

CULTURAL PRACTICES ON BANANA PRODUCTION

A. Soil Requirement

- Deep, friable and well drained soil.
- pH requirement is 6.5.

B. Climatic Requirement

- The mean temperature requirement is 22°C - 31°C.
- Can be grown from sea level up to 1,000 meters above sea level (ASL).

C. Planting Materials

- use of tissue cultures banana plantlets.



Advantages:

- Convenient to handle.
- Free from diseases.
- Higher survival rate at field establishment.
- Exhibit more vigorous and uniform plant growth.
- Shorter planting to harvest periods.
- Produces quality and bigger fruits.
- Increased annual yield.



D. Planting Distance

Planting distance depends on:

- Variety or cultivars
Lakatan: 3 m. X 3 m. = 1,111 hills
Cardaba: 4 m, x 4 m. = 625 hills.
- Soil fertility and fertilization.
- Sucker control.
- Topography.
- Economic factor.
- Planting pattern.

For smallholders:

- Rectangular system
– when using bamboo props.
- Square system.

For mechanized plantation:

- Double-hedge row - when using aerial props and cable fertigation, tractor-drawn, or power sprayer.

E. Farm Sanitation

- Base cleaning and ring-weeding.
- Leaf pruning or trimming.
- Stem and mat sanitation.
- Sucker pruning.



F. Fertilization

For maximum production:

- Good fertilization program should be based on soil and leaf analysis.
- An average bunch weight of 20 kgs banana removes 44 g of N, 5 g of P₂O₅ and 143.47 g of K₂O.
- Critical period of banana which is 1 to 6 months after planting needs proper nutrition.
- In the absence of soil analysis, the general recommendation for banana is 90 kg N, 30 kg P₂O₅ and 120 kg K₂O per hectare.
- Apply 0.25 kg (46-0-0); 0.25 kg (0-0-60) for every 3 months.
- N fertilizer maybe applied after heavy leaching rain at 90 g (46-0-0) or 125 g (20-0-0).
- If pH is below 5.0, apply lime.
- If soil is low in magnesium, apply dolomite at 2.5 ton/ha.



G. Control Measures for Virus Diseases

- Use of disease-free planting materials
- Practice quarantine procedures to prevent the movement of infected materials.
- Early detection.
- Prompt eradication of infected plants.
- Consistent and timely insecticide application to eliminate aphid vector.
- Elimination weed hosts of insects in the area or sanitation.

H. Fruit Care Operations

a. Propping

The aerial stem of banana entirely depends on the surroundings mass of leaf sheaths for support. Such a limp structure is mechanically incapable of supporting the



vegetative portion of the plant and much less in supporting a huge bunch. Physiologically, the pseudostem mainly provides vascular connections from the roots to the leaves and to the bunch. Hence, there is a need for a mechanical support by propping.

Propping supports the pseudostem in carrying a heavy bunch and preventing fruit losses.



Technology:

The three methods of propping are cable propping, pole propping, and guying. For large plantations, cable propping is practiced. For smallholdings, pole propping and guying are more practical.

a.1. Procedure for Pole Propping:

- Prepare wooden or bamboo poles of appropriate size for propping.

The two common techniques are single propping and double propping. In single propping, only a single pole is used to support the plant. Two poles intersecting each other at the upper ends of the poles to form an "X" wherein the base of the bunch is anchored, are used in double propping. Another technique is called umbrella propping, wherein one single big pole is installed at a point equidistant to four or more plants and are anchored by a guy (rope).

- Bury the poles firmly into the ground close to the hill or cluster of hills.

- Position the poles so that they will not touch or obstruct the developing bunch.
- Slightly push the poles upwards to tighten the hold on the stalk for more stability and to make the plant more upright to reduce the risk of tipping over.
- Tie the adjacent fruit-bearing plants for support.
- After propping, clear the bunch from all fruit obstructions.

a.2. Procedure for Guying:

Guying involves using a twine in tying the propped plant to two adjacent plants for support.

