



# Community Training Manual on Macro-propagation Using Detached Corms



RESEARCH  
PROGRAM ON  
Roots, Tubers  
and Bananas

Alliance



## Table of contents

Table of contents.....	1
Overview .....	2
Session 1: Introduction session .....	4
Session 2: Construction of macro-propagation unit/chamber.....	6
a) Standard macro-propagation unit .....	6
b) Alternative macro-propagation unit type 1 .....	9
c) Alternative macro-propagation unit type 2 .....	11
Activity: .....	12
Session 3: Preparation of macro-propagation materials.....	12
Activity: .....	14
Session 4: Planting of corms and management of macro-propagation unit .....	15
Activity: .....	17
Session 5: Construction of the nursery .....	18
Activity: .....	19
Session 6: Potting and acclimatisation of plantlets .....	20
Potting substrate .....	20
Acclimatisation/ hardening .....	22
Activity: .....	23
Session 7: Planning and way forward.....	24
Community macro-propagation planning template .....	25
References.....	27

Content: Alice Simbare<sup>a</sup>, Muller Kamira<sup>a</sup>, Walter Ocimati<sup>a</sup>, Mpoki Shimwela<sup>b</sup>

Editors: Deborah Nabuuma<sup>a</sup>, Beatrice Ekesa<sup>a</sup>

Photos: Alice Simbare<sup>a</sup>, Deborah Nabuuma<sup>a</sup>, Guy Blomme<sup>a</sup>, Muller kamira<sup>a</sup>, Sara Quinn<sup>c</sup>, Walter Ocimati<sup>a</sup>, TARI – Maruku

<sup>a</sup> The Alliance of Bioversity International and CIAT; <sup>b</sup> Tanzania Agricultural Research Institute (TARI – Maruku); <sup>c</sup> International Potato Centre

A Bioversity International project funded by HarvestPlus under the grand challenge program and the CGIAR research programmes (CRPs), Agriculture for Nutrition and Health (A4NH) and Roots Tubers and Bananas (RTB), working to enhance the availability and access to banana-based foods that are rich in pro-vitamin A carotenoids and to promote production practices that are accessible and attractive to small-scale farmers and their communities.

*Citation: Simabare A., Kamira M., Ocimati W., Mpoki S. (2021) Community Training Manual on Macro-propagation Using Detached Corms. Kampala, Uganda. The Alliance of Bioversity International and CIAT*

## **Overview**

### **Background**

Within the framework of a Bioversity International project titled “Addressing micronutrient deficiencies in sub-Saharan Africa through Musa – based foods”, banana varieties rich in vitamin A originally from outside East and Central Africa were introduced in Burundi and the Democratic Republic of Congo. Following agronomic and sensory evaluation, some of the varieties have been selected and are being grown by farmers. The planting material given to farmers in different communities was previously produced through macro-propagation at research stations. There has however been a high demand for the vitamin A-rich banana varieties in the project sites and in response, lead farmers will be selected and trained on how to carry out macro-propagation using detached corms in their communities.

Macro-propagation will allow the farmers to locally multiply banana varieties and increase the planting material of vitamin A-rich banana varieties at much lower cost. This technique is able to timely provide sufficient quantities of planting material. From one corm 10-50 plantlets can be obtained depending on the banana variety. In addition, the technique will generate income through the sale of plantlets. In the long run, increased access to diverse banana planting material and increased land under Vitamin A-rich banana varieties is anticipated to enhance diversity in diet and intake of vitamin A-rich foods and incomes of the smallholder farmers and their communities.

This manual therefore informs the user about the banana macro-propagation technique using detached corms. It relates the different actions and processes required to successfully multiply banana planting materials.

This manual will be used by project trainers, lead farmers, extension workers and other extension service providers in the agricultural sector to improve their knowledge on techniques of propagating banana planting material at lower cost and within a short period of time.

### **Training manual**

The training manual has 7 sessions outlining the time and materials required, the objectives of the session, the technical notes that will be referred to by the moderator, and the activities to be conducted.

