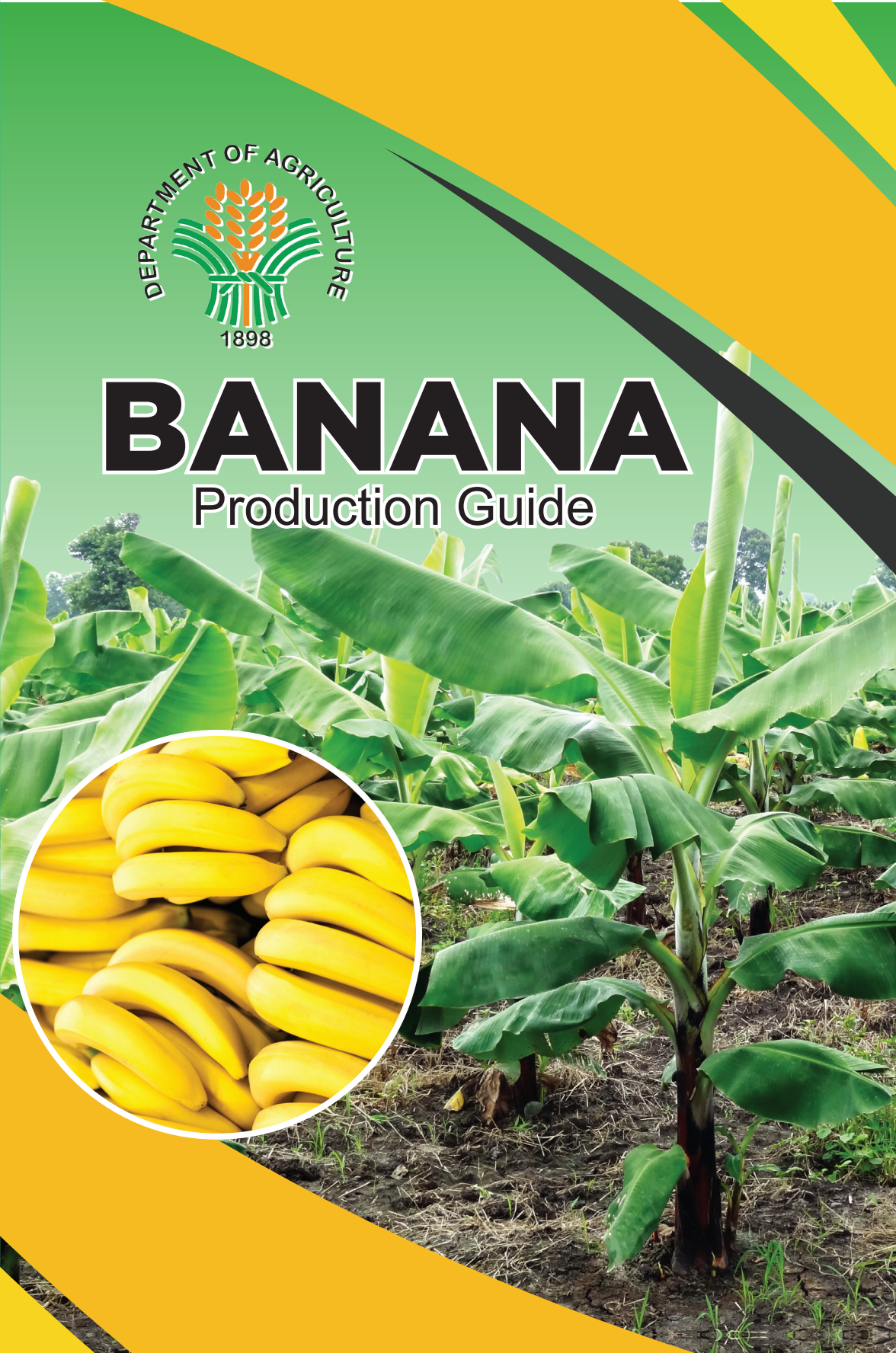
DEPARTMENT OF AGRICULTURE
1898

BANANA

Production Guide



Banana

INDUSTRY SITUATION

- Banana production during the third quarter of 2017 was estimated at 2.38 million metric tons which was 3.4 percent higher than 2.30 million metric tons of same quarter of 2016. This could be attributed to the following reasons:

