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Agricultural Transformation Institute
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BANANA SUCKER PRODUCTION BUSINESS

TRAINING COURSE FOR YOUTH AGRI-ENTREPRENEURS

Ethiopian Agricultural Transformation Institute

ADDIS ABABA, ETHIOPIA
2025

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CONTENTS

OVERVIEW OF THE MODULE

This training module is designed to equip youth and women groups, farmers and any groups interested to acquire knowledge and skill on banana sucker seedling production. This skill and knowledge enable the youth groups, farmers and others involved in banana sucker seedling production to apply the technologies so as to increase the production of banana sucker seedling production thereby improves their income.

The module consists of five sections: banana variety selection and ecological requirement of banana, conventional/traditional method of banana production, marketing and distribution and financial feasibility and risk management of banana sucker seedling production. The module also contains pre and post assessment questions at the end of each section to enable the trainees to evaluate their understanding about each topic.

The Agriculture-focused Dignified Employment for Youth (ADEY) program is implemented by the Ethiopian Agricultural Transformation Institute in partnership with the Mastercard Foundation to enable 611,343 inclusive and dignified work opportunities for young women and men and support youth entrepreneurship, employability, and sustainable livelihoods in the agribusiness sector.

INTRODUCTION

Banana is one of the major fruit crops grown and consumed widely across Ethiopia. It is cultivated by both large-scale commercial farms and smallholder producers. In the humid forest and mid-altitude agro-ecological zones of sub-Saharan Africa, bananas serve as an important staple food and a significant source of income for smallholder farmers. The crop is primarily grown for its fruit, which can be eaten fresh (as dessert) or cooked. Ripe bananas are rich in essential vitamins and nutrients, while the cooked form provides a good source of carbohydrates.

In addition to being consumed directly, banana fruit can be processed into a variety of value-added products such as flour, canned slices, jam, jelly, puree, vinegar, wine, and beer. As a fast-maturing tropical fruit with consistently high demand, banana holds strong market value and is regarded as an economically important crop for producers. Its widespread popularity makes it a dependable cash crop for smallholder farmers.

The leaves and pseudo-stems are also useful, commonly fed to livestock during drought seasons, while banana leaves are frequently used for packaging and traditional roofing. Given these multiple benefits, the Government of Ethiopia has recently placed greater emphasis on expanding banana cultivation nationwide. As a result, there is growing demand for quality banana planting material to support these expansion efforts.

Despite this increasing demand, banana production is significantly constrained by a shortage of suitable planting materials. Banana can be propagated through several techniques: natural suckers produced by mother plants, macro-propagation, and tissue culture. In Ethiopia, smallholder farmers predominantly rely on naturally regenerated suckers, which are often infected with pests and diseases, leading to poor yields. Tissue culture, on the other hand, offers clean, disease-free planting material but remains costly and difficult to access for most resource-limited farmers.

To address this gap, the International Institute of Tropical Agriculture (IITA) and other organizations have explored alternative methods such as macro-propagation for producing healthy banana seedlings. Macro-propagation is a relatively simple and cost-effective technique, which can be performed in a shaded structure or even in open fields. The process involves removing apical dominance from healthy planting material to stimulate the production of multiple suckers. Compared to tissue culture, macro-propagation is more accessible and requires less financial investment, making it an ideal method for small-scale seedling producers.

Accordingly, this training manual is developed to offer a practical, step-by-step guide for banana seedling production using the macro-propagation method. It aims to build the technical capacity of youth groups, women, and other interested individuals engaged in banana seedling production as a business venture, thereby improving access to clean planting material and supporting the sustainable expansion of banana cultivation in Ethiopia.

Target Groups

Target group of this module is youth and women groups, farmers and other groups who have an interest in banana seedling production.

Target methods

Group discussion, brainstorming, lectures, presentation, assignment, visit

Training materials

Flip chart, LCD, markers, white board

Training time

16 hours

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SECTION 1. DESERT BANANA VARIETY SELECTION AND ITS ENVIRONMENTAL REQUIREMENT

1.1. OVERVIEW OF THE SECTION

Selection of appropriate improved variety of banana is one of the factors that determine the productivity of the crops. Use of improved varieties of banana has many advantages over local varieties. Improved varieties take shorter time to bear fruits, have bigger fibreless fruits which are greatly preferred in the market and fetch higher returns. In addition, they are easier to manage due to their characteristic short height and tolerance to disease.

Improved varieties are also preferred by exporters and processors. Processors prefer improved varieties due to greater recovery rate and their fibreless nature which make them easier to process. Besides varieties, selection of suitable ecology for banana production is very important to maximize the productivity of the crop. This section describes the most used varieties of desert banana and their suitable ecology to maximize the productivity.

