

# PHILIPPINE NATIONAL STANDARD

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**Code of good agricultural practices (GAP)  
for mango**



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## **Introduction**

The Department of Agriculture (DA) approved the Administrative Order No. 25 series of 2005 on the Certification of Good Agricultural Practices (GAP) for Fruits and Vegetables Farming. This regulation is the Department's response to the "farm-to-fork" principle of ensuring food safety being promoted by the Food and Agriculture Organization (FAO). The goal/objective of the Good Agricultural Practices (GAP) Certification Program is to provide fresh and safe agricultural food products for the consumers. It focuses on the reduction of risks from pathogens, heavy metals and pesticide contamination. Additional benefits of the program are to ensure worker health and safety, and protection of the environment.

Although the Code for GAP is generic and has a wide application, the industry-led National Mango Action Team (NMAT) deemed it necessary that a specific GAP Manual for mango production be adopted and implemented by the Department considering its high domestic consumption and significant export potential.

In response, the Department created a Technical Working Group (TWG) composed of experts from the concerned government agencies namely, Bureau of Plant Industry (BPI), Fertilizer and Pesticide Authority (FPA), Bureau of Agriculture and Fisheries Product Standards (BAFPS), National Crop Protection Center of the College of Agriculture, University of the Philippines Los Baños (NCPC-UPLB) and industry representatives from the NMAT and CropLife Philippines Incorporated. The TWG was tasked to draft the Philippine National Standard (PNS) – Code of GAP for Mango and facilitate the conduct of its presentation to the stakeholders through public consultative meetings.

This Code of GAP for mango lists down the practices for pre-and post-production of safe and high quality mangoes intended for both domestic and export markets. It provides common understanding on farm location, farm structure and maintenance, cultural and farm management, integrated pest management (IPM), and pesticide management geared towards GAP compliance. This PNS – Code of GAP for Mango is applicable for both small and large-scale farms and will be used as a basis for evaluating farms towards obtaining a GAP Certification.

**Code of good agricultural practices (GAP) for mango**

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**I Farm location**

1. For existing farms, the following factors may be taken into consideration in evaluating the possible sources of chemical, biological or physical contaminations: prior land use of the farm, its current use and activities of neighboring farms or lands. It should not be a source of contamination (e.g. former mining site or dumpsite).
2. Where a significant risk of a chemical, biological or physical hazard is present, remedial measures must be taken and records of such activities are recorded.
3. When selecting new areas for mango plantation, the following may be used as guide in assessing suitability of the land for mango production. The area should preferably be rich in organic matter and suitable for mango production:
  - a) Soil characteristics – well drained soil; pH of 5.5 to 7.5.
  - b) Climatic conditions – preferably with distinct wet and dry season; with four (4) months dry period; with the temperature of 22 °C - 34 °C
  - c) Elevation –preferably the area should not be higher than 600 meters above sea level;
4. A farm land with good drainage and a flat to slightly rolling terrain is ideal for growing mangoes. A farm topography map should be made available showing the location of crop production sites, windbreakers, water resources, irrigation lines, drainage canals and outlets, roads, buildings, storage facilities and other structures.
5. The Bureau of Agricultural Research (BAR) Geographic Information System (GIS)-based maps for mango can also be used as guide as to where to plant mangoes.
6. In highly sloping areas which are prone to soil erosion, environmental impact assessment is recommended.

**II Farm structure and maintenance**

1. Preferably farm boundaries are enclosed to ensure that there are no stray animals inside the production area, especially during harvesting.
2. Designated areas or facilities for the working shed of orkers and separate sheds for farm implements and equipment should be available. Sheds for farm workers must be provided with adequate and clean comfort rooms.

3. Toilet provided for the farm workers must be properly maintained. These should not be close to water sources or in places where rain can wash out contaminants or cause spills.
4. Storage and packing areas must be kept clean and tidy. Litter and waste materials must be removed immediately from the crop production area. Effective measures (i.e. composting) must be taken to dispense of the trash or waste material on the farm.
5. Irrigation system should be clean and well-maintained to provide effective delivery of clean water, prevent blockage and backflow.
6. All equipment associated with cultivation, harvesting storage of mangoes should be clean and maintained at optimum operating conditions.
7. Adequate areas for waste collection measures and storage for biodegradable and non-biodegradable wastes should be provided. Non-biodegradable wastes should be separated from biodegradable waste materials.
8. Domestic and farm animals, except those that will be used for transport, should be excluded from the production site and packing shed during harvesting. Such animals must be on leash to prevent them from entering the production areas especially during harvesting.
9. When pest control measures such as baits, traps and vermin control are used, the location, date of application and a trained person assigned for the maintenance should be properly recorded.

### **III Cultural management**

#### **A. Quality planting materials**

1. For the establishment of new farms, it is recommended that cultivars are chosen based on resistance to pest, suitability to the site, yield potential and market preference.
2. The following are the recommended strains of Carabao mango approved and registered by the National Seed Industry Council (NSIC) (Annex 1).

GES 73  
GES 77  
GES 84  
GES 85  
Lamao Strain No.1  
MMSU Gold  
Sweet Elena  
Talaban  
Fresco  
Tanaleon

Efondo  
Guimaras Super (Galila)  
JTA Sweet  
P-1 King Rodolfo

3. Scions of these registered varieties/strains can be gathered from the parent trees or from established foundation/scion groves validated and certified by the Bureau of Plant Industry – National Seed Quality Control Services (BPI-NSQCS) (Annex 2).
4. Grafted seedlings will also be tagged as certified in credited nurseries if scions are gathered from the certified foundation/scion trees. The Bureau of Plant Industry – Crop Production Division (BPI-CPD) was mandated to do accreditation of plant nurseries.
5. A record of the source of the planting materials, the and date of purchase must be kept in the farm.
6. The minimum age of the grafted planting material should be one (1) year old. Overgrown/too old planting materials should not be recommended.