    - o increase in area harvested and bearing hills as a result of expansion of cavendish banana plantation farms controlled by Lapanday Foods Corporation, Sumifru Corporation, Dole Food Company, Inc., and Del Monte Foods, Inc in SOCCSKSARGEN (Sultan Kudarat), Northern Mindanao (Bukidnon) and Davao Region (Davao Norte);
    - o bigger bunches harvested in SOCCSKSARGEN (North and South Cotabato) due to sufficient rainfall; and
    - o increase in number of bearing hills harvested in Caraga (Agusan Sur and Surigao Sur) due to application of Good Agricultural Practices (GAP).

- The highest production was observed in Davao Region with 38.6 percent share or 918.97 thousand metric tons from the overall national production. This was followed by Northern Mindanao and SOCCSKSARGEN with 21.5 percent and 12.2 percent shares, respectively.

Cavendish variety took the sizable share of 51.7 percent of the total banana production. It was followed by Saba with 28.0 percent and Lakatan with 10.5 percent.

Major Banana Growing Regions, Philippines

Regions	2016 Production Data
Banana Cavendish	
CAGAYAN VALLEY	326.04
CALABARZON	968.35
WESTERN VISAYAS	1,409.88
CENTRAL VISAYAS	1,784.25
EASTERN VISAYAS	88.38
ZAMBOANGA PENINSULA	169.71
NORTHERN MINDANAO	1,237,619.00
DAVAO REGION	2,634,744.00
SOCCSKSARGEN	481,142.82
CARAGA	100,243.09
ARMM	179,681.21
NEGROS ISLAND REGION	151.52
Banana Lakatan	
CAR	4,276.17
ILOCOS REGION	807.05
CAGAYAN VALLEY	34,218.99
CENTRAL LUZON	12,944.50
CALABARZON	6,846.97
MIMAROPA	14,502.90
BICOL REGION	3,639.35
WESTERN VISAYAS	15,494.54
CENTRAL VISAYAS	12,534.66
EASTERN VISAYAS	11,720.14
ZAMBOANGA PENINSULA	61,909.66
NORTHERN MINDANAO	168,389.57
DAVAO REGION	222,775.54
SOCCSKSARGEN	173,975.09
CARAGA	21,834.70
ARMM	123,771.28
NEGROS ISLAND REGION	8,873.80
Banana Saba	
CAR	8,844.33
ILOCOS REGION	20,628.65
CAGAYAN VALLEY	258,652.81
CENTRAL LUZON	22,699.97
CALABARZON	74,011.62
MIMAROPA	61,631.21
BICOL REGION	40,103.37
WESTERN VISAYAS	126,890.40
CENTRAL VISAYAS	82,659.61
EASTERN VISAYAS	154,061.25
ZAMBOANGA PENINSULA	138,394.01
NORTHERN MINDANAO	302,527.65
DAVAO REGION	531,435.15
SOCCSKSARGEN	295,896.70
CARAGA	105,149.24
ARMM	164,318.87
NEGROS ISLAND REGION	86,294.27

Banana Growing Regions by Island

Island Region	2016 Production Data
Luzon	
CAR	25,584.50
ILOCOS REGION	41,505.81
CAGAYAN VALLEY	354,400.39
CENTRAL LUZON	49,654.01
CALABARZON	111,735.95
MIMAROPA	97,993.93
BICOL REGION	76,841.19
Visayas	
WESTERN VISAYAS	200,509.26
CENTRAL VISAYAS	125,992.52
EASTERN VISAYAS	226,602.84
NEGROS ISLAND REGION	152,097.81
Mindanao	
ZAMBOANGA PENINSULA	260,789.86
NORTHERN MINDANAO	1,864,422.34
DAVAO REGION	3,479,472.65
SOCCSKSARGEN	1,024,388.89
CARAGA	278,014.99
ARMM	533,677.20

IMPORTERS

Below are the 15 countries accounted for the highest dollar value worth of bananas exported from the Philippines during 2016:

1. Japan: US$231.3 million (37.4% of total bananas exports)
2. China: $144.8 million (23.4%)
3. South Korea: $114.7 million (18.5%)
4. United Arab Emirates: $28.8 million (4.7%)
5. Iran: $24.6 million (4%)
6. Kuwait: $20.1 million (3.2%)
7. Saudi Arabia: $16.7 million (2.7%)
8. Hong Kong: $10 million (1.6%)
9. New Zealand: $8 million (1.3%)
10. Malaysia: $5.8 million (0.94%)
11. Singapore: $5.6 million (0.91%)
12. Iraq: $3.1 million (0.5%)
13. Qatar: $1.4 million (0.23%)
14. North Korea: $1.1 million (0.18%)
15. Mongolia: $1.1 million (0.17%)

World top producers of Banana chips

1. Arrowood Industries Inc., Butuan, Philippines
2. Celebes Agricultural Corp., Lahug, cebu
3. Celebes coconut Corp., Cebu
4. Ecofruit SA, Equador
5. PISAOO Agroindustria, Colombia
6. ROYCE Food Corp., Cebu
7. Snacks Brands Equador, S.A, Equador
8. Thai Food & Pickled Veg. Limited Porarsh, Thailand
9. The Exotic Blends Co., Equador
10. Thelma Dev,t. Corp., General Santos City
11. Tropican World Trade PVTLTD, India

Marketing Practices

- Domestic markets for fresh banana - the middle men getting the produce from the farm
- Fresh fruits and vegetable traders/agents - buy banana from farmers
- Shippers at the port of origin - Cagayan de Oro, Gensan, Davao
- Consignees/receivers - at the port of Manila for sales distribution to wholesalers and jobbers
- Wholesalers or jobbers - from all over Luzon
- Retailers - Fruit stands in rich neighborhood, supermarkets, wet market and mobile retailers cart)

Major Banana buyers in Davao

1. Davao NorthLink Foods
2. Tropical Synergy Industry
3. See's International Food Manufacturing Corp.
4. ArcMen Industries Inc.
5. B-G Fruits & Nuts Mfg. Corp.
6. Celebes Agricultural Corp.
7. El Coco Mfg. and Trading Corp.
8. Four Seasons Fruit Corp.
9. Koki Food International
10. Green Bee Banana Chips Corp.
11. GSL Enterprise
12. BFC Worlwide Inc.
13. Festive Food Int'l. Inc. Sunbliss International

Credit Assistance

❑ The National Government provides credit assistance through:
Production Loan Easy Access (PLEA) - a special credit program designed to address the financial needs of marginal and small farmers and fisherfolk for a fast, convenient and affordable credit.
Survival and Recovery (SURE) Assistance Program (areas under State of Calamity with considerable damage in agriculture due to natural calamities as determined by the DA and/or LGUs

❑ Landbank which caters to cooperatives has the following maximum loanable amount at 80% of project cost:
Cardaba : P37,000/ha
Lakatan : P 122,000/ha

ISSUES AND CONCERNS

Strengths

- High demand in local/ international market
- High demand for processed products
- Can be grown organically
- Good intercrop with other fruit trees
- High yield
- Sole producer of large quantities
- Saba/Cardaba is resistant to major leaf diseases
- Low input requirements
- Early return of investment

Weaknesses

- Cardava or saba is susceptible to “Bugtok” disease
- Inappropriate marketing system
- Lack of marketing promotion in other countries

Opportunities

- Increase demand in local / international market
- Preferred in local market
- High price
- Improve human nutrition
- High economic return

Threats

- Viruses and other diseases
- Land-use conversion
- High pesticide use

Opportunities

- Processing
- Banana Chips
- Banana Catsup
- Banana Puree
- Industrial Flour
- Food Grade Flour
- Others (Animal Feeds,Fertilizer)
- Fresh Fruits (local & export)

COMMERCIALLY GROWN BANANA CULTIVARS

CARDAVA

- Generally cooked before eaten
- Cardava is also cooked by deep frying (turon), banana cue
- Commercially processed into banana chips
- The bud is used as vegetables
- Banana peels can be utilized as feeds for livestock
- Large fingers and angular with starchy pulp but sweet when ripe
- 10-16 hands/bunch, 10-20 fingers/hand
- Mature in 150-180 days from shooting

LAKATAN

Has a light orange to orange pulp, firm and aromatic. Each bunch has 10-12 hands with 12-20 fingers/hand. The size of each finger ranges from 10-20 cm. in length and 2.0 to 2.5 cm. in diameter. The fruit matures 80-90 days from shooting.