1. Introduction session
2. Construction of macro-propagation unit
3. Preparation of planting material
4. Planting of corms and management of macro-propagation unit
5. Construction of the nursery
6. Potting and acclimatisation of plantlets
7. Planning and way forward

The presentation of the technical aspects covered in each session will be followed by (i) a discussion to obtain input from participants and answer any questions and (ii) practical demonstration of key steps. The training is anticipated to take 1 full day or 2 half-days depending on the resources available and availability of participants, that is, whether they are willing to participate in a full day training or prefer 2 half day training sessions. The training is designed for 10-30 participants.

## Training program

### One day program

Time	Session	Details
8:30 – 9:00	Introduction Session	Participants introductions Introduction to macro-propagation
9:00 – 10:30	Construction of macro-propagation unit	Construction materials and procedures Preparation of substrate
10:30 – 11:00	Break	
11:00 – 12:00	Preparation of macro-propagation materials	Selection of materials Treatment of materials
12:00 – 13:00	Management of macro-propagation unit	Planting of corms Maintenance of the unit
13:00 – 14:00	Lunch	
14:00 – 16:00	Acclimatisation	Construction of the nursery Potting of plantlets Acclimatisation of plantlets
16:00 – 16:55	Planning and way forward	
16:55 – 17:00	Closure	

### Two day program

Day	Time	Session	Details
Day 1	8:30 – 9:00	Introduction Session	Introductions Introduction to macro-propagation
	9:00 – 10:30	Construction of macro-propagation unit	Construction Preparation of substrate
	10:30 – 11:00	Break	
	11:00 – 12:30	Preparation of macro-propagation materials	Selection of materials Treatment of materials
	12:30 – 12:45	Closure	
Day 2	8:30 – 9:00	Recap	
	9:00 – 10:00	Management of macro-propagation unit	Planting of corms Maintenance of the unit
	10:00 – 10:30	Break	
	10:30 – 12:30	Acclimatisation	Construction of the nursery Potting of plantlets Acclimatisation of plantlets
	12:30 – 13:25	Planning and way forward	
	13:25 – 13:30	Closure	

### **Important notes**

1. Participants should be informed about the venue / training site in advance.
2. The venue should have an area suitable for the practical demonstrations laid out in the activity sessions
3. Training is hands-on and requires active engagement of trainers and participants
4. Trainers should prepare a check list of all training material and tools as outlined for each session and make all necessary preparations and materials prior to the training
5. Before the start of each session, trainers should recap what was learnt in the preceding session to ensure continuity
6. Trainers should prepare a simple budget for construction of simple macro-propagator unit based on locally available materials

### **Session 1: Introduction session**

Time: 30 minutes

Materials: flipchart and markers

Objectives of the introduction session:

1. Get to know participants and moderators
2. Understand the objectives and scope of the training
3. Get key concepts in macro-propagation

### **Welcome remarks**

- The moderator welcomes the participants and thanks them for their participation
- The moderator asks the participants to introduce themselves, giving their names, occupation, village and expectations of the training. The expectations are written down on a flipchart
- The trainers then introduce themselves also sharing their expectations
- The moderator then shares the objectives and outcome of the training as follows:
  - The objective of the training is to build their skills on how to conduct banana macro-propagation technique using detached corms in order to increase the availability of planting material for vitamin A-rich banana varieties.
  - By the end of the training, the trainees would have learned how to:
    1. Construct a macro-propagation unit
    2. Prepare planting material
    3. Plant corms and manage the macro-propagation unit
    4. Construct the nursery
    5. Pot and acclimatise the plantlets
- The moderator then clarifies the expectations shared by the participants, sharing those that will or will not be met by the training
- The moderator then shares the training program and thereafter proceeds to the group activity 1 below.

### **Group activity 1:**

Through brainstorming, participants agree on training and housekeeping guidelines. The guidelines are written on a flipchart and pinned in a visible place.