Learning outcome

After this training session the trainees will

- *Able understand banana varieties with their potential yielding capacity.*
- *Able to understand which environmental requirement of banana production areas*

Learning question

1. *Do you know the rage of agro- ecology in which different banana can grow?*
2. *What different varieties of banana do you know?*
3. *What is suitable range of temperature for banana production?*

Duration: 3 hour

1.2. BANANA VARIETY IDENTIFICATION AND SELECTION

- There are different banana varieties that has been registered in the country
- Poyo and Giant Cavendish have moderate resistance to wind and boring nematodes
- Ducasse hybrid is very sensitive to wind damage, but it is highly resistance to boring nematodes.
- Poyo is preferable to transport bunches for a longer distance compared to other varieties

Table 1. Registered desert banana varieties in Ethiopia

S/N	VARIETY	YIELD/HA (QT)	AREA OF PRODUCTION
1	Dward cavendish	531	Lowlands
2	Giant Cavendish	372	Lowlands
3	Poyo	482	Lowlands
4	Ducasse Hybrid	261	Lowlands
5	Williams-1	556	Lowlands
6	Grande Nain	436	Lowlands
8	Robusta	395	Lowlands
9	Butuzuwa	391	Lowlands
10	Dinkua	495	Lowlands
11	Lady finger	455	Lowlands

ECOLOGICAL REQUIREMENTS OF BANANA PRODUCTION

Learning question

1. *How many of you are familiar with avocado types?*
2. *What types of avocado is found around your community?*

Learning question

1. *What is nursery sites?*
2. *What kinds of nursery you are familiar with and how it operates?*
3. *How root stock can be developed?*

Altitude

Banana grows at wider altitudinal range from low land to mid-altitude both in rainfall and irrigation

However, for dessert banana, higher yield and quality fruit are obtained at altitude below 1000 m with supplementary irrigation.

Rainfall

Areas with an average annual rainfall of 1200-2000mm with well distribution are favorable for sustainable banana production.

It requires a regular water supply that matches or slightly exceeds the free-water evaporation rate

Irrigation is essential for high yields if rainfall is less than evaporation and it also provides the advantage of fertilization via the irrigation water.

Areas with very high rainfall may not too cloudy for optimum photosynthesis

Temperature

It can also be cultivated in area of warm climate with optimum temperature between 25-28 0C

Bananas are transported at temperatures between 12°C and 13°C when respiration is low. Growth begins at about 18°C, reaches an optimum at 27 °C, then declines and comes to a stop at 38°C (Figure 1).

Still higher temperatures cause sun-scorch.

Solar radiation should be as high as possible for best growth and yields, although fruit sunburn can occur, especially if water supply is low; petioles can also be burnt.

Shaded or overcast conditions extend the growth cycle by up to 3 months and reduce bunch size.

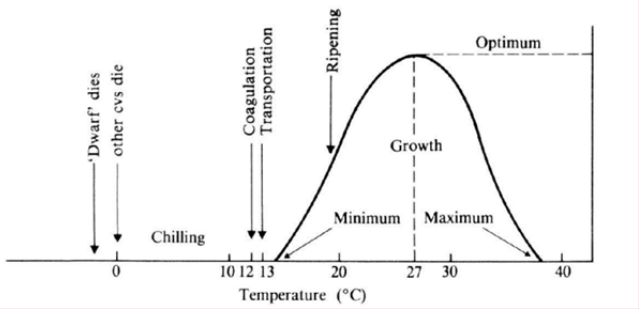


Figure 1 The relationship of level of temperature, banana growth and other process

Soil types

Bananas grow on wider range of soil types but give desirable yield with deep and well drained loam and fertile soil having high contents of organic matter.

- Deep friable loams with natural drainage and no soil compaction are preferred.
- Soils with poor percolation due to excess of clay or with an excessive amount of sand should be avoided, as well as soils with high amounts of gravel.
- The appropriate pH of soil for best growth is 5.8 to 7.
- Under poor fertile, high acidic and saline soil commercial banana cultivation is not feasible.
- Soil depth should be around 1.0–1.2m, with no superficial water tables or impermeable layers.

Take away message

Effective variety selection and critical site selection is important in banana propagation and production

Post assessment questions

1. *What is appropriate range of altitude in which banana can grow and give maximum potentials yield?*
2. *What is range of Temperature that enables to develop banana?*
3. *What is appropriate range of soil PH at which banana can grow?*

Learning outcome

After this training session the trainees will

- *Able understand the importance of sanitation in banana propagation.*
- *Understand the critical importance of keeping nursery tools and environment clean in the process of banana micropropagation*
- *Able to understand different traditional methods of banana seedling propagation*

Learning question

1. *What is the important of sanitation during sucker production?*
2. *What common sanitation methods of materials do you know?*
3. *What Kinds of banana propagation do you know?*
4. *What is common banana propagation is carried out in your community?*

Duration: 7 hour

SECTION 2. CONVENTIONAL/ TRADITIONAL METHOD OF BANANA PROPAGATION

2.1. OVERVIEW OF THE SECTION

Banana is propagated by vegetative means. There are different types of banana vegetative propagation. The two most known methods of banana vegetative propagation are traditional and modern methods. The traditional methods as its name describe is the usual method where the suckers and corms of banana are used as planting material.

This traditional method can be further classified as traditional (suckers, corms) and improved traditional methods (mother plant stripping, false decapitation and complete decapitation). The modern method of banana propagation (micropropagation) is the in vitro regeneration of plants from cells or protoplasts, tissues or organs on specially formulated nutrient media. This training manual aims to provide a step-by-step explanation of traditional methods of banana propagation.