CAVENDISH

Greenish yellow fruit under normal temperature. Has a white cream pulp, soft, fine textured and sweet. Seven to fourteen hands per bunch. Up to 60 kg. Fruit matures 105-120 days from shooting. Three to 5 m tall.

LATUNDAN (KANTONG, TUNDAL)

Fine textured, white pulp and yellow peel. A bunch has 5-9 hands with 12-18 fingers. Matures from 75-85 days from shooting.

SOIL AND CLIMATIC REQUIREMENTS FOR BANANAS

Suitable Soils:

1. Requires moist, deep, fertile and well drained soil
2. Can tolerate a soil pH range of 4.5 to 7.5
3. For maximum growth and production it should be planted in fertile sandy loam soil or in alluvial loam soil

Desirable areas are

- flat terrain
- ravines and hilly lands can be utilized provided that erosion and production management are considered like planting distance and population densities.

Suitable Climate

- Bananas are best grown in warm and moist region
- Sensitive to low temperature injuries. Growth are impaired when rainfall drop below 10 cm a month
- Banana plants are sensitive to strong winds. In places frequently visited by strong winds and rains, wind breaks should be provided
- Standard rainfall requirement for optimum growth is 20-22 cm distributed evenly in a month
- Temperature should not reach below 15^0C nor above 35^0C

Management practices for bananas

SELECTION OF PLANTING MATERIALS

Select planting materials that are FREE from DISEASES

1. Tissue-culture plantlets

2. Sword-leaf stage suckers

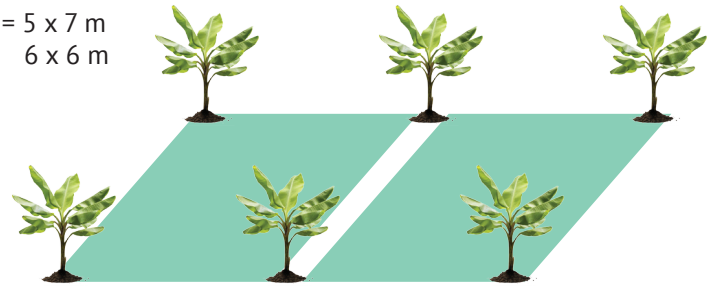
LAND PREPARATION

1. In hilly or rolling areas, contour farming using the SALT is recommended
2. Plow and harrow the field thoroughly to eliminate weeds and have good soil tilth.

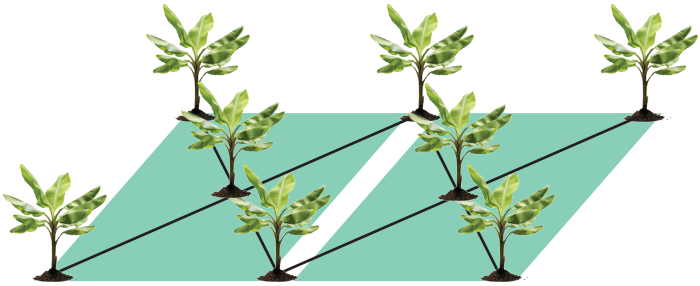
FIELD LAYOUT, STAKING & HOLING

Recommended distance of planting per variety

Cardava = 5 x 7 m
6 x 6 m



Square Method



Quincunx System

Lakatan – 2.0 m in hills x 2.5 m between rows
(2000 mats/ha.)
- 3.0 m in hills x 3.0 m between rows
(1111mats/ha.)

Cardaba – 5m in hills x 7m between rows
(286mats/ha.)