## **Introduction to macro-propagation**

Using flipcharts and markers, the trainer shares with the participants what macro-propagation is and what it entails using the session notes below:

### **Session notes**

Macro-propagation techniques that include field decapitation, excised bud and detached corm multiplication are methods that use whole suckers, large pieces of the parent corms, or sword-sucker-corms to produce banana planting materials. Macro-propagation provides a cheap, simple, and relatively rapid technique to multiply bananas. This method can be used by low-income and unskilled farmers, and by small- and medium-scale farmers who are the major growers of bananas and plantains in the humid tropics.

The most commonly used macro-propagation method is the detached corm multiplication method, which will be the focus of this manual. This method involves cutting off the main shoot/plant to allow growth of several shoots arising from the side of the corm in humid chamber conditions. The detached corm method is recommended because it produces high number of seedlings that grow uniformly. The seedlings obtained are also less prone to stress once planted in the field because of the reserve food in the small corm pieces to which they are attached. Detached corms or buds are prepared for sprouting in the macro-propagation unit. Plantlets from the primary buds are then prepared for secondary bud sprouting and plantlets resulting from the secondary buds are then rooted in a nursery. Finally, after an acclimatization period, they are ready for planting in the field. The entire process from macro-propagation to hardening plants in a nursery can take between 12-18 weeks (3-5 months). This process is summarised in the following 5 steps covered in the manual:

- i) Construction of macro-propagation unit/chamber
- ii) Preparation of planting material
- iii) Planting of corms and management of macro-propagation unit and corms
- iv) Construction of the nursery
- v) Potting and acclimatisation of plantlets

Note: The standard recommended macro-propagation units are costly and often unaffordable for many resource-poor farming communities. Alternative cost-effective simpler macro-propagation units made using local materials will therefore also be provided in this manual. These alternative units have been found to be less costly, easy to construct and are as effective as the standard units in the multiplication of banana planting materials. Simplified standard macro-propagation units can be constructed using transparent plastic sheets and wood. Alternative low-cost macro-propagation units can be made with wooden sticks, elephant grass stems or bamboo; or have corms covered directly with a thick layer of spear grass/elephant grass mulch.

### **Group activity 2:**

Following the introduction to macro-propagation, the trainer asks the participants to verbally share any experiences they have had with macro-propagation process. This activity marks the end of session 1.

## Session 2: Construction of macro-propagation unit/chamber

Time: 1 hour and 30 minutes

Materials: flipchart, markers, measuring tape, rope, chalk, small wooden pegs, wooden sticks or bamboo, boxes/cartons, masking tape, nails, wire, hammer or saw.

By the end of this session the participants should have learnt:

1. The different types of macro-propagation units
2. How to construct the macro-propagation units
3. How to prepare different types of substrates for the units

Using flipcharts, markers, the pictures and session notes in the manual, the trainer shares with the participants how the 3 types of macro-propagation units can be constructed and filled with substrate: (i) standard macro-propagation unit, (ii) Alternative macro-propagation unit type 1, (iii) Alternative macro-propagation unit type 2.

### Session notes

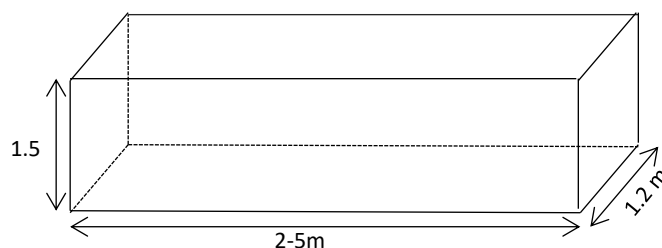
Step one of the process involves construction of macro-propagation unit/chamber. The macro-propagation unit is a chamber where corms are placed to allow for sprouting of buds and plantlets. These chambers provide a humid environment that quickens sprouting of shoots from the corms. The chambers are filled with a substrate, that is the materials where the corms are planted.

#### a) Standard macro-propagation unit

**Materials required:** Transparent plastic sheets, wood, nails, pins, roofing materials

#### **Construction:**

- The sides should be covered with 30 cm high cement blocks or wooden planks to hold the substrate.
- For easy management, macro-propagation units should be about 2-5 m long, 1.2 m wide and 1.5 m high.