- Tie the bunch with looped twine at the base.
- Pass an appropriate length of twine through the loop and make a knot in the middle of the long twine so that both ends of the twine are free.
- Tie the two ends of the twine to the stem, 0.6 - 0.9 m from the base of two separate plants big enough to support the plant being propped and located on the opposite side where the bud bunch had bent.

a.3. Removing Fruit Obstacles:

The operation can be integrated with bunch spraying, bud injections, and leaf pruning. It avoids or minimizes bruising and malformation of young developing fruits.

Technology:

- Remove fruit obstruction like spadices, flag leaves, and follower leaves, and relocate props that touch the bunch.

a.4. Bunch Spraying:

Bunch spraying is regularly done to protect the fruits from fungal infection and insect damage. It is done from the time the first hand is out until the bunch is due for bagging.

Technology:

a. Mixing procedure:

Centralized mixing is recommended.

- Mix in a mixing tank the recommended chemicals and dosage enough for a one-day operation. Wear a respirator (cartridge type) for safety while mixing and spraying.

b. Bunch Spray Procedure:

- Remove fruit obstacles before spraying.
- Start spraying from the bended floral stem down to the bud and then reverse with a total swath of eight for the two different positions.
- Be sure that the four sides of the bunch are sprayed. The dosage per hand ranges from 8 to 10 ml depending on the size of the bunch.
- Direct the nozzle 25-30 cm from the bunch.
- Spray with full pressure.
- Spray all bunches before bagging the fruits.
- Stir the spray solution as necessary to achieve a homogenous mixture.
- Discard leftover solution after 48 hours.
- Always observe the DOs and DONT's in the safe handling of chemicals.
- Spray three times a week at 2-3 day interval for six months (or 24 weeks x 3 sprayings = 72 sprayings) for the first year.
- For the second year and onward, spray thrice a week for 48 weeks, or a total of 144 sprayings.

b. Fruit Bagging

Fruit bagging protects the bunch from pest damage and the fruit from mechanical injuries. It hastens fruit maturity by providing a favorable microclimate for fruit development inside the bag, and it makes the fruit skin smoother and glossier, and free from pest damage and injuries.

- To hasten fruit filling and maturity.
- To prevent sunburn.



Technology:

- Use polybags with 50-100% colorant on bunches along roads, canals, and other exposed areas within the blocks to minimize sunburning the fruits during the summer months. Otherwise, use light colored polybags other times of the year, especially during the rainy months to avoid pale-colored fruits.
- Perforate the polybags to complement an open bottom to aerate the fruits and to regulate the relative humidity and temperature inside the bag.
- Space the bagging rounds every seven days at most to ensure accurate bagging census from which fruit projections are based.
- Cut the guard leaf or *kapote* if it tends to damage the bunch. If there is any danger of bunch exposure to the sun, the guard leaf could be used to cover the bunch temporarily.
- Use a bamboo ladder to start bagging when about 4-6 male hands are already exposed or when the last female hand starts curling upward. Early bagging can also be done. Make sure that the bunch is freshly sprayed with a mixture of fungicides before bagging.

- Use newspapers to protect the bunch from sunscalding in exposed areas or in plants with a low number of functional leaves. Place the newspaper inside the bag or outside the bag during the sunny days.
- Remove the male hands and cut the bud 10-15 cm from the false hand. Likewise, remove some of the fingers of the false hand to serve as index fingers where the date of the fingers of the false hand to serve as index fingers where the date of bagging and block number are written. Remove the last one or two distal hands, depending on the hand-pruning scheme for the area.
- Remove all fused fingers in a hand and fingers that form a three-layered hand or prune one or more hands if the number of functional leaves is low.
- Slowly slip the bag (open on both ends) on the bunch from the bottom upward. Avoid damaging the fingers.
- Girdle around the bunch stalk and tightly tie with a piece of string several inches above the first hand.
- Tie color strips at the cut portion of the bunch stem to indicate the age of the bunch or the number of hanging days as reference for harvesting the bunch.
- Leave the bottom of the polybag open to avoid the accumulation of floral rubbish/water. Close the bottom of the polybag in areas infested by scarring beetles and other insects.