FACTORS TO CONSIDER IN CHOOSING FIELD DESIGN

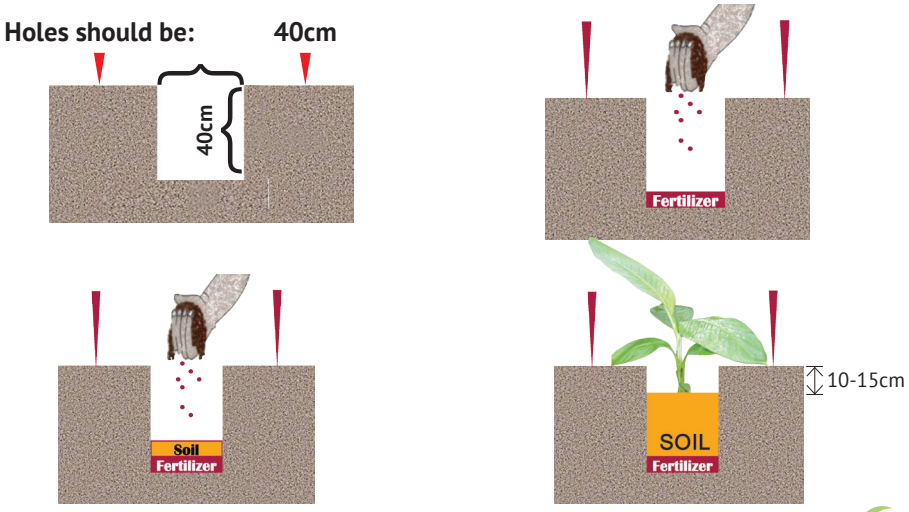
- At close spacing, care should be taken that plants do not come into contact with neighboring plants
- The method of irrigation should be also considered
- Topography will determine the layout of the field
- The degree of mechanization and the use of equipment will be determined
- The cultivation system will definitely influence both the spacing and the layout of the field.

Distance of planting depends on the :

- Cultivars
- Topography of the area
- Fertility of the soil
- Availability of planting materials
- Fertilization program
- Method of sucker control
- Economic factor
- Production management and status of the area

PLANTING

east - west direction is recommended to give equal distribution of sunlight from among the rows



FERTILIZATION PROGRAM

- ✓ A good fertilization program should be based on soil and/or leaf tissue analysis
- ✓ In the absence of soil and/or leaf tissue analysis, use the general recommendation for banana:)
  RR = 90-30-120 NPK
  Rule of Thumb (2:1:3 NPK)

- ✓ Start applying the right amount of fertilizer on the early stage of the crop
- ✓ Monthly application is best to give continuous nutrition to the crop
- ✓ In rolling areas slightly dig & apply the fertilizers on the up-hill side of the plant
- ✓ Apply fertilizer when there is enough soil moisture

AMOUNT OF NUTRIENTS REMOVED BY A BANANA FIELD THAT PRODUCES 30 T/HA

Nutrient	Amount removed from 1 ha
Nitrogen (N)	50 – 75 kg
Potassium (K2O)	175 – 225 kg
Phosphorus (P2O5)	15 – 20 kg
Magnesium (MgO)	25 – 30 kg
Calcium (CaO)	10 – 20 kg

CARE AND MANAGEMENT OF THE PLANT

Weed control

1. Control weeds by manual ring or line weeding or slashing during the early stage of the plant (1-4 mos.)
2. Herbicide control can be done at 6 mos up, when plants are tall. Avoid contact of herbicide to any part of the plant to avoid herbicide burn
3. Mulching can also be done as weed control and moisture conservation.

Irrigation and drainage

1. Banana requires large amount of water for growth & development. Irrigation facility should be installed in the farm.
2. In flood-prone areas, good drainage system should be established

Stem and mat sanitation

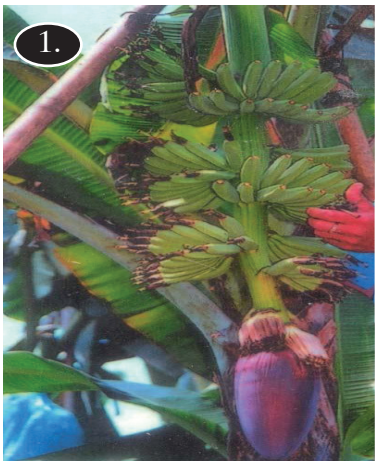
1. Remove dried and unfunctional leaf sheath/bract and leaves.