#### Macro-propagation unit dimensions

- Can be made using wooden posts or timber fixed to the foundation made of cement blocks or wood and roofed with transparent plastic sheets that allow for 50% illumination.

- A shading structure can be constructed above the macro-propagation unit to regulate the temperature. This shading can be made of elephant grass, palm leaves, shade netting, or iron sheets.
- A permanent shading structure made of shade netting, or iron sheets is an expensive option but ideal for medium-large scale enterprises.



Simplified standard macro-propagation unit



Shading structure above simplified standard macro-propagation unit



Standard macro-propagation unit with shading structure



### ***Substrate:***

**Materials required:** sawdust, rice hulls, coffee husks, shredded cacao husks, groundnut shells, or oil palm fibres

- Any of the materials above can be used as substrate
- Sawdust provides the most suitable environment, as it is easy to use and can be recycled for reuse by steaming.



Standard macro-propagation unit filled with sawdust substrate

### ***Sterilising the substrate:***

**Materials required:** Old oil drums, manure, top soil, polybags and wood

- Sterilize the substrate using an oil drum.
- Iron bars are welded 20 cm above the bottom of the drum on which an iron net is placed.
- The modified oil drum is then placed on stands welded on the outside, usually about 20 cm above ground.
- A bag can be placed on top of the iron net to prevent sawdust from falling through the iron net.
- Water is poured into the drum up to the height of the iron bars.
- After applying the sawdust into the drum, the sawdust can be covered with bag again.
- Heat is applied under the drum using firewood and steam from the water sterilizes the sawdust.
- Steam is passed through this construction for one hour.



Drums for steam sterilisation of substrate

### b) Alternative macro-propagation unit type 1

**Materials required:** wooden sticks or bamboo, elephant grass stems or palm leaves, ropes

**Construction:**

- The same dimensions as those for the standard macro-propagation unit are used: 2-5 m long, 1.2 m wide and 1.5 m high
- The wooden sticks or bamboo are inserted in the soil and bent to make a semi-cylindrical frame (a tunnel)
- The frame is covered with knitted elephant grass stems or palm leaves or any readily available material in a way that can easily be removed to allow for management of the corms
- The soil inside the macro-propagation unit is loosened up to 30 cm depth
- A small gutter is dug around the macro-propagation unit to divert possible excess rain water
- Such structures allow rainwater into the chamber but do, however, reduce the effects of heavy rainfall, which could damage plants.
- Construction of a shading structure above the unit adds protection and helps regulate temperature



or



Type 1 of an alternative macro-propagation unit made with knitted elephant grass stems and with bamboo sticks

***Substrate:***

**Materials required:** soil and decomposed farmyard manure

- The corms are covered/planted in a mixture of loosened soil and decomposed farmyard manure
- Use of manure is optional, it can be used where available



Soil and manure as a substrate in an alternative macro-propagation unit type 1

### c) Alternative macro-propagation unit type 2

**Materials required:** elephant grass, palm leaves, or spear grass

**Construction:**

- Similar dimensions as those for the standard macro-propagation unit are used: 2-5 m long, and 1.2 m wide
- The soil inside the macro-propagation unit is loosened up to 30 cm depth
- A small gutter is dug around the macro-propagation unit to divert possible excess rain water

**Substrate:**

**Materials required:** soil and decomposed farmyard manure

- The prepared corms are buried in the loosened soil or loosened soil mixed with decomposed farmyard manure and directly covered with a 5 cm thick layer of elephant grass, palm leaves, or spear grass
- Use of manure is optional, it can be used where available



Type 2 of an alternative macro-propagation unit

**Notes:**

- Location of the macro-propagation units especially the alternative types: construct the macro-propagation units away from banana plantations on/using soils that did not previously have bananas. This is done to prevent corm infection by banana pests such as weevils, nematodes and infestation of plantlets by banana bunchy top virus-spreading aphids; and diseases especially black leaf spots and fusarium wilt.
- Humidity and high temperatures: these are required for growth and additional care is needed in high altitude areas where temperatures are lower to ensure that the chamber creates a more humid environment.

