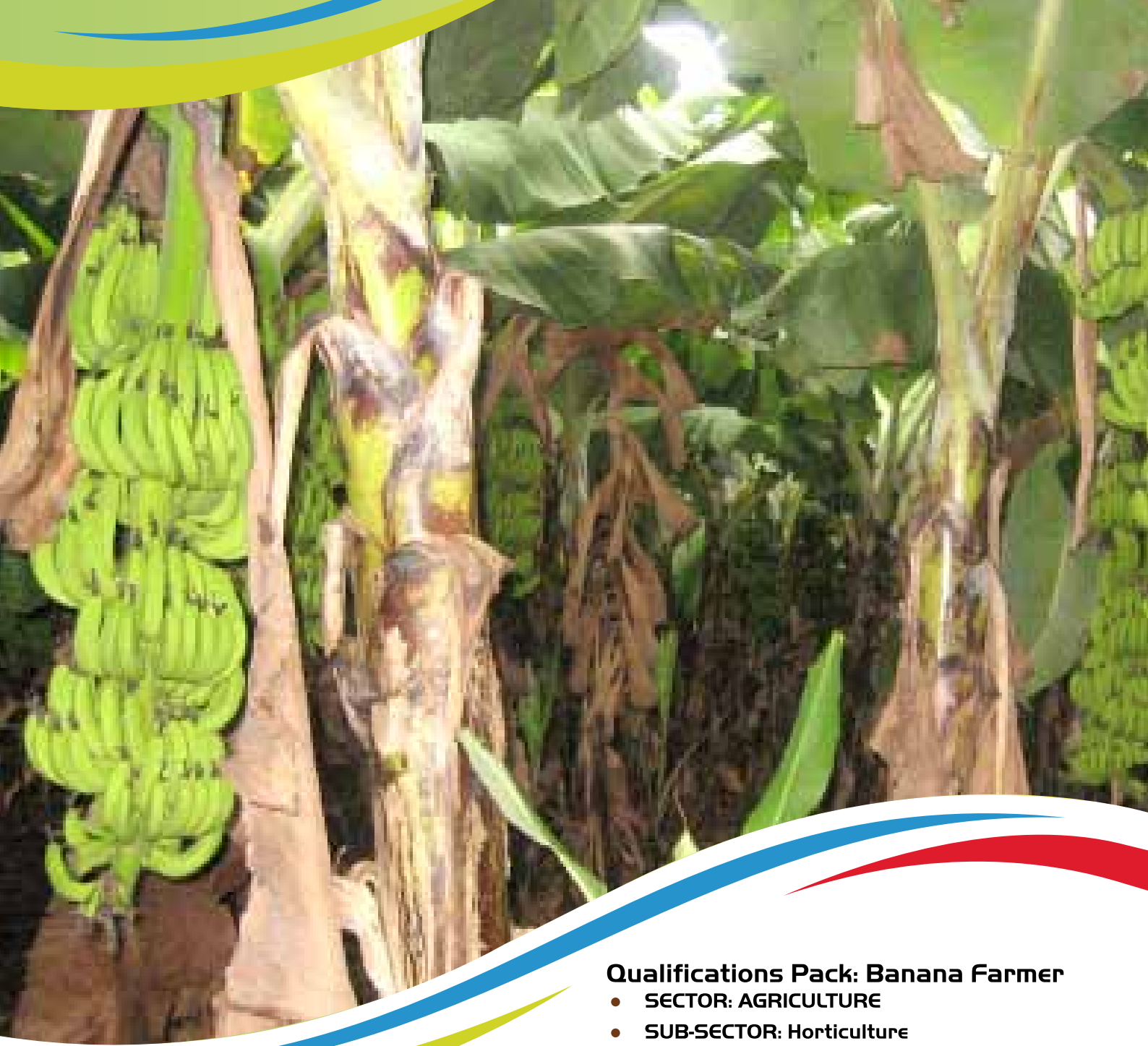


Trainer's Guide

Banana Farmer



Qualifications Pack: Banana Farmer

- SECTOR: AGRICULTURE
- SUB-SECTOR: Horticulture
- OCCUPATION: Horticulture Crops Cultivation
- REFERENCE ID: AGR / Q 0201

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Session Plan

Program Name	Banana Farmer		
Name of Client	NSDC		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	◆	One year experience in banana cultivation	
	◆	No Entry level barrier; 5th standard appear or pass preferable	
Training Outcomes	After completing this program, participants will be able to cultivate banana crop on a given piece of land which involves procurement of seed material from the market to the sale of farm produce in the market.		