I. Harvesting

- Harvest the bunches preferably in the morning.
- Use the pole props or other poles to help lower the bunch for harvest to use the shoulder pad.
- Hold the tail end of the bunch before it touches the ground.
- Cut the peduncle, leaving about 30 cm of the stalk, for easy handling.
- To transport bananas from steep hillsides, tie the bunches in pairs (already deheaded) to each end of a yoke or pingga usually made of bamboo and carry them on the shoulder.

- On flat or moderately rolling lands, place the bunches on animal drawn sleds and move toward the roadside or to a packing shed. Put banana leaves in between the bunches to prevent bruising.

J. Proper Postharvest Technology

Ways to reduce damage during harvest:

1. Train pickers to handle product correctly.
 - Do not squeeze delicate products.
 - Discard substandard products.
 - Use harvest aid correctly.
 - Do not leave products in the open sun.
 - Transfer products gently.
 - Do not overfill containers.
2. Minimize number of container transfer.
3. Use clean containers.
4. Use padding or liners in containers.

J.1. Maturity Indices

Significance of maturity indices:

- Ensure sensory and nutritional quality.
- Ensure an adequate postharvest shelf-life
- Facilitate scheduling of harvest and packing operations; equipment, materials, facilities and labor needs.
- Facilitate marketing (some fresh product standards include maturity specifications)
- Influence overall productivity.
- Facilitate quality control (fresh market vs. processing requirements).



K. Pest and Disease Management

The threat of pests and diseases:

- Smallholder farmers are abandoning banana growing because of BBTv, Bugtok and Fusarium Wilt.
- Black Sigatoka reduces yield by as much as 80% of small farmers' fields.
- Farmers wait for 18-21 months for Cardaba to be harvested, only to find out that 80% are bugtok infected.

Banana Virus Diseases

1. Banana Bunchy Top (BBTV)

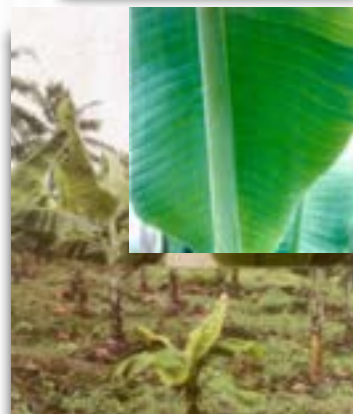
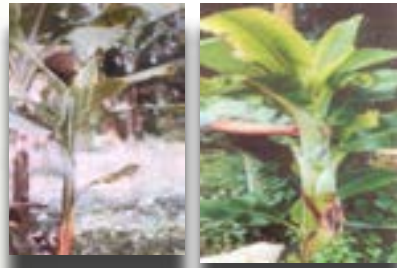
- caused by virus, systemic in nature.
- transmitted through banana aphid, *Pentalonia nigronervosa*.

Spread:

- Regrowth of suckers of incompletely destroyed infected mats.
- Via undetected infection in suckers or tissue-cultured plants.

Symptoms:

- Pale green to slightly whitish thin papery leaf.
- As the leaf unfurls, its edges often roll upwards and show marginal yellowing.
- When leaf is completely unfurled, it remains stiff and narrower than older leaves
- Pseudostem does not develop fully.

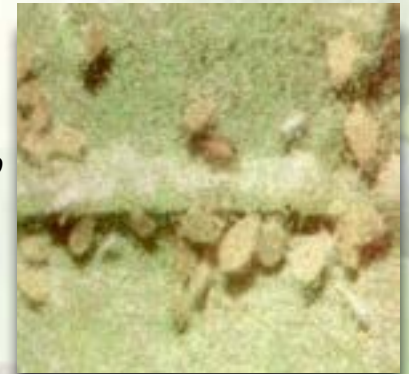


2. Banana Bract Mosaic (BBrMV)

- Caused by virus, also systemic in nature.
- Transmitted by *Aphisgossypii*, *Rhopalophum maidis* and *Pentalonia nigronervosa*.
- Reduce fruit yield by 40% in Cardaba and Lakatan.