Leaf Pruning/De-leafing

1. Old and diseased leaves that hang around the pseudostem should be removed
2. If healthy leaf area is more than 50%, trimming is recommended rather than removing the complete leaf
3. Be sure to maintain 8-15 functional leaves

Fruit and bunch care

1. Deflowering
2. Debudding/debelling
3. Bagging
4. Bunch Spraying



Sucker control

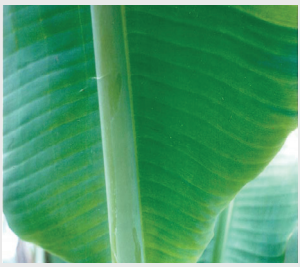
- ✓ Remove excess suckers to reduce nutrient & water competition
- ✓ Digging of unwanted suckers is allowed when the first generation is harvested

PESTS & DISEASES OF BANANAS:
Management and control measures

A. VIRAL DISEASES

1. Banana bunchy top virus

- Carried /transmitted by the aphid Pentalonia nigronervosa Coq.
- These aphids feed and Multiplies primarily on banana and abaca. Gabi-gabi and camia are alternate hosts.



SYMPTOMS:

✓ Early stage

- Dark green broken dashes at the base of the emerging leaves
- Dark green streaks in midribs and petiole

✓ Advance stage

- Typically bunched together at the apex forming rosette resulting in severe stunting.
- The leaves are very brittle and easily snap off when bent or rushed.
- If ever infected plant bear fruits, hand are deformed and fingers are severely reduced in size.

2. Banana bract mosaic

- Insect transmitted by Vector – A. gossypii & R. maidis symptoms

3. Banana mosaic

Other names

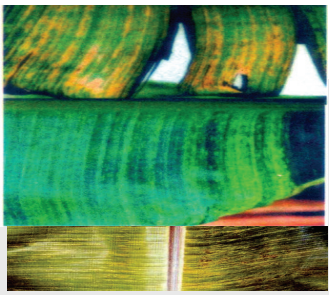
- Infectious chlorosis
- Cucumber mosaic
- Heart rot
- Virus shoot rot

Insect vector

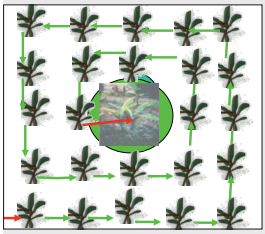
- Aphis gossypii,
- Rhopalosiphum maidis

❑ It can be mechanically transmitted

4. **Banana streak virus**
   Serious in dwarf Cavendish Caused by Badnavirus
   Vector – Mealy bugs of Citrus
   - Resemble of the Banana Mosaic in the early stage of ymptoms
   - Progresses to necrotic streaks
   - Heart rot in severe cases



■ **Control measures of all viral diseases**
- Careful selection of planting materials
- Early detection of diseases plants
- Insecticide application to eliminate insect vector
- Eradication of infected plants



■ **Eradication of diseased plants**

Option I
- Spray with insecticide first the plants within the 6 meters radius from the infected plant and spray last the infected plant
- After spraying dug up completely infected plant and chop into small pieces
- Again spray insecticide the chopped materials
- Replanting will be done 3-5 days after eradication

Option 2
- After 24 hours spraying, cut pseudostem close to the ground, chop the cut small pieces and allow to dry.
- Stab the middle of the remaining pseudostem with herbicide impregnated bamboo stick (full strength) to prevent re-growth.
- If the re-growth occurs, cut the pseudostem close to ground and repeat steps.

B. LEAF AND FRUIT DISEASES

1. Banana Freckles

SYMPTOMS:

- Numerous rough, black spots about in the midrib and lamina of the older leaves.
- It may coalesce resulting to defoliation. Infected fruits are full of blemishes.