- Do not use materials from banana fields such as leaves and pseudostem sheaths to cover corms in the macro-propagation unit in order to avoid infecting plantlets at an early age with black sigatoka spores
- Depending on the resources available to a farmer, hybrids of the macro-propagation unit types described above can be used. For example:
  - i) Use of wooden sticks that make a semi-cylindrical frame in alternative type 1 macro-propagation unit that is covered with a plastic sheet
  - ii) Adding shading structures to alternative type 1 and 2
  - iii) In the semi-cylindrical frame in alternative type 1 macro-propagation unit, substrates like saw dust or coffee husks can be used

### **Group activity 3:**

1. Following the presentation on how to construct the different types of macro-propagation units, the trainer asks participants which materials are readily available in their community for (i) Construction of the macro-propagation unit and (ii) use as a substrate. The responses are written down on a flip chart

The trainer then discusses the feasibility of these materials together with the participants.

2. Following the discussion of readily available materials, the trainer reinforces the information on construction of the different macro-propagation units by practically demonstrating:
  - i) The dimensions of the macro-propagation unit using measuring tape, rope or chalk, small wooden pegs, boxes/cartons, masking tape
  - ii) Making the frame for Type 1 of an alternative macro-propagation unit made with knitted elephant grass stems and with bamboo sticks
  - iii) Loosening of soil for the alternative macro-propagation units

The above practical demonstration marks the end of session 2.

### **Session 3: Preparation of macro-propagation materials**

Time: 1 hour

Materials: flipcharts, markers, suckers, machete, tarpaulin, wood, water, fire, old oil drum/ large saucepan

By the end of this session the participants should have learnt:

1. How to select of suckers
2. The purpose of sucker preparation and treatment
3. How to prepare and treat of suckers and corms

Using flipcharts, markers, and the session notes, the trainer shares with the participants how to prepare the materials that will be used for macro-propagation.

## Session notes

**Materials required:** suckers, knives, plastic sheets or polybags, wood, water, fire, old oil drum/ pan, digging spear

### Selection:

- The preferred corms are those about to flower
- Prepare an adequate number of corms that match the size of the macro-propagation units constructed/prepared
- Corms should be from a reliable area/ field that has no diseases, no weevils and limited nematode presence
- Select and use corms of similar size

### Preparation and sterilisation:

- All corms have to be pared to avoid any risk of these banana pests. The roots are removed, and the leaf sheets are cut away one by one, exposing the buds.
- The pared corms are treated with boiling water (100°C) for 30 seconds to kill eggs and larvae of weevils not seen during paring
- Instead of treating with boiling water, the corms can be dipped in fungicide solution for 20 minutes. Fungicides include Agrolaxyl – MZ – 72 – WP or Mancozeb
- The corms are scarified at the top (by cutting an X) after which every other observable bud is scarified.



Corm paring and pared corms ready for treatment



Treating process of corms using boiling water



Scarified corms ready for planting

#### **Group activity 4:**

1. Following the presentation on how to select and treat the macro-propagation materials, the trainer asks participants to share experiences on treatment of banana planting materials using the questions below:
  - i) When they are going to plant bananas, how do participants usually handle/ treat the banana planting materials?
  - ii) What is the experience of participants that have used the treatment methods shared by the trainer?
2. Following the discussion on treating planting materials, the trainer practically demonstrates how to:
  - i) Pare and hot water treat suckers
  - ii) Scarify corms

This group activity marks the end of session 3.

## Session 4: Planting of corms and management of macro-propagation unit

Time: 1 hour

Materials: flipcharts, markers, knives, tarpaulin, corm with shoots.

By the end of this session the participants should have learnt:

1. How to plant corms in the different macro-propagation units
2. How to manage the different macro-propagation units

Using flipcharts, markers, the pictures and session notes in the manual, the trainer shares with the participants how to plant the corms and maintain the macro-propagation unit.