Symptoms:

- Dark spindle discoloration on the bract of the inflorescence.
- Leaf shows yellowish green or dark green spindle-shaped streaks.
- Pseudostem, petiole and midrib show reddish brown spindle shaped streaks or stripes for 'Lakatan', whitish to yellowish spindle-shaped streaks or stripes for Cardaba.



3. Banana Mosaic (BMV)

- Caused by virus, also systemic in nature.
- Transmitted by *Aphis gossypii* and *Rhopalosiphum maidis*.



Symptoms:

- Light yellow dot-like spots that gradually elongates into short narrow dashes.
- Dashes enlarge, become lemon yellow streaks.
- Mottling occurs throughout the leaf blade, but more distinct streaks are confined only either on the upper half or on the lower half of the affected leaves.
- Elongated streaks sometimes turn brown and become necrotic.

Control measures for virus diseases:

- Use of disease-free planting materials.
- Practice quarantine procedures to prevent the movement of infected materials.
- Early detection.
- Prompt eradication of infected plants.
- Consistent and timely insecticide application to eliminate aphid vector.
- Eliminate weed hosts of insects in the area.

Banana Bacterial Diseases

1. Moko

- Caused by the bacterium, *Ralstonia solanacearum*.
- Very contagious disease that can kill an infected banana in just a few weeks.



Symptoms:

- At initial stage, bacterial wilt develops as a yellowish discoloration of the inner leaf lamina, close to the petiole.
- Diseased vascular tissues are discolored, ranging from pale yellow to dark-brown or bluish-black.
- Individual fingers appear distorted or turn yellow and the pulp turns very dark-brown.



Control:

- Quarantine and exclusion is the most effective control. Infected plants are eradicated and disinfected by use of chemicals or burning.

2. Bugtok

- An important disease infecting cooking bananas known as "tibagnol".
- Caused by *Ralstonia solanacearum*.
- Spread by several insects like thrips, wasps and bees.



Symptoms:

- Bracts of male inflorescence fail to dehisce.



- Internally, pockets of dry gelatinous grayish black or yellowish red tissues are found on the fruits which may extend to the whole pulp.
- Vascular strands in the pseudostem are discoloured.



Control:

- Early debudding or removal of male buds as soon as 'false hand' appears.
- Inflorescence bagging at bending stage with open end (remove the bag and debud after 15 days).
- Improve drainage system.



Banana Fungal Diseases

1. Panama Disease or Fusarium Wilt

- Contagious soil-borne disease.
- Most susceptible cultivars are Cavendish, Latundan and Lakatan.
- Caused by *Fusarium oxysporum* var. *cubense* Snyder & Hansen.



Symptoms:

- Early symptoms consist of yellowing of the leaves, collapse and drying up of the older leaves.
- Infected corm when cut diagonally show stained dark or purple vascular streaks running in all directions.
- The pseudostem may split and discoloration of vascular strands extends upward but not on the fruit.

Control:

- Use of disease-free planting materials.
- Early detection and elimination of infected plants with strict quarantine and phytosanitary measures.
- Fallow the area.
- Disinfect tools with 10% formaldehyde solution for at least one minute.

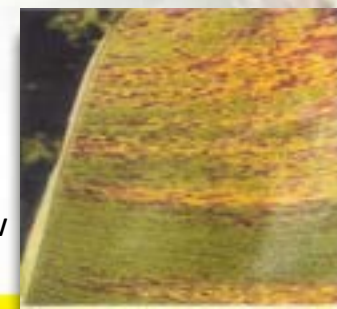


2. Sigatoka

- Caused by *Mycosphaerella fijiensis*.
- Reduces yield by as much as 80% in small farmers' field.
- Leaf spot diseases destroy banana leaves leading to decrease in yield and premature ripening of fruits.
- A major limiting factor in the production of export-quality banana in commercial plantations and smallholders banana farms.