Sr. No.	Module	Session	Objectives	Methodology	Tools	Duration
1	Evaluation	Pre-training Assessment	<ul style="list-style-type: none"> Assess the current knowledge of the participant on tractor and its operations 	<ul style="list-style-type: none"> Theory Test 	<ul style="list-style-type: none"> Trainer's Guide Assessment Guide 	1 hour
2	Ice Breaker	Ice Breaker	<ul style="list-style-type: none"> Get introduced to one another to build rapport with their fellow participants and the trainer. 	<ul style="list-style-type: none"> Group Participation Activity 	<ul style="list-style-type: none"> Game 	1 hour 30 minutes
3	Introduction to Banana Crop	Introduction to Banana Crop	<ul style="list-style-type: none"> State the origin and distribution of banana crop; List the nutritional value of banana. 	<ul style="list-style-type: none"> Trainer-led Discussion 	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hour
4	Planting Material Preparation in Banana Cultivation	Agro-climatic Conditions	<ul style="list-style-type: none"> State the climatic and soil conditions required for banana cultivation. 	<ul style="list-style-type: none"> Trainer-led Discussion 	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours 30 minutes
5	Planting Material Preparation in Banana Cultivation	Characteristics of Cultivars	<ul style="list-style-type: none"> Select the variety based on the characteristics of cultivars; List the varieties that are suitable to the zone of cultivation. 	<ul style="list-style-type: none"> Trainer-led Discussion 	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours 30 minutes

Sr. No.	Module	Session	Objectives	Methodology	Tools	Duration
6	Planting Material Preparation in Banana Cultivation	Selecting the right Variety for given Zone	<ul style="list-style-type: none"> List the best suitable varieties that can be grown for a given agro climatic zone. 	<ul style="list-style-type: none"> Group Discussion Activity 	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours
7	Planting Material Preparation in Banana Cultivation	Identification of appropriate Planting material	<ul style="list-style-type: none"> State the types of planting materials; Identify the appropriate planting material for various banana varieties. 	<ul style="list-style-type: none"> Trainer-led Discussion Group Discussion Activity 	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours 30 minutes
8	Planting Material Preparation in Banana Cultivation	Procurement of Planting Material	<ul style="list-style-type: none"> Identify various suppliers for quality planting material; plan and procure planting material; Identify appropriate storage space to store planting material; Identify the appropriate time for procuring planting material. 	<ul style="list-style-type: none"> Trainer-led Discussion Group Discussion 	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours
9	Planting Material Preparation in Banana Cultivation	Treatment of Planting Material	<ul style="list-style-type: none"> treat planting material as per dosage recommended. 	<ul style="list-style-type: none"> Trainer-led Discussion Group Discussion 	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	1 hour

Sr. No.	Module	Session	Objectives	Methodology	Tools	Duration
48	Professional Skills	Case Study	<ul style="list-style-type: none"> ◆ Make decisions pertaining to the concerned area of work; ◆ Plan and organise banana plantation; ◆ Work with banana experts; ◆ Evaluate possible solutions for problems with cultivation and marketing. 	<ul style="list-style-type: none"> ◆ Group Discussion ◆ Presentation 	<ul style="list-style-type: none"> ◆ Trainer's Guide 	10 hours
49	Revision	Revision/ Self Learning	<ul style="list-style-type: none"> ◆ To revise the learning acquired through the training. 	<ul style="list-style-type: none"> ◆ Trainer-led Discussion ◆ Question Answer Session 	<ul style="list-style-type: none"> ◆ Trainer's Guide 	6 hours
50	Revision	Practice	<ul style="list-style-type: none"> ◆ To revise the skills acquired through the training. 	<ul style="list-style-type: none"> ◆ Practice 	<ul style="list-style-type: none"> ◆ Trainer's Guide ◆ Required Tools and Equipments 	10 hours
51	Evaluation	Assessment-2	<ul style="list-style-type: none"> ◆ Assess the knowledge and skills acquired by the participants from the training programme. 	<ul style="list-style-type: none"> ◆ Theory Test ◆ Practical Test ◆ Viva 	<ul style="list-style-type: none"> ◆ Trainer's Guide ◆ Assessment Guide ◆ Required Tools and Equipments ◆ Tractor 	6 hours
52	Evaluation	<ul style="list-style-type: none"> ◆ Post Training Assessment 	<ul style="list-style-type: none"> ◆ Assess the knowledge acquired by the participants through the training. 	<ul style="list-style-type: none"> ◆ Theory Test 	<ul style="list-style-type: none"> ◆ Trainer's Guide ◆ Assessment Guide 	1 hour

