



# Simple and Cost-Effective Macro-propagation Methods for Producing Large Numbers of Healthy Banana Plantlets

## Authors

Jules Ntamwira<sup>1</sup>, Walter Ocimati<sup>2</sup>, and Guy Blomme<sup>2</sup>

<sup>1</sup> INERA Mulungu Research Station, Bukavu, Democratic Republic of the Congo; [ingjules2007@yahoo.fr](mailto:ingjules2007@yahoo.fr)

<sup>2</sup> The Alliance of Bioversity International and CIAT; [w.ocimati@cgiar.org](mailto:w.ocimati@cgiar.org); [g.blomme@cgiar.org](mailto:g.blomme@cgiar.org)

 Tunnel and straw-covered beds after planting the *Musa* corms (Source: Ntamwira et al., 2017).

## Using simple macro-propagation techniques

Banana and plantain (*Musa* spp.) are staple food crops feeding over 50 million people in central and eastern Africa. Access to sufficient quality seed for banana and plantain production is a major constraint. *Musa* is vegetatively propagated, and most farmers depend on natural regeneration of small plantlets or “suckers” from banana mats, which is slow and often leads to the spread of pests and diseases.

Shoot propagation through tissue culture (micro-propagation) generates large numbers of pest- and disease-free plantlets in a short time but is too costly for most smallholder farmers. These services are also not available or accessible to rural communities.

Macro-propagation (MP), which is the generation of plantlets from banana corms, offers a cheaper option for generating large numbers of healthy plantlets. Standard MP units made of transparent plastic sheets, wooden planks, nails, and sawdust as substrate (Figure 1) have



**Figure 1.** Standard macro-propagation unit (Source: Ntamwira et al., 2017)

received less adoption, because resource-poor farmers still find them costly ( $\pm$  US\$ 300 for a 1 x 4 m unit that can produce 480 to 1,200 plantlets).

To overcome these challenges, a simpler and less-costly MP unit has been developed that uses soil as the substrate and other locally available materials reducing production cost to as low as \$0.44 per plantlet compared with \$1 for the standard units. These units produce a comparable number of healthy plantlets compared with the standard MP unit. Here we demonstrate how to construct the simple MP units.



**Figure 2.** Tunnel and straw-covered beds after planting the banana corms (Source: Ntamwira et al., 2017)

## Constructing a simple MP unit

- Use soil as the substrate and readily available local materials for the structure.
- Bury corms in loosened soil, or a soil and decomposed farmyard mixture in raised beds.
- Cover the beds/corms with grass mulch (Figure 2).
- Alternatively, build a semi-cylindrical tunnel consisting of bent sticks as the frame covered with knitted elephant grass stems (*Pennisetum purpureum*) or grass.
- The knitted elephant grass stems or just grass is attached in such a way that it can be easily removed for weeding and harvesting of plantlets (Figure 2).

**From the selection of the mother mat to the harvesting of seedlings, there are several stages.**

## Steps from corm preparation to weaning banana plantlets

### 1 SUCKER SELECTION

Pick a visibly healthy, vigorously growing sucker from a healthy mat and banana field.

### 2 CORM PARING

Pare/clean all the roots and any damaged parts of the corm using a machete to remove any pests such as nematode and weevil eggs and larvae (Figure 3).



**Figure 3.** A corm being pared (A) and pared corms awaiting hot water treatment (B). © INERA Mulungu/J. Ntamwira

### 3 CORM DISINFECTION

Soak the corms in boiling water for 30 seconds (Figure 4) to eliminate nematodes and weevil larvae that could have escaped step 1 (corm paring).



**Figure 4.** Corms are immersed in boiling water to eliminate pests.  
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### 4 SCARIFY LATERAL BUDS AND REMOVE THE APICAL MERISTEM

This consists of incising or destroying visible lateral buds between leaf sheaths and the apical meristem to stimulate sprouting of more plantlets (Figure 5).



**Figure 5.** Further cleaning of corms (paring and gentle removal of leaf sheath) after the boiling water treatment followed by removal of apical meristem and lateral bud scarification. © INERA Mulungu/J. Ntamwira

### 5 SITE SELECTION FOR THE NURSERY

Select a site away from banana fields to avoid contamination with pathogen spores and insect pests such as nematodes, banana weevils and aphids. The site should have enough loose soil to cover the corms.

### 6 SOIL PREPARATION AND PLANTING THE CORMS

Loosen the soil to a depth of 30 cm. Create a trench or furrow and raise the soil to form a raised bed. Bury the corms while face up in the furrows, at a spacing of 20 cm between rows and 10 cm between corms, fully covering the corms with soil (Figure 6).



**Figure 6.** Planting the corms in furrows.  
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## 7 CORM MANAGEMENT

Watering and weeding is done as necessary. Scarify (destroy the apical meristems) all the first emerging seedlings to obtain numerous secondary plantlets. For the subsequent emerging seedlings, scarify only the large plantlets, while the small ones should be harvested and planted in potting bags filled with topsoil.

## 8 HARVESTING THE PLANTLETS

Plantlets with more than 2 to 3 leaves are harvested and planted in pots containing fertile loam soil to develop roots under a shade (Figure 7). The plantlets are ready for transplanting after three to six weeks.

Plantlets can be harvested from the corms up to five months after corm planting, depending on the variety and planting environment.



**Figure 7.** Banana plantlets ready to be harvested (A), and harvested plantlets being hardened (B). © INERA Mulungu/J. Ntamwira

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## Recommended reading

Ntamwira J; Sivirihauma C; Ocimati W; Bumba M; Vutseme L; Kamira M; Blomme G. (2017). Macropropagation 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.

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