2.2. SANITATION

1. It is very important that the starting material for macro-propagation is clean.
2. Clean starting material can be obtained in a variety of ways:
   - Treatment of nursery tools and planting materials with chemicals (Mancozeum and rodimil)
   - Through paring of suckers
   - Treating suckers with hot or boiling water treatment at the time of deception, corm detachment, sucker detachment
   - Through using tissue culture plants

2.3. TRADITIONAL METHODS

2.3.1. SUCKER

1. Banana sprouts, known as suckers, are detached for planting from the mother plants growing in the field.
2. It is ordinary propagation technique of using suckers directly detached from a mother plant
3. Suckers carry different names depending on their stage of development. Their development consists of distinct physiological stages.
4. Maidens, sword suckers, water suckers and peepers are different age groups of banana suckers used as a planting material (Figure2).
5. Maiden: the larger sucker that are about to flower

   - Water sucker- the shallow/superficial sucker with broad leaf and stunt growth stage and are not advisable to use for filed planting
   - Sword sucker- the sucker at about one meter length having sword shape leaf; best suckers for banana propagation
   - Peepers- the very young early shooting bud bearing scale leaf only; they are used for establishing nurseries.

6. These planting materials differ in the time to fruiting. This may be utilized in commercial production in timing the crop to a favourable marketing time or to avoid adverse seasons.
7. The absolute time for shooting and maturity varies with climate but in general it seems that large shoots, including the large swords mature slightly earlier.

8. The criteria for selection of suckers are as follows:

   - The suckers should have broad corm.
   - The suckers must have narrow sword-like leaves.
   - The suckers should be selected from viral, fungal and bacterial infection free mother plants

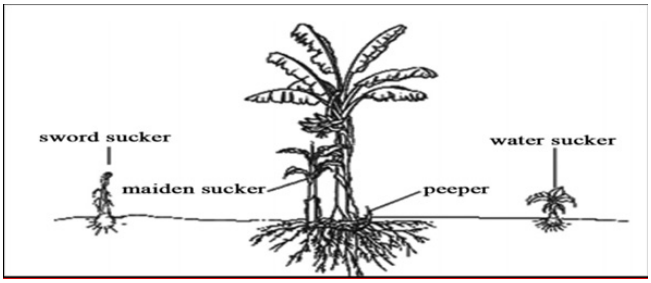


Figure 2 Different types of banana sucker

Some of the limitations associated with this method of propagation include lack of materials for large scale production, lack of uniformity, and risk of disease dissemination

It is limited by low multiplication rates and propensity of disseminating pests and diseases, which culminates in reduced banana productivity.

2.3.2. CORN

- Whole or split rhizomes can also be used when suckers are not available.
- Bits of rhizomes of 2 kg or more may be planted in the nursery for sprouting or directly sown in the main field.
- For quick multiplication of a variety rhizome bits may be use though the plant will require a little time to fruit.

2.4. IMPROVED TRADITIONAL METHOD

- The improved traditional method is one way to propagate banana plants that produce suckers or pups from their rhizomes (underground stem).
- This method has also three broad categories: Mother plant stripping, Field techniques and Detached corm techniques(macro-propagation).

2.4.1. MOTHER PLANT STRIPPING

The outer leaf sheath at the base of the mother plant's pseudo-stem are stripped off to expose the buds followed by mounding up soil around the base of the plant to allow the buds to grow into suckers.

This method can double the sucker production per mat in a year to as high as 40 suckers per plant

2.4.2. FIELD TECHNIQUES OF DIVISION METHOD

1. Two decapitation techniques exist: False and complete decapitation.
2. Both false decapitation and complete decapitation consist of the following steps

   - Removal of apical dominance
   - Sucker detachment.

3. Both techniques increase sprouting and sucker multiplication in the field.

False decapitation/Partial decapitation

Procedures

STEP 1. REMOVAL OF APICAL DOMINANCE

Identify existing suckers on an established mature banana plant

- A small hole (~ 5 cm in diameter) is cut in the pseudostem (Figure 3) of six-month-old plants to destroy the actively growing point (meristem) while the foliage remains physiologically active for about three months thereafter. Be careful not damaging any roots while doing so!
- The hole is made at about 20 cm above the ground by removing the central part of the plant.
- The plant is left to stand for at least one month to allow sprouting

STEP 2. SUCKER DETACHMENT

- About four to seven suckers, depending on banana or plantain cultivar, will sprout three weeks after removal of the apical dominance.
- Sprouted suckers are detached immediately once they attain three to four leaves (usually when they measure 20-30 cm in height).
- Detached suckers are transferred directly to the field.
- Make sure each sucker has its rhizome attached.
- Place newly cut off pup/suckers on topsoil enriched with organic matter like compost/manure.
- Water well afterwards but avoid overwatering as it might cause rotting.