Module 2: Planting Material Preparation in Banana Cultivation

Session	Tools	Duration
Agro-climatic Conditions	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	1 hours
Characteristics of Cultivars	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours 30 minutes
Selecting the right Variety for given Zone	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours
Identification of appropriate Planting material	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours 30 minutes
Procurement of Planting Material	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	2 hours
Treatment of Planting Material	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	1 hour
Prepare Planting Material from Mother Plants	<ul style="list-style-type: none"> Trainer's Guide Participant Handbook 	4 hours

Agro-climatic Conditions

Objectives

After completing this session the participants will be able to:

- ◆ state the climatic and soil conditions required for banana cultivation.

Do

- ◆ Ask the participant about the climate and soil of their region.
- ◆ Discuss about the climate favorable for banana crop.
- ◆ Discuss about the soil suitable for banana crop.

Notes for Facilitation

Session Plan

1	Climate
2	Soil

Climate

The climatic conditions for banana cultivation are:

- ◆ Most Suitable temperature for banana is 24-28°C.
- ◆ Optimum growth at 27°C.
- ◆ Humidity : 75 – 80%.
- ◆ Average rainfall of Jalgaon: 805mm
- ◆ Grown in Maharashtra: Ahmednagar, Dhule, Nanded, Parbhani regions of the state.
- ◆ Banana hubs in Jalgaon district: Raver, Bhusaval, Jalgaon, Chalisgaon and Chopda.

The Soil conditions for banana cultivation are:

- ◆ Soil : Loamy soils with a pH range of 6.50 to 7.50 are most suited.
- ◆ Soils which are not too acidic or alkaline are desirable for banana cultivation.
- ◆ Water stagnation in the field damages the banana crop.
- ◆ Loamy soils having good drainage, adequate fertility and moisture are good for banana growing.
- ◆ Saline sodic (high concentration of sodium) and calcareous (high concentration of calcium carbonate) soils are not good.

Characteristics of Cultivars

Objectives

After completing this session the participants will be able to:

- ◆ select the variety based on the characteristics of cultivars;
- ◆ list the varieties that are suitable to the zone of cultivation.

Do

- ◆ Discuss the characteristics of cultivars.
- ◆ Discuss the best suited variety for a particular type of cultivar.

Notes for Facilitation

Session Plan

1	Characteristics of Cultivators
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Cultural Practices to Control Diseases and Pest Incidence

The Characteristics of Cultivators is discussed in the given table:

Variety	Characteristics	Duration (months)	Yield (t/ha)	Soil Suitability	Resistance and/ Susceptibility	
					Pests and Diseases	Climatic Conditions
Grand Naine	Imported Commercial variety from Israel. Medium height. Good quality bunches having well spaced hands with straight orientation of fingers, bigger in size. Fruit develops attractive uniform yellow colour with better self life and quality than other cultivars. 8-10 hand and 200-220 fruits per bunch. The length of the fruit is 15-21 cm and girth is 12-13 cm.	11	70-75	Loamy soils having good drainage, adequate fertility and moisture	Susceptible to Sigatoka leaf spot disease when grown in humid tropics	Tolerant to biotic stress

Basrai	Very popular variety. Dwarf statured. Used for table and processing purpose. Bunch size, fruit length and size is good. Keeping quality is poor. The average bunch has 6-7 hands and with about 13 fruits per hand. The thick rind of the fruits retains to some extent the greenish colour even when the fruits are ripe.	14	45-50	Performs well drained fertile soils	No resistance to diseases and pests	Suitable for semi arid eco regions
Sreemanthy and Mahalaxmi	These two varieties are also preferred by the local farmers. Almost having the similar characteristics like Robusta. Better self life and market potential	17 months	65-70	Loamy soils having good drainage, adequate fertility and moisture	No resistance to diseases and pests	Suitable for semi arid eco regions
Nendran	There is considerable diversity in plant stature. Bunch has 5-6 hands weighing about 6-12 kg. Fruits have a distinct neck with thick green skin turning buff yellow on ripening. Fruits remain starchy even on ripening.	16	55-60		No resistance to diseases and pests	uitable for semi arid eco regions

Selecting the right Variety for given Zone

Objectives

After completing this session the participants will be able to:

- ◆ List the best suitable varieties that can be grown for a given agro climatic zone.