### Session notes

#### Planting of corms

**Materials required:** corms prepared and varieties name tags

- The shoot of each corm and any visible lateral bud are removed before planting in the macro-propagation unit
- The entire corm is planted in the macro-propagation unit
- Whole corms are planted and fully covered with about 5 cm thickness of substrate on top.
- Corms are planted at a 10-20 cm spacing
- For corms that were about to flower or that were already harvested, the corm can be split into two or more bits depending on its size and the parts planted as above.
- The corms have to be well watered immediately after planting



Planting of corms in a standard macro-propagation unit



## Management of macro-propagation unit

**Materials required:** watering can, water, small knives

- Corms must be completely covered by the substrate at all times
- Watering in the standard macro-propagation unit is done when the plastic sheets are not moist
- For alternative type 1 and type 2 macro-propagation units, watering is done watering should be done in the morning or evening, only when the soils look dry. Do not water when there is adequate rainfall
- Depending on the cultivar, 3-7 shoots arise from one piece of planting material
- A second round of scarification is done 3 to 5 weeks after planting. The scarification is done on the emerging lateral shoots/ seedlings
- Large shoots should be scarified to obtain secondary plantlets. The shoot is cut off and an “X” is made in the middle of the remaining corm.
- After another 3 weeks, each of the destroyed shoots would have given rise to 3-7 shoots again. These shoots are allowed to grow to a good size for harvesting
- Plantlets are harvested at a height of at least 20 cm with at least 2-3 leaves. This should be at least two to three weeks after the last round of scarification.
- Plantlets with roots go straight into the potting mixture, using one plant per bag and taken to the nursery
- Plantlets without roots are placed back in the substrate and left in the macro-propagation unit for at least 10 days before potting
- After about 10 weeks, 10 – 50 secondary shoots will have emerged from one corm, each with two to three small leaves and ready for potting



Plantlets and shoots on a corm in a standard macro-propagation unit



Plantlets in alternative macro-propagation units type 1 (left) and type 2(right)



Plantlets ready for potting

**Note:**

- Maintain a clean environment in and around the macro-propagation units
- For alternative type 1 and type 2 macro-propagation units, ensure that the shade or mulch covering the corms is intact. Replace or add more material as required.
- It is important that a little portion of corm remains attached to the plantlet to provide it with a nutrient reserve

**Group activity 5:**

Following the presentation on how to plant the corms and maintain the macro-propagation unit, the trainer practically demonstrates how to scarify corms that have shoots.

This group activity marks the end of session 4.

## **Session 5: Construction of the nursery**

Time: 45 minutes

Materials: flipcharts, markers, measuring tape, rope or chalk, small wooden pegs, boxes/cartons, masking tape.

By the end of this session the participants should have learnt:

1. The purpose of a nursery
2. How to construct and manage a nursery

Using flipcharts, markers, the pictures and session notes in the manual, the trainer shares with the participants what a nursery is and how to construct it.

### **Session notes**

A nursery is a managed site that provides favourable conditions for growth of potted plantlets until they are larger, tougher and more vigorous for planting in the field. The nursery makes it possible to give maximum care to weak plantlets, reduces the risk of damage to or loss of plantlets, and increases the quality of plantlets and future productivity of the plant.

**Materials required:** Wood, palm branches with leaves or banana leaves or other types of grass, nails, hoe, machete

### **Construction**

- The nursery should be constructed in protected area that allows continues care and management. It should be near reliable source of water and where water does not stagnate
- The size of the nursery depends on the estimated number of plantlets that will be obtained from the macro-propagation unit and on the available materials and resources.
- The nursery should be a minimum of 2m in height to allow proper lightning and management.
- The layout should allow free movement by personnel and that operations can flow logically to save labour and time
- A nursery is usually arranged in a series of beds with pathway between them. It also has an open area is needed at one end, where work such as sieving of soil and filling of containers can be done
- Construct a shade roof to provide partial shade. It should be loosely woven and easily removed when the plantlets need to be hardened off.