Figure 3 The division method of banana sucker multiplication (partial decapitation)

COMPLETE DECAPITATION

The complete decapitation follows the following detail procedure

STEP 1. SELECT PROPER SITE AND ESTABLISH MOTHER PLANTS

1. To establish banana seedling producing plot first we need to establish banana sucker harvesting plot (Figure 4).

   - Undertake site selection for banana sucker producing plant as per site selection criteria
   - Establish banana mother clone preferably by tissue culture banana seedling.
   - Select appropriate spacing which enables for rapid multiplication of banana sucker.
   - Usually, 1.5m by1.5m enables to have about 4500 plant at hectare.

Figure 4 Establishment of banana plantation for sucker multiplication

STEP 2. REMOVAL OF APICAL DOMINANCE

- Cleaning deception materials by hot water or chemical (Preferably rodmil) should get critical attention
- The pseudostem of a 6-month-old plant is completely cut down at ground level; emerging suckers should not be cut (Figure 5).
- The meristem is destroyed by using a clean knife or machete and removing the 5 cm diameter growing part in the middle of the pseudostem.
- Usually, the meristem is soft and when hitting harder tissue (the corm), one can be sure the meristem is destroyed. The corm is left to sprout for a month.

Figure 5. After cutting down the entire pseudostem, the meristem is removed, and the corm is left to sprout.

STEP 3. SUCKER MANAGEMENT

- About four to seven suckers, depending on banana cultivar, will sprout three weeks after removal of the apical dominance.
- Plants should only be watered when necessary.
- Fertilizers and other balanced fertilizers like NPK (19.19.19.) need to be applied.
- Weeding and earthing up need to be done based on the required time

Figure 6. Decanted banana plant with many suckers growing around

STEP 4. SUCKER DETACHMENT

- Temporary shade at which sprouted sucker acclimatized need to be constructed from local materials.
- Sprouted suckers are detached immediately once they attain three to four leaves (usually when they measure 20-30 cm in height).
- Material cleaning need critical attention at time of sucker detachment
- Detached suckers are transferred directly to the field or pot
- Suckers need to be graded based quality of sprout to maintain uniformity of seedling

Figure 7 Detached sucker transferred to acclimatization shade

2.4.3. DETACHED CORM TECHNIQUES (MACRO-PROPAGATION)

- Corm is an underground storage organ consisting of central buds which develop into a plant and the lateral bud grow into suckers.
- It is covered with closely packed leaf scars, which form rings around the corm.
- The internodes are extremely short. Each leaf scar carries a bud.
- Ten to fifteen buds on each corm develop into suckers.
- Pieces of corm carrying such buds, called mini setts, can be used as planting material, with one to three eyes.
- Detached corm technique is a faster technique of inducing plantlets (suckers) production from banana corms removed from the field plants.
- Using detached corm techniques, activities are carried out in propagators and weaning facilities.
- Detached corms or buds are prepared for primary bud sprouting.
- Plantlets resulting from these primary buds

are subsequently prepared for secondary bud sprouting.
- Plantlets resulting from these secondary buds are rooted.
- Finally, after an acclimatization period, they are ready for field planting.
- After 12-18 weeks, using this technology, planting material can be multiplied ten-fold.
- Using detached corm techniques, the following steps can be required

  - Construction of propagators
  - Filling of propagators
  - Selection of suckers
  - Preparation of suckers and planting
  - Propagator management
  - Potting mixture preparation
  - Rooting
  - Acclimatization.

STEP 1. CONSTRUCTION OF PROPAGATORS

- Propagators are used for sprouting of new seedlings and hardening of the subsequent sprouts.
- Simple propagators can be constructed using cheap materials, such as bamboo and polythene sheets.
- It is important that at least 50% shade is provided and that the fragile seedlings are well-protected, by constructing a shade above the propagators.
- A convenient size for a propagator is 1.5 (width) x 5.0 (length) x 1 (height) meter.
- Propagators should be kept clean and completely covered with transparent polyethylene sheets.
- Humidity and temperature should be high.
- The propagator compartments can be made using wood or bricks and should measure not more than 0.5 m in height.

Figure 8: Close up propagator

STEP 2. FILLING OF CHAMBERS

1. Propagators are filled three quarter-full of steam-sterilized fine sawdust.
2. Steam sterilization of sawdust can be performed as follows 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.
   - An old potato 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 old potato bags 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.

Figure 9. A propagator filled with steam- sterilized sawdust

STEP 3. SELECTION OF SUCKERS

- Healthy sword or maiden suckers detached from plants that are in between flowering and harvest can be used as source material, as well as corms of plants that are about to flower or that are already harvested.
- Of critical importance is that the source material is pest- and disease free.
- A maiden sucker is the most mature sucker on a stool and will give rise to the next crop cycle.

- A sword sucker is a young sucker whose leaves are pointed like a sword.
- The decision whether to use a sword sucker, a maiden sucker or corms depends on the type of detached corm technique explained below.
- Prior to use, the pseudostem is cut off from the suckers.
- propagator filled with steam-sterilized sawdust.
- Roots are removed from a harvested sucker or corm, followed by a thorough wash to remove plant and soil debris.
- The outer leaf sheaths are removed, one by one, 2 mm above the corm and from the leaf base with a sharp knife.
- This will expose all the buds and/or the meristem.
- The prepared material can be surface sterilized for 20 min in a fungicide mixture.