Notes for Facilitation

- ◆ Do an activity at the end of the session.
- ◆ Ask the participants to list the varieties they would select for their agro climatic zone of cultivation and the reason for selecting the particular variety.
- ◆ Ask the participants to use the Activity Sheet provided in their Participant Handbook.
- ◆ Discuss the varieties listed by the participants in the class.

Identification of Appropriate Planting Material

Objectives

After completing this session the participants will be able to:

- ◆ state the types of planting materials;
- ◆ identify the appropriate planting material for various banana varieties.

Do

- ◆ Discuss the types of planting material.
- ◆ Discuss the planting materials suitable for different varieties of banana.

Activity

- ◆ Do an activity at the end of the session.
- ◆ Ask the participants to use the same Activity Sheet provided in their Participant Handbook.
- ◆ Continue with the activity for identification of the type of planting material for the varieties listed in the sheet by the participants
- ◆ Discuss the planting material identified for the listed varieties in the class.

Notes for Facilitation

Session Plan

1	Types of Planting Material
2	Varieties and their Appropriate Planting Material

Types of Planting Material

There are three types of planting material:

- i. **Suckers:** Shoots growing from the rhizome of banana plants which then grow into new plants.
 - ◆ Ideally suckers should come from a healthy, pest and disease free plantation.
 - ◆ Sword suckers with well developed rhizome having conical or spherical shape.
 - ◆ Sword suckers weighing approximately 500-1000gm are generally used as propagating material.
 - ◆ Due to variation in age and size of the suckers; crop may not remain uniform and management becomes difficult.
 - ◆ Avoid use of water suckers and peepers.

- ii. **Corm pieces:** Portions of the banana plant cut from the rhizome (corm) of the plant and with a bud attached.
- ◆ More planting material from fewer suckers.
 - ◆ Easy to transport.
 - ◆ Easy to treat for pests and diseases.
 - ◆ Corm pieces should come from a healthy, pest and disease free plantation relatively clean planting material.
- iii. **Tissue culture plants:** Banana planting material grown in a clean environment in the laboratory. These planting material are small plant pieces from mother plant. Seedlings developed through tissue culture technology are healthy, disease free and uniform in growth.
- ◆ Advantages of tissue culture plants:
 - Mother plants are selected from high yielding clones;
 - Crop matures uniformly with heavy and uniform bunches.
 - ◆ Selection of tissue culture planting materials:
 - 45-60 days hardened tissue culture plant approximately of 30 cm in height;
 - Plant having at least five photo-synthetically active leaves and 25-30 active roots of 15 cm length;
 - Plantlets should be free from visual symptoms of leaf spots, pseudo stem rot and physical deformations;
 - Plantlets should be free from nematodes;
 - Abnormal plantlet should be discarded.

Varieties and their appropriate plant material

Variety	Appropriate Planting Material
Grand Naine (G-9)	Tissue culture raised properly hardened secondary seedlings.
Dwarf Cavendish, Robusta, Basarai	Suckers as well as tissue culture
Nedran	Suckers as well as tissue culture
Mahalaxmi and Shri Manthey	Suckers and tissue culture

Procurement of Planting Material

Objectives

After completing this session the participants will be able to:

- ◆ identify various suppliers for quality planting material;
- ◆ plan and procure planting material;
- ◆ identify appropriate storage space to store planting material;
- ◆ identify the appropriate time for procuring planting material.

Do

- ◆ Discuss the sources for obtaining planting materials.
- ◆ Ask the participants who grow bananas using tissue culture to share their experiences and details of some suppliers.
- ◆ Describe the procedure for obtaining planting material from the mother plant.
- ◆ Discuss the time of procurement and storage of planting materials.
- ◆ At the end of the session, allow participant to discuss.

Notes for Facilitation

Session Plan

1	Selection of supplier
2	Obtaining planting material from mother plant
3	Time of procurement and storage

Selection of Supplier

The sucker/corm supplier should meet the following requirements.

- ◆ Suckers/corms from true to type mother plant.
- ◆ Mother plant should come from diseases and nematode free clean fields.
- ◆ Trust worthy, cost effective with quality planting material

Tissue culture plants can be obtained from the following suppliers:

- ◆ Regional Research Station, Mahatma Phule Krishi Vidyapeeth, Neemkheda Road, Jalgaon, Maharashtra,
- ◆ Tissue Culture & Agricultural Services, Jain Irrigation Systems Ltd., Jain Plastic Park, N.H.No.6, Bansbari, P.O. Box-72, Jalgaon-425001, Maharashtra,
- ◆ Mahabanana, Krishi Utpanna Bazar Samittee, Jalgaon-425003, Maharashtra.