Nurseries made with different types materials



Layout of plantlets in a nursery

**Notes:**

Construct the nursery away from banana plantations to prevent infection by banana pests such as weevils, nematodes and infestation of plantlets by banana bunchy top virus-spreading aphids; and diseases especially black leaf spots and fusarium wilt.

**Group activity 6:**

1. Following the presentation on how to construct the nursery, the trainer asks participants which materials are readily available in their community that can be used to construct the nursery and discusses the feasibility of these materials
2. Following the discussion of readily available materials, the trainer practically demonstrates the dimensions and layout of a nursery using measuring tape, rope or chalk, small wooden pegs, boxes/cartons, masking tape.

This group activity marks the end of session 5.

## **Session 6: Potting and acclimatisation of plantlets**

Time: 1 hour and 15 minutes

Materials: flipcharts, markers, potted plantlets, potting substrate not yet mixed (top soil, substrate material available in the community and manure)

measuring tape, rope or chalk, small wooden pegs, wooden sticks or bamboo or palm leaves or banana leaves

By the end of this session the participants should have learnt:

1. How to prepare the substrate for the plantlets
2. The purpose of potting and acclimatisation
3. How to Selection of plantlets ready for planting

Using flipcharts, markers, the pictures and session notes in the manual, the trainer shares with the participants how to prepare potting substrate, pot the plantlets from the macro-propagation unit, and acclimatise them.

### **Session notes**

#### **Potting substrate**

This is the material in which plantlets from the macro-propagation unit will be planted until they are ready for planting in the field.

**Materials required:** potting substrate, old oil drum, wood and polyethene bags

- Potting substrate is a mixture of 3 materials: (i) top soil; (ii) substrate material such as sawdust or coffee husk or cocoa husk or rice husk or oil palm fibre; and (iii) decomposed farmyard manure
- A ratio of 6:3:1 of top soil: substrate material: manure is recommended
- This mixture should be sterilized before use as follows:
- After mixing, the potting substrate is placed in a drum and steam-sterilized for 12 hours.
- The drum must be covered at the bottom with an old oil drum to prevent steam escaping from the mixture during heating.
- After sterilization, the potting substrate should be allowed to cool for 24 hours before use



Sterilisation of the potting substrate



Cooling of sterilised substrate

### Potting of shoots

- Plantlets with a height of at least 20 cm, 2-3 leaves and roots are planted in the potting mixture, one plant per bag
- Use 17cm x 24cm black polythene bags for potting each
- Ensure that that a little portion of corm remains attached to the plantlet to provide it with a nutrient reserve



Potting of plantlets in a nursery

### **Group activity 7:**

1. Following the presentation on how to pot plantlets, to mark the start of the section on acclimatisation/hardening, the trainer:
  - i) Asks participants to share experiences of planting banana plantlets produced through macro-propagation
  - ii) Proceeds to discuss the importance of acclimatisation and how it is carried out using the session notes below

### **Acclimatisation/ hardening**

Acclimatisation is the process where banana plantlets from the macro-propagation unit are placed until they are ready for planting in the field. This allows the plantlets to adjust from the environment (temperature, humidity, light) that was in the macro-propagation unit, allow enable them to withstand the conditions they will find in the field.

- Potted plants are then placed in the nursery for acclimatization.
- Acclimatization should be carried out at 25-27°C. This requires that plantlets are not indirect sunlight
- Plantlets should be watered four times a week.



Plantlets in a nursery

### **Selection of plantlets ready for planting**

- After 4 to 6 weeks in the nursery, the plants are ready for the field.
- In the prepared hole that was 30-60 cm deep and spaced 3m X 3m with top soil and manure, dig a small hole in the middle that is 30cm deep
- Place the plantlet in the middle of the small hole leaving 15 cm at the bottom of the hole for the mixture of topsoil and manure
- Place mulch of 2-3cm around the plantlet with 2cm between the plant and mulch
- Water the plant immediately after planting



Plantlets ready for the field

**Note:**

- If plantlets are moved to distant nurseries for acclimatization, they should be transported in humid transparent polyethene bags

**Group activity 8:**

1. Following the discussion on acclimatisation, the trainer practically demonstrates:
  - i) How to mix the potting substrate using top soil, manure and a substrate material available in the community
  - ii) How to pot the banana plantlets

This activity marks the end of session 6.