Figure 10: Sword suckers before paring (right) and after paring (left)

Figure 11. Sucker ready for cleaning

Figure 12. Cleaning paring and antifungal treatment of corms

STEP 4. PREPARATION OF SUCKERS AND PLANTING

- Detached corm techniques include whole corm, split corm, excised buds, meristem-drilling, plants resulting from stem fragments.

Whole corm

- Whole corm technique is applied to corms that are about to flower or that are already harvested.
- The meristem is absent while buds are present. Propagation is by means of bud manipulation.
- Roots are removed and the leaf sheets are cut away one by one, exposing the buds. A fungicide can be applied.
- The corm is scarified at the top (by cutting an X) after which every other observable bud is scarified.
- The entire corm is planted in the propagator.
- Corms are planted at 30 cm intervals and covered fully with sawdust and must be well watered immediately after planting.

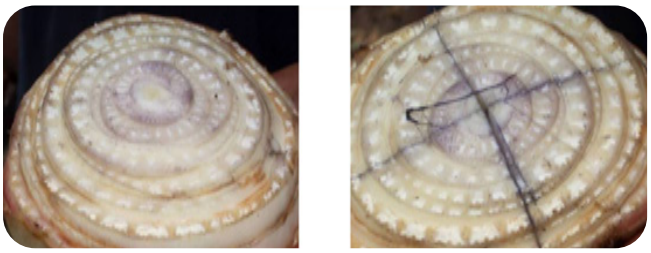


Figure 13. Corm with removed sheets (Left) and after scarification(right)

Split corm technique

- Split corm technique is applied to corms that are about to flower or that are already harvested.
- The meristem is absent while buds are present.
- Propagation is by means of bud manipulation.
- The whole corm is harvested and pared. Exposed buds on top are scarified.
- Leaf sheets do not need to be removed.
- The corm is fragmented into two or more bits, depending on its size, and planted in the chamber for buds to sprout.
- Prepared corm pieces are planted at 10 cm intervals and covered with 2 cm of sawdust.
- The chamber is well watered immediately after planting.

Figure 14. The corm is fragmented into two or more bits depending on its size

Excised buds

1. Excised bud technique is applied to corms that are about to flower or that are already harvested.

    - The meristem is absent while buds are present.
    - is by means of bud manipulation.
    - Buds are cut out from the corm in pieces of 50-100 g and planted in the propagator to sprout.
    - Buds are planted at 10 cm intervals and covered with 2 cm of sawdust.
    - The chamber is well watered immediately after planting.

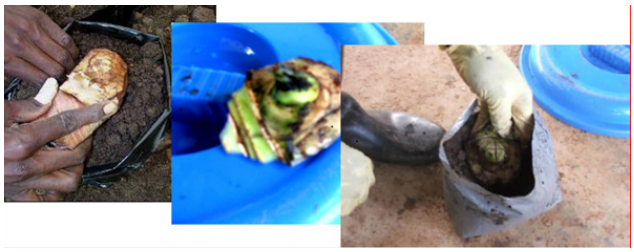


Figure 15. Buds are cut out from the corm in pieces of 50-100 g. Buds can be planted directly in plastic bags

STEP 5. PROPAGATOR MANAGEMENT

- During propagator management, it is important that a clean environment is maintained.
- Plants should only be watered when necessary. If the plastic sheets are moist, no watering needs to be done.
- Depending on the cultivar, three to seven shoots arise from one piece of planting material.
- Large shoots (usually obtained after three weeks) should be manipulated (scarified) to obtain secondary plantlets as follows.

    - Apical dominance is destroyed by cutting of the shoots and making an X in the middle of the remaining corm.
    - After another three weeks, each of these shoots will give rise to three to seven shoots again.

Figure 16. Young plants (Primary shoots) emerging from axillary buds on the corms

STEP 6. ACCLIMATIZATION

- After about 10 weeks, 10 to 50 secondary shoots will have emerged, each with two to three small leaves.
- These plantlets are detached.
- Those that have roots go straight into the potting mixture, using one plant per bag or cup.
- Those without roots are replanted in sawdust for 10 days prior to their movement to the potting mixture.
- It is important that a little portion of corm remains attached to provide the plants with a nutrient reserve.

Figure 17. Secondary shoot emerging from axillary buds on the corm (left). After they attain two to three leaves (right)they are ready for rooting

- Plantlets with roots are transferred in their plastic bags or cups to weaning facilities for acclimatization.
- If plantlets are moved to distant nurseries for acclimatization, they should be transported in humid transparent polythene bags.
- Acclimatization is ideal at 25-27oC and is accomplished in shades 2m in height for proper lighting and management.
- Plantlets being acclimatized should be watered four times a week.
- After three to six weeks in the weaning facility, plants are ready for the field.