Obtaining Planting Material from Mother Plant

a. Suckers

- ◆ Sword suckers (1.8–2.1 m high and ~4.5 cm in girth) are preferred, partly because
- ◆ they are less infested with nematodes and banana weevils than larger planting material.
- ◆ Sucker preparation should be done far from the new field.
- ◆ Remove all leaves, roots and all parts of the rhizome that appear diseased (tunnels indicating banana weevils, reddish lesions at base indicating nematodes).
- ◆ The oldest leaf sheaths should also be removed as they may house banana weevil eggs or adults.
- ◆ A slanting cut is made to remove the top part (slanting prevents water from collecting on top, causing rotting).
- ◆ Plant suckers within a week after uprooting.

b. Corm:

- ◆ Separate the corm from the stem of the plant. Cut off the outer layers of the corm, about 3 cm deep, to reduce nematode populations.
- ◆ Remove damaged parts and wash the corm with clean water.
- ◆ Cut up the corm into 4–7 pieces depending on corm size and number of buds.
- ◆ Every piece should contain a visible, healthy bud.
- ◆ Treat corm pieces with recommended insecticides before planting

c. Tissue culture plants:

No major preparation is needed of tissue culture plants if they have been kept in a clean environment prior to planting. However, if the plants are seen to have pest infested leaves or leaves in a bad condition, these should be cut off prior to planting.

◆ Primary nursery plantlets

Tissue culture banana plantlets available in net pots to an approximate height of 12 cm. with three to four leaves. The plantlets are packed in open cartons or closed boxes and transported in pick-up-vans or trucks. These plantlets grown in Secondary Nursery for 8-12 weeks prior to planting in the main field.

◆ Secondary nursery plantlets

The Tissue culture Banana plantlets also available in poly bags to an height of 30 to 40 cm with 6 - 8 leaves from the Commercial Laboratories' secondary nursery. These plants are ready for field planting.

◆ Grading

Plants must be graded based on their height (up to fork in terminal leaf) and girth prior to planting in the main field for proper crop management.

◆ Transportaion to the main field

Only after eight to twelve weeks growth in the secondary nursery, the plants can be transported to the main field for transplanting. There is no need to cut back the pseudostem for tissue culture banana in polybags.

- ◆ **Cost of planting material**

- ◆ The cost of the plantlet is more than the sucker/corm.
- ◆ The cost varies depending on the conditions and the suppliers.
- ◆ Jain Irrigation is the major supplier of tissue cultured banana at the rate of Rs.15-20/- per plant.
- ◆ The rate is variable and fixed on the basis of input cost every year.

Quantity Required:

The number of plants required depends on the space required for planting. The space between plants will vary with the variety.

Time of Procurement and Storage

- ◆ The planting of banana is done twice in the year i.e. Kharif (June- July) and Rabi (October-November) seasons.
- ◆ Keep the field ready for planting while procuring planting material.
- ◆ Procure planting material depending on the field conditions, so that planting is done with a minimum gap between procurement and planting.
- ◆ Store the planting material in clean condition ensuring no chances of infection of pathogens and pests if there is a time lag between procurement and planting.
- ◆ Treat the planting material with fungicides/pesticides before transplanting in the field.

Labour requirement

- ◆ The actual labour cost will vary from location to location depending on minimum wage levels or prevailing wage levels for skilled and unskilled labour.
- ◆ The use of ergonomically suitable tools and equipments is desirable for efficient planting.

Treatment of Planting Material

Objectives

After completing this session the participants will be able to:

- ◆ treat planting material as per dosage recommended.

Do

- ◆ Ask the participants to share some experiences and challenges faced with various types of planting material.
- ◆ List down some of the major problems as the participants respond.
- ◆ Discuss the recommended treatment for the planting material.

Notes for Facilitation

Session Plan

1	Recommended treatment for Diseases and Pests of Planting Material
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Recommended treatment for Diseases and Pests of Planting Material

Diseases of Planting Material

Rotting of suckers, Weevil and nematodes are the major problems of planting material.

Treatment Recommended

- ◆ Treat suckers with Monocrotophos(0.50%) and Bavistin (0.1%) before planting to control the weevil.
- ◆ Application of 2-3gm carbofuran per plant in secondary hardening stage can protect nematode infestation.
- ◆ Neem cake would also ensure vigour and health of the plants.
- ◆ Dip suckers in a solution of aurofugine (10g/100 litres water) or Captafol (200 g/100 litres water) or Carbendazin (100 g/ 100 litres water) for 1.5 hours prior to planting, to prevent fungal diseases.