## **Session 7: Planning and way forward**

Time: 55 minutes

Materials: flipcharts, markers

By the end of this session the participants should have agreed on:

1. Where the participants will set up the macro-propagation units
2. How resources and materials will be mobilised
3. How the vitamin A-rich planting material from the macro-propagation will be distributed

The purpose of this session is to assist the participants to plan for how their macro-propagation units will be set up and operated.

### **Group activity 9:**

The trainers together with the moderator organise the participants and assist them through the planning exercise as follows:

- Participants form groups of 5 to 7 people based on the location of their homesteads and farms and select a group leader
- Trainers ensure that each group has a participant who is a project ToT and/or one who has participated in the community training process.
- In their groups, participants take 20 minutes to brainstorm on the aspects below. Participants use the community planning template to document their discussion.
  - i) Where the macro-propagation units and nurseries will be set up and a timeline of the set up
  - ii) How the materials and resources to set up macro-propagation units will be mobilised
  - iii) How and who will carry out the different activities involved in setting up and maintaining the macro-propagation units and nurseries
  - iv) How the vitamin A-rich planting material will be shared/distributed
  - v) How the unit will be sustainably managed
- Moderator and trainers assist groups in their planning process
- Groups then take 15 minutes to present a summary of their plan to the rest of the participants and obtain feedback from the participants and trainers.
- The groups then take 10 minutes to refine their plans based on the feedback provided
- The trainers and groups must each remain with a copy of the developed plans.

After the plans are developed and shared with the trainers, it marks the end of session 7.

## Community macro-propagation planning template

Date:

Site:

Village:

Group Leader:

	Group members	Telephone
1		
2		
3		
4		

Activity	Resources needed	Where/ how they will be obtained	Responsible person/persons	When will the activity be done
1. Construction of the macro-propagation unit (Note: type of unit, area/space, materials, construction, substrate)				
2. Macro-propagation materials (Note: types of bananas, source)				
3. Planting of corms and maintenance of the unit				

<b>Activity</b>	<b>Resources needed</b>	<b>Where/ how they will be obtained</b>	<b>Responsible person/persons</b>	<b>When will the activity be done</b>
4. Construction of the nursery (Note: type of nursery, area/space, materials, construction)				
5. Potting of the plantlets (Note: type of substrate, treatment, storage)				
6. Acclimatization of plantlets				
7. Distribution of plantlets (Note: target groups, season of distribution, cost)				
8. Record keeping				

## References

1. Baiyeri, K.P., Aba, S.C., 2007. A review of protocols for macro-propagation in *Musa* species. *Fruit, Vegetable and Cereal Science and Biotechnology* 1, 110–115.
2. Njau, N., Mwangi, M., Gathu, R., Mbaka, J., Muasya, R., 2011. Banana weevil (*Cosmopolites sordidus*) reduces availability of corms for seedling production through macro-propagation technology. *J. Anim. Plant Sci* 12, 1537–1542.
3. Njukwe, E., Ouma, E., van Asten, P.J.A., Muchunguzi, P., Amah, D., 2013. 8 Challenges and Opportunities for Macro-propagation Technology for *Musa* spp. among Smallholder Farmers and Small-and Medium-scale Enterprises. *Banana Systems in the Humid Highlands of Sub-Saharan Africa* 66.
4. Njukwe, E., Tenkouano, A., Amah, D., Sadik, K., Perez, M., Nyine, M., Dubois, T., 2007. Training Manual Macro-propagation of Banana and Plantain. International Institute of Tropical Agriculture.
5. Ntamwira, J., Sivirihauma, C., Ocimati, W., Bumba, M., Vutseme, L., Kamira, M. and Blomme, G. 2017. Macro-propagation of banana/plantain using selected local materials: a cost-effective way of mass propagation of planting materials for resource-poor households. *Eur.J.Hortic.Sci.* 82(1), 38-53.