Figure 18. Plants being acclimatized

Figure 19. Acclimatization site of banana sucker propagated by corm

2.5. TECHNICAL FEASIBILITY

1. This manual is going to be used for youth and women groups and other interested individual willing to engaged in the banana seedling production and distribution.
2. Implementing capacity of these group, particularly unemployed youth and women group is at its early stage and need to assess the technical feasibility of method of banana sucker production.
3. From the above-mentioned methods of sucker production appropriate methods that easily suited to these group is detached corm techniques.
4. The rationality why these methods of banana sucker production has been selected is that,
5. The method is much less complex than other traditional methods like detached corm system.

- Much more productive than the division method and much sucker can be produced.
- Initial Investment is much less and goes with ADEY investment per individual member of the group.
- Less risky than the division methods and less complex than detached corm system.
- The techniques go with capacity of group supposed to be organized.
- This method can be easily transforming trends of sucker production from this stage to detached corm methods and further to tissue culture seedling production as it is strategic point to capacitate and encourage further investment.

2.6. BANANA SUCKER PRODUCTION CALENDAR

Figure 15. Buds are cut out from the corm in pieces of 50-100 g. Buds can be planted directly in plastic bags

DESCRIPTION OF ACTIVITIES	MAY	JUNE	JULY	AUG	SEP	OCT.	NOV	DEC	JAN.	FEB.	MAR	APR
Site selection												
Land preparation												
CIG Organization &Legalization												
Tissue culture supply for mother tree establishment												
Mother tree planting												
Management of established fruit tree												
Sucker collection												
Sucker distribution												

Take away message

Complete decapitation / removal of apical dominance method is effective way of conventional methods of banana sucker multiplication.

Post assessment questions

- *Which types of conventional methods of sucker multiplication is more appropriate for your areas?*
- *Explain the types of suckers and which are most appropriate for seedling production?*
- *What are important steps to be followed for sucker production when we use corm as planting materials?*

SECTION 3. FINANCIAL FEASIBILITY

3.1. OVERVIEW OF THE SECTION

Financial feasibility describes whether agri-business is financially viable. It involves determining initial investment (resource) requirement to start the business, estimating production cost, operation expenses, and sales revenue.

Learning outcomes

To equip trainees on:

- *How to determine initial investment requirement to start the business*
- *How to estimate periodical production costs, operating expenses, and sales revenue of the business*
- *How to determine profitability and cash flow of the business*
- *How to calculate break-even point (minimum level of production) to recover total cost and generate profit.*
- *To calculate payback period (time requirement to recover initial investment*
- *How to make decision to accept or reject the investment alternative*

Duration: 4 hours

Learning question

Do you know how to determine financial feasibility of the given specific agri-business to make wise investment decision?

3.2. INITIAL INVESTMENT

- Initial investment is the minimum capital requirement to start the business.
- Example of initial investment requirement to start seed production business includes tools and equipment, seed storage, land, tractor, working capital, etc

Table 3: Template to estimate initial investment requirement for agri-business

DESCRIPTION	TOTAL COST	REMARK

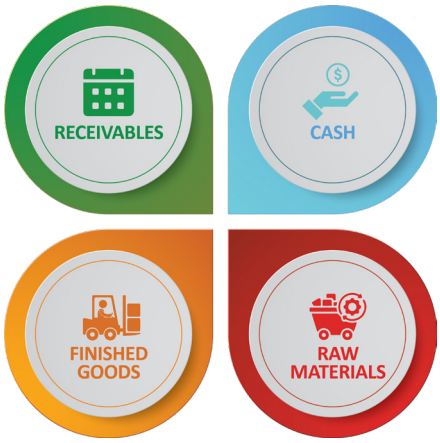
3.2.1. LONG-TERM INVESTMENT

Long-term investment in agri-business involves all asset requirement for the business which can serve for more than one year.

- Example tools and equipment, tractor, storage, land, etc

Table 4: Template to calculate total cost for acquisition of long-term investment

TYPES OF INVESTMENT	UNIT OF MEASUREMENT	QUANTITY	UNIT COST	TOTAL COST



3.2.2. WORKING CAPITAL

Working capital for the planned agri-business includes all payments requirement for day-to-day operating activities such as production costs and operating expenses.

Example

- Production costs include cost of seed, fertilizer, chemical, labor cost etc
- Operating expenses includes administrative salary, sales commission, promotion, etc

Working capital excludes long term investments such as warehouse, tools and equipment, land, tractor, and etc

1. Production cost

   - Production costs are a key component in agri-business.
   - It includes all costs associated with production including value addition to make the product ready for sale.

Table 5: Template for estimating production cost per hectare for onion seed production

TYPE OF COSTS	UNIT OF MEASUREMENT	QUANTITY	UNIT COST	TOTAL COST
TOTAL				

2. Operating expenses

Operating expenses are all costs not directly associated with production.

They are common costs incurred for administrative and selling activities.

Example: Administrative salary, promotion cost, sales commission, transport cost to sale,

TYPES OF COSTS	TOTAL COSTS

3.3. ESTIMATED PRODUCTION AND SALE REVENUE

Production volume is the main source of revenue for the agri-business to generate profit.

Producers should determine the estimated average production volume from the planned production season.