Control Measure:

- Remove infected leaves to prevent spread of the disease..
- Provide drainage canals to avoid water logging which triggers high humidity favorable for disease development..
- Maintain proper plant nutrition.
- Remove infected leaves to prevent spread of the disease.
- Provide drainage canals to avoid water logging which triggers high humidity favorable for disease development.
- Maintain proper plant nutrition.

2. Sigatoka

SYMPTOMS:

- Tiny brown streaks initially appear on the underside of the third and fourth leaf
- Dense aggregation of the black streak may form and when these areas become water-soaked, the leaf turns black, dries-up rapidly, and becomes brown

Control Measure:

- Remove diseased leaves from infected plants to reduce inoculums.
- Sanitation-drain excess water logging which produces high humidity
- Proper nutrition
- Spray contact and systemic fungicide on the candle
  leaf and expanded leaves at 10-15 days interval

3. Dry rot disease

- Based on observation the malady are high during summer when temperature is 35°C
- The upper portion of the peduncle is exposed to sunlight bleached and starts to rot which result to reduced finger size and eventually in severe cases of bunch occur.

Control Measure:

- The disease could be prevented by spraying the peduncle and bunch with 0.1% Carbendazim immediately after shooting and covering the peduncle with leaves (flag leaf) to protect from heating.

4. 2. Bugtok / Tibagnol

Control Measure:

- Regular stem and mat sanitation
- Regular de-leafing of dried leaves
- Early de-budding
- Bagging of inflorescence at bending stage

Fusarium wilt or Panama disease

- Fusarium Wilt or Panama disease the most highly destructive vascular disease reported in the Philippines.
- The fungus enable to survive for more than 30 years in the soil after their hosts have been removed
- Wilt is present on latundan (Silk) lakatan (AA) & Pitogo (ABB) also present sporadically on abaca
- Germinates and penetrates susceptible plants in the presence of roots.

SYMPTOMS:

- Dead leaves hanging down the pseudostem like a skirt
- Eventually the Heart leaf dies and the pseudostem will remain standing until it is removed or collapses
- Splitting of pseudostem just above the soil level
- Yellow, red or brownish dots and Streaks localized in the vascular strands of the rhizome and pseudostem
- Rhizome discoloration is severe where the stele joins the cortex
- In advanced stages of infection, rhizome discoloration is more prolific and the stains more intense

Management and control of Fusarium Wilt

- Management of Fusarium wilt disease depends on the integration of different control strategies
- No single method is fully effective on its own.
- These strategies concentrate on lowering the amount of inoculum in the field, while enhancing plant vigor and disease tolerance.
- The most effective method for control of wilt disease is the use of resistant plants, when they are available.

Recommendations:

1. Prevent the introduction of Fusarium wilt into the disease- free farms/field through
   - Honoring quarantine regulations
   - Using tissue culture banana plants
   - Put water baths with disinfectants and restriction signboards
   - Clean all machinery, equipment and tools used in potential diseased fields

2. Early Identification and isolation of new outbreaks
   - Contact knowledgeable plant pathologist immediately if you suspect Fusarium wilt outbreak
   - Isolate infection sites by digging trenches and fencing-off the area
   - Control all movement of people into the infected site
3. For severely infected fields, NO management strategy exists

Eradication process

- Eradicate diseased plant and adjacent mats (within 2.5 meter radius) within 24 hours after confirmation.
- Burn all plant parts including corms and excavated roots within the day using rice hull.
- A second burning is recommended to completely burn tissues of infected plant.

- Fallow the area for 6 months and observe clean culture.
- Replant with disease-free tissue cultured plantlets, preferably tolerant cultivars.

Quarantine measures

1. Quarantine the following areas

- Site of infection – fence the area, construct canal around the affected area, construct foot bath at entry / exit points and use recommended disinfectant solution.
- Affected farm – place a foot bath at designated entry/exit points
- Affected plantation – place tire dips at designated entry / exit points
- Replenish disinfectant solutions in the foot bath or tire dip as needed or as recommended by the manufacturer.