Prepare planting material from mother plants

Objectives

After completing this session the participants will be able to:

- ◆ uproot suckers from the mother plant;
- ◆ separate corm from the stem of mother plant.

Do

- ◆ Conduct a practical session for preparing planting material from mother plants.
- ◆ Arrange for the required materials and equipment for the practical session.
- ◆ Identify a few sections in the field for the practical session.
- ◆ Demonstrate the procedure for cutting sucker using the appropriate tools and equipment.
- ◆ Demonstrate the procedure for separating corm using the appropriate tools and equipment.
- ◆ Recall the various precautions to be taken while preparing planting material.
- ◆ Divide the class into small groups of 4 participants and assign the practical for cutting suckers and separating corm.
- ◆ Guide the participants to complete the practical assignment.

Notes for Facilitation

For both suckers as well as corm selection of mother plant is very important

- ◆ Mother plant should be true to type, healthy and free from pests and diseases.
- ◆ In banana male flower bud exhibits the symptoms of viral disease like bunchy top and bract mosaic hence retain the male flower bud to ascertain disease infection.
- ◆ An isolation distance of 500m should be kept from mother plant.
- ◆ Mother plant should be tagged to track the source and pedigree.

Step wise procedure for cutting sucker

The procedure for cutting sucker are:

- ◆ Select the proper tool with broad flat tip hoe
- ◆ Identify the sword and water suckers on the rhizome or corm of the mother plant.
- ◆ With the help of tip hoe separate the well developed sword suckers of more than one foot growth from the corm of the mother plant. Water suckers/peepers produces late and poor crop.
- ◆ Whole or split rhizomes (corms) can also be used for planting when suckers are not available.
- ◆ Separate the sword sucker from the main rhizome (corm) in such a way (an approximate angle of 300) that a minimum damage is done to the corm

Step wise procedure for separating corm

Developing banana seedlings from the corm can also be used by trained and specialized persons either in the nursery (ex-situ) or in the field (in- situ) by an organization or private person. (Usually not in practice)

The procedures are:

1. Decapitation

- ◆ 4-6 months old plant is headed back and pseudostem is cut down
- ◆ Pseudostem is cut down and cross incisions are given on the growing meristem to stimulate bud production. This will result in 9-15 uniform shoots span.

2. Decortification

- ◆ Pseudostem (preferably of harvested plants) of the mother sucker is cut transversely 2cm above the collar region and removing the apical meristem leaving a cavity of 2cm diameter and 4cm depth to activate the lateral buds to give rise to more side shoots.
- ◆ After cleaning the corm and treated with fungicide (Bavistin 0.3% for 15 minutes) dry for a day, planted in a initiation medium having a rooting hormone (IBA 2500ppm).. this will pave the way for the emergence of 3-4 buds.

i. Ex-situ mass multiplication

- ◆ With the available initiation medium these emerged 3-4 buds when attain the height of 15-20cm with 3-4 leaves.

a. Secondary decortification

- ◆ After (30-35 days) 3-4 buds when attain the height of 15-20cm with 3-4 leaves again headed back with a sharp knife followed by 3-4 transverse cuts. This encourages the production of multiple shoots.

b. Third phase decortification

- ◆ Again after (20-25 days) again headed back with a sharp knife followed by third phase decortification very carefully as the shoot buds are located very closely.
- ◆ This encourages the production of multiple shoots.
- ◆ Thus in these 4-5 months about 50-60 shoots are produced.

c. Hardening

- ◆ Lateral sprouts of 8-10cm length are shifted to pro trays having cocopeat and vermiculite medium and after sufficient watering left in shed (70%) and 80-90% humidity.
- ◆ After 15-20 days sprouts are shifted from trays to polythene bags and maintain at 50% shed and 40-50% humidity.
- ◆ These will be ready for field planting in 40-45 days.

ii. In situ mass multiplication

- ◆ In situ sucker production is induced 40 ppm growth regulator in the decorticated cavity and covering the individual corms with a mixture having equal parts of sandyloam soil and poultry manure 5 cm above the ground level.
- ◆ This chemical induction of lateral buds could be done on the first generation suckers and continued up to third generation suckers.
- ◆ By then these 40-45 suckers are separated from the mother corm and subsequently rooted in sterile soil medium under intermittent misting.



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