Formula - 1

Tolal production volume = Average Production per hectare X Land size (ha)

After determining the estimated volume of production, it is possible to determine the expected sales revenue for the planned production.

Formula - 2

Total sales revenue = Tolal production Volume X unit selling price

Table 7: Template for estimating volume of production and sale revenue

A	B	C	D	E	F
TYPES OF PRODUCT	LAND SIZE (HA)	ESTIMATED PRODUCTION/HA	TOTAL PRODUCTION	ESTIMATED SELLING PRICE/UNIT	TOTAL SALES REVENUE (FXG)

3.4. PROFIT AND LOSS STATEMENT

The primary objective of any business is to generate profit.

Profit and loss statement is the main tool to calculate profitability of the business.

It is used to accept or reject the investment based on estimated profit.

Formula -3

a. *Gross profit = Total sales revenue – Cost of goods sold*
b. *Net profit = Gross profit – Total operating expenses*

Table 8: Template for profit and loss statement preparation

DESCRIPTION		
Sales Revenue		
Cost of production (-)		
Gross profit		
Operating Expenses (-)		
NET PROFIT		

3.5. BALANCE SHEET

Balance sheet used to know the total resource owned, amount of claim by creditors and amount of owners' equity

- Balance sheet contains asset, liability, and own capital
- Assets are all resources available for use or for sale

  Example: cash, inventory, warehouse, land, equipment etc

- Liabilities are all debts obtained from bank, microfinances, individuals or others
- Own equity/capital involves own/member contribution, grant/donation, etc

Formula - 4

Total Asset = Total liability + Total own capital

Table 9: Template for balance sheet preparation

DESCRIPTION		
Asset		
Current asset		
Cash		
Inventory		
Total current asset		
Fixed asset		
Tools and equipment		
Total fixed asset		
Total asset		
Liability and Capital		
Liability		
Bank loan		
Debt from relative		
Total liability		
Owners' capital		
Own capital contribution		
Grant/donation		
Total owners' capital		
Total liability and capital		

3.6. CASH FLOW STATEMENT

Cash flow is all cash inflow and outflow for any purpose in the business operation.

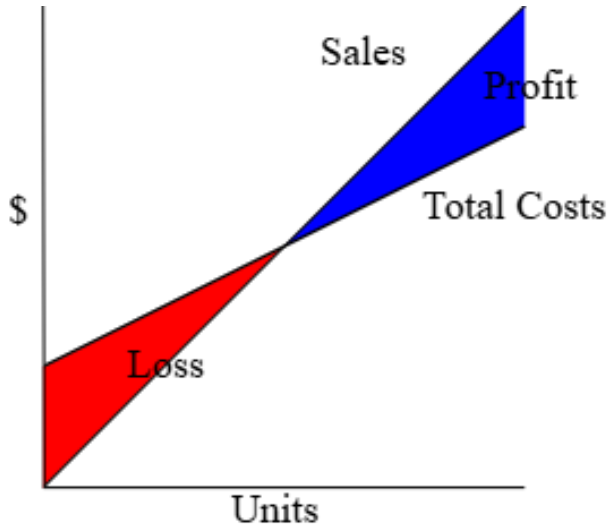
1. Example
- Cash inflows include sale of seed/seedling, debt obtained from banks, members capital contribution, etc
- Cash out flow includes purchase of input, payment for construction, repayment of debt, payment for salary, etc

Formula - 5

Beginning cash balance + total cash inflow = ending cash balance + total cash out flow

Table 10: Template for cash flow statement preparation

DESCRIPTION	AMOUNT OF OUTFLOW	AMOUNT OF INFLOW
Owners' investment		
Debt		
Grant		
Sales revenue		
Wate house construction cost		
Purchase of equipment		
Purchase of input		
Land rent		
Irrigation cost		
Labor cost		
Cash Operating costs		
Ending cash balance		
TOTAL		



3.7. BREAK EVEN ANALYSIS

1. Break even analysis is used to determine the minimum level of production to cover total cost
2. At break-even point no profit no loss
3. To make profit, level of production and sale should exceed/greater than breakeven point.
4. Fixed costs are fixed in total amount regardless of increase/decrease in volume of production.
   - *Example:* depreciation, warehouse rent, administrative salary, promotion cost, etc
5. Variable costs varied in total in response to increase/decrease in level of production
   - *Example:* production costs, packaging cost, loading and unloading, etc

Formula - 6

Break-even point = Fixed cost/(Unit selling price – unit Variable cost)

3.8.PAYBACK PERIOD

Payback period is used to determine number of years/ periods it takes to recover initial investment.

Formula - 7

- When the annual profit of the business is uniform/equal
  Payback period = Initial investment/annual profit
- When the annual profit fluctuate/vary from year to year
  Pay back period = # of year before coverage + uncovered amount/profit of the next year

Payback Period

The amount of time it takes to recover the cost of an investment.

Take away message

Analyzing financial feasibility of agribusiness enables to pre-determine the applicability of the business in terms of initial investment requirement, profitability, and sustainability.