Moko or Bacterial wilt in banana

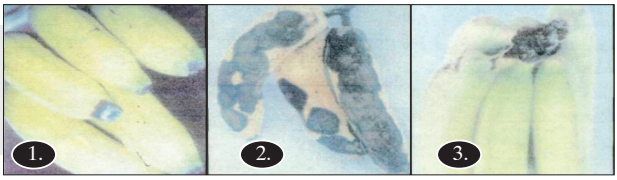
- Moko disease or bacterial wilt is caused by a bacterium that affects all plant parts at any stages
- Wilting of the second or third youngest leaf
- Vascular tissue has black to brown discoloration
- Fingers ripen prematurely
- Infected tissue will exude slimy bacterial ooze
- Fusarium wilt or Panama disease
- Moko of bacterial wilt

Control measures for soil born diseases

- Establish good drainage system
- Spraying of fungicides & insecticides
- Early detection of infected plants
- Fallow the area for 6 months to 1 year
- Soil sterilization to eliminate soil borne bacteria, fungi and nematodes in the soil
- Plant or use disease-free planting materials

Other Diseases of Banana

1. Cigar End Rot
2. Anthracnose
3. Crown Rot



Insect pests of banana

- Banana aphids

- Thrips
  - ✓ Feeds on fruit peel, resulting to corky scab or reddish brown discoloration
  - ✓ Severely damage fruits may split open

- Nematodes

  Control Measures:
  - ✓ Use nematode-free planting materials (suckers or TC)
  - ✓ Quarantine measures
  - ✓ Use of Nematicides
  - ✓ Propping to avoid toppling
  - ✓ Fallow field

- 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

- Corm weevil

  Damage:
  - ✓ 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

Integrated management practices for pest and diseases of bananas

Preventive measures

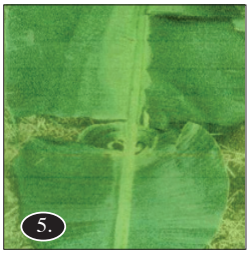
- Plant/use disease-free planting materials
- Practice farm sanitation and quarantine measures
- Bagging the fruits to prevent fruit infection
- Follow proper plant spacing

Eradicative / curative measures

- Establish good drainage systems
- Spraying of fungicides and insecticides
- Burning of infected plants and or soil sterilization to eliminate soil borne bacteria, fungi and nematode in the soil (Use rice hull or coco husk)

Nutrient deficiency symptoms

1. Nitrogen deficiency
2. Potassium deficiency
3. ZINC DEFICIENCY
4. BORON DEFICIENCY
5. CALCIUM DEFICIENCY



❑ HARVESTING

Step in harvesting

Manual harvesting requires two persons.

1. Remove the leaves in order not to destroy other nearby plants.
2. Slowly remove the bamboo or nylon props.
3. Simply cut the middle portion of the psuedostem and pull the bunch slowly to the shoulder of the carrier.
4. Cut the top of the psuedostem leaving 2-3 meter stalk to serve as reservoir for water and nutrient to the growing suckers.

❑ MARKETING

For cardava or saba
If for banana chips

- Green-mature at least 118 –125 days from removal of male bud.
- Medium to large -7-10 cm to 11– 14 cm long not less than 2 cm. diameter
- Should not ripen 4 days from arrival in the banana chip processing plant.

Maturity indices of banana for the local market

VARIETY	WEEKS AFTER SHOOTING
Amas	6-8
Señorita	6-8
Latundan	9-11
Lakatan	12-14
Bungulan	12-14
Cavendish	13-15
Saba or Cardaba	20-24

Maturity indices of banana for the local market

- Fully matured
- Sold per hand big- 20-40.00, small-15-20.00 or by kilogram at 7.00/kg.

Estimated 5-year cost & return per hectare

		Lakatan	Cardava
1.	Establishment	P23,855.00	P 7,500.00
2.	Care & maintenance	414,761.00	114,823.00
3.	Miscellaneous expense	43,855.00	12,622.00
4.	Cumulative 5-year production cost	482,671.00	138,851.00
5.	Cumulative 5-year gross income	P1, 314, 451.00	286,800.00
5.	Cumulative 5-year Net income	P 780, 153.00	123,859. 00
	ROI	161.63%	89.2 %

DEPARTMENT OF AGRICULTURE
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Koronadal City

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