Symptoms:

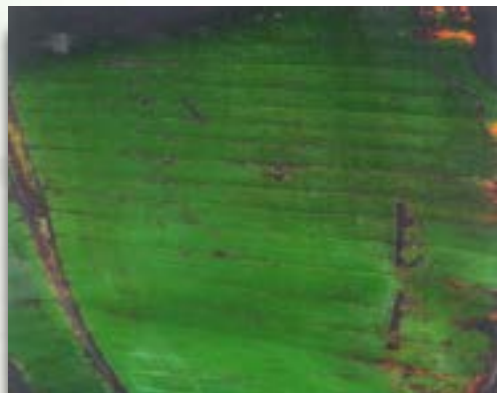
- Yellow-green specks on the lower surface of the 3rd or 4th youngest open leaf.
- Specks elongate and expand to clearly visible brown streaks.
- As streaks further increase in size, they become elliptical brown spots surrounded by a yellow halo.
- When the spot fully develops, the central areas turn gray and the spot is surrounded by a dark brown or black margin with or without yellow halo.



- Heavy spotting caused premature leaf senescence which consequently reduces the number of functional leaves.
- Severely defoliated plants produce bunches with fewer and lighter hands having short, unfilled, soft fingers.

3. Banana Freckle

- Damage is more on fruit, causes blemishes, which become very unattractive.
- caused by *Phyllostictina musarum*.



Symptoms:

- Numerous, small, slightly raised reddish or dark brown spots with black dots on the center of leaves and fruits.

Control:

- Sanitation by removal of infected leaves
- Regular spraying with fungicides
- Proper bagging of fruits as a standard practice will also control the incidence of the disease on fruits.

Insect Pests of Banana

1. Banana Aphids

- found in all areas where banana is grown.
- found between the leaf sheaths and at the base of the pseudostem.
- do not directly cause injury but transmit the bunchy top virus.



Control:

- Practice good sanitation.
- Stem and mat spray of insecticide.

2. Thrips

- Feed on fruit peel, resulting to corky scab or reddish brown discoloration.
- Irregular eruption on the peel that becomes rough and often turns into brown-colored cracks when the fruit matures.



Control:

- Inject bud with insecticide solution.
- Stem and mat spray with insecticide.
- Bunch spray with an insecticide-fungicide combination.
- Do stem sanitation.

3. Mealy Bugs

- Young mealy bug nymph is pinkish white while the adult has a soft body with white powdery wax.
- High infestation is observed on the fruit and the pseudostem during summer.
- Mealy bug infestation as well as that of sooty molds result to unsightly appearance on the peel of the fruits.



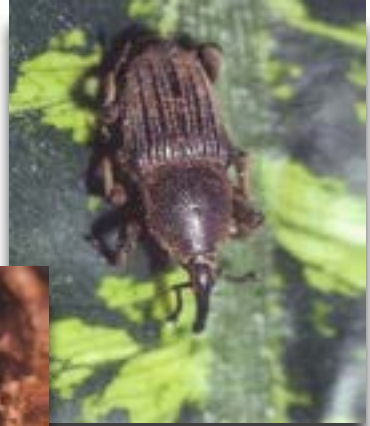
Banana Production

Control:

- Bag the bunches with Lorsban-impregnated polyethylene.
- Do stem sanitation to expose mealybug colonies to sun and rain which can reduce its population.
- Stem and mat spray with insecticide.

4. Corm Weevil

- Adult corm weevil is reddish brown at its early emergence but turn black after a week.
- Larva has a reddish brown head with creamy white body.
- Larva feed on the corm by making tunnels.
- Larval damage lessens the uptake of water and nutrients from the soil resulting to smaller and lighter fruits
- Plants easily toppled by strong winds.



Control:

- Mechanical Trapping.
- Use pseudostem stump by cutting crosswise and place on the top of the ground near the base of the mat to attract adults.
- Cultural method.
- Stem and mat sanitation.
- Chemical method.
- Use counter 10G at 30 g/mat at 2 cycles per year.