Post assessment questions

1. Which of the following is part of working capital
   a. *Purchase of fertilizer*
   b. *Purchase of tractor*
   c. *Transportation cost*
   d. *Purchase of chemical*

2. *Which of the following should include in profit/loss statement*
   a. *Purchase of tools and equipment*
   b. *Sales revenue*
   c. *Debt*
   d. *Owner investment*

3. *Which of the following is variable cost*
   a. *Purchase of seed*
   b. *Administrative salary*
   c. *Depreciation*
   d. *Rent of storage*

SECTION 4. POTENTIAL RISKS AND MITIGATION MEASURES

POTENTIAL RISKS	MITIGATION MEASURES
Limited demand driven input/ early generation seed supply	Create strong, sustainable, and diversified linkage with suppliers through contractual based early generation seed production
Climate change	Use climate adoptive crop varieties, use irrigation scheme, use climate prediction information and tends of climate change, use diversification, understand effective crop Calander
Inflation/market fluctuation	Conduct effective demand assessment, understand competition in the business, apply cost-based pricing strategy, understand the market trend, use diversified market outlets
Limited access to finance	Create strong linkage with diversified source of finances such as banks, microfinance, use family/friends/partner, develop saving,
Insects and disease	Use quality and certified seed, apply crop rotation, understand the type of the insects/disease and use chemicals/manual mitigation method
Security	

ANNEX

Practical example on Avocado Nursery Seedling Development financial feasibility

1. 1. Fixed cost of establishing nursery for complete decapitation

Table 1: Fixed cost of establishing banana sucker producing nursery plot

S/N	DESCRIPTION OF ACTIVITIES (BASE OF COST AND REVENUE)	UNIT	UNIT COST(ETB)	AMOUNT	TOTAL COST (ETB)
1	Procurement of tissue culture seedling	No	5000	60	300,000
2	Procurement of tools	Lumb sum	3000	1	3,000
3	Chemicals	"	2000	1	2,000
4	Fertilizers	Qt	4500	4	18,000
	Total fixed cost of nursery establishments				**323,000**

Cost of operating nursery is owned by the youth and not included to both fixed and variable cost.

Table 3: Financial feasibility and sustainability of banana sucker production by organized youths

DESCRIPTION OF ITEMS	UNIT	AMOUNT
Mother plant established	No	4500
Average sucker harvested a point	No	6
Total sucker plant collected at around	No	27000
Round of harvest per year at maximum management	Round	3
Round of harvest per year at average management	Round	2.5
Total sucker produced with maximum management	No	81000
Total sucker produced with average management	No	67500
Price of sucker at farm gate	ETB	30
Total revenue generated with maximum management	ETB	2,430,000
Total revenue generated with average management	ETB	2,025,000
No. of youth organized	No	20
Rational saving at maximum management	ETB	729,000.00
Rational saving at average management	ETB	607,500.00
Operation cost per year at maximum management	ETB	150,660.00
Operation cost per year at Average management	ETB	125,550.00
Dividend at maximum management	ETB	1,550,340.00
Dividend at Average	ETB	1,291,950.00
Dividend/ individual/ year at maximum management	ETB/Peron	77,517.00
Dividend/ individual/ year at Average management	ETB/Peron	64,597.50
Average Income per month for maximum	ETB	6,459.75
Average Income per month for maximum	ETB	5,383.13

Economic/ financial feasibility for banana sucker seedling production from corm

This is a cost and benefits estimate for constructing a propagator comprised of five chambers with a total capacity of 1000 corms. These 1000 corms can yield at least 10,000 plants in four months. The propagator can last for more than five years and yields three time in a year.

Table 4: Fixed cost of establishing propagator for banana sucker propagation from corm

PROPAGATOR 1.5*5*1	UNIT	UNIT COST	AMOUNT	TOTAL COST
Transparent plastic sheets	Roll	1100	56	61,600
Wood	Roll	350	40	14,000
Nail	Packet	700	5	3,500
Corm	No	500	100	50,000
Nursery tools	Lup sum	10000	1	10,000
Construction cost	"	15000	1	5,000
	SUB TOTAL			**154,100**

Table 5: Operation cost of banana sucker multiplication from corm

OPERATION MATERIALS	UNIT	UNIT COST	AMOUNT	TOTAL COST
Saw dust	Bag	100	100	10,000
Top soil	m3	100	100	10,000
Poly bags	Kg	70	220	15,400
				35,400.00

Table 6: Revenue generated from banana sucker multiplication from corm in five champers

DESCRIPTION	UNIT	UNIT PRICE	AMOUNT AT ROUND	FREQUENCY OF SUPPLY IN A YEAR	TOTAL SUPPLY	TOTAL REVENUE (ETB)	TOTAL OPERATION COST (ETB)	GROWTH PROFIT(ETB)
Banana sucker produced from corm	No	35	10000	3	30000	1050000	35,400	1,014,600

Table 7: Financial feasibility of banana sucker multiplication from corm

DESCRIPTION	UNIT	AMOUNT
Group	No	10
Investment cost /Member	ETB/Person	9,475
Saving	ETB	304,380
Operation cost	ETB	38940
Dividend as a group	ETB	671,280
Dividend as individual/year	ETB	67,128
Income per month	ETB	5,594

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