**B. Land preparation**

1. For flat to rolling areas not previously planted with agricultural crops, the land is prepared by plowing at least once and harrowing twice. This is done especially if there is an intention of intercropping mangoes with other crops. For steeper areas, practice minimum tillage by clearing about 2 sq.m. for each plant and digging a hole of at least 1/3 cubic m.
2. However, if the site will be used solely as a mango plantation, the area where the mangoes will be transplanted should be cleared of weeds before a hole is dug.
3. Land preparation is best done before the onset of the rainy season.

**C. Design and distance of planting**

1. For flat to slightly rolling areas, the ideal lay-out should follow an east-west orientation to maximize exposure of trees to sunlight.
2. In highly sloping areas, contour planting is recommended.
3. The recommended planting distance for carabao mango ranges from 12 m x 12 m to 20 m x 20 m depending on the fertility of the soil and the intended purpose (intercropping).
4. The planting design for mangoes may either be square or quincunx. In the latter, a tree is planted in each corner of the square and an additional tree in the center. In the former, one tree is planted in each corner of the square.

## D. Cultural management of young trees

### Early pruning

1. Formative pruning is done to reduce the height of trees. This is usually done when the tree is about 1 m tall, and the terminal portions are cut/pinched to encourage lateral branching.
2. Three (3) to four (4) branches are allowed to grow to 1 m and then the second cutting or pruning of terminal portions is done until the branches are evenly distributed.
3. For established young trees, 3-4 year old (at least 3 meter tall), where early pruning is not practiced, the tree is center-pruned to control the height and for proper development of lateral branching. This allows sunlight penetration, air circulation, and facilitates spraying, bagging and harvesting operations.
4. Pruning is suggested to be done during the dry season

### Fertilization

1. Soil and tissue analyses are preferably carried out and used as bases for the amount, kind and timing of fertilizer application. Samples may be sent to the Bureau of Soils and Water Management (BSWM) or to other government accredited or recognized laboratories. Results of such analyses should be kept.
2. In cases where no such analysis are carried out, the following are suggested:

Age of the trees (in years)	Fertilization schedule/program (per tree)
1	Split application <sup>a</sup> of 100 g urea, or 200 g of organic fertilizer <sup>b</sup> + 100g urea  The fertilizer should be placed in the soil near 10 cm the base of the plant. Ring method with soil cover
2	Split application <sup>a</sup> of 200 g urea, or 500 g organic fertilizer +200 g urea  The fertilizer should be placed about 15 cm away from the trunk. Ring method with soil cover
3	Split application <sup>a</sup> of 300 g 14-14-14, or 1 kg - 2 kg organic fertilizer + 300 g 14-14-14  The fertilizer should be placed about 30 cm away from the trunk. Ring method with soil cover
4	Split application <sup>a</sup> of 400g 14-14-14, or 2 kg - 3 kg organic fertilizer + 400 g 14-14-14  The fertilizer should be placed about 50cm away from the trunk. Ring method with soil cover
<sup>a</sup> 1 <sup>st</sup> application – at the onset of the rainy season <sup>b</sup> 2 <sup>nd</sup> application – before the end of the rainy season List of registered organic fertilizers can be found in Annex 3	

### **Irrigation**

1. Irrigation is done by manual watering, sprinkler or drip method to keep the base of the plant moist at all times. This promotes rapid growth for bigger canopy or early maturity.
2. During the dry season, water plants weekly. Saturate with enough water or use about 3 L - 5 L of water per tree.
3. To minimize evaporation, mulching using dry leaves or thick layer of rice hull (10 cm - 15 cm) at the base of the mango tree is recommended. This prevents growth of weeds and serves as source of organic matter.

### **Inter-cropping**

1. The area between the rows of mango trees may be planted with fruit trees, vegetables or legumes best suited to the area and with high demand in the locality.
2. Pests affecting these intercrops should likewise be managed properly as they may serve as alternate hosts of insects and diseases.

### **Weed control**

Weeds compete with mango for nutrients and water. To control weeds, the following are recommended:

- a) ring cultivation, about 1m radius from the trunk;
- b) inter-row cultivation (plow/tractor);
- c) cover cropping with leguminous creeping vines like Tropical Kudzu and Centrocema. These can also be plowed under (green manuring) to provide additional nutrients; and
- d) apply herbicides, only when necessary.

## **E. Cultural management of bearing trees**

### **Pruning**

1. Pruning involves the removal of unnecessary branches such as water sprouts, dried, disease-infected branches and all branches that grow towards the center of the canopy. This is preferably done after harvest.
2. To minimize pest infestation, open-center pruning should be practiced.
3. Drastic or radical pruning is the removal of the total canopy or more than 30 % of the canopy and is usually done to rejuvenate unproductive trees.

**Fertilization**

1. Soil and tissue analysis is recommended before the application of fertilizer. Samples may be sent to the Bureau of Soils and Water Management (BSWM) or to other government accredited or recognized laboratories. Results of analysis should be kept on record.
2. In case soil and leaf analyses are not available, the following fertilization schedule is recommended.

<b>Age of the trees (in years)</b>	<b>Fertilization schedule/program (per tree)</b>
5-6	500 g - 1 kg of 14-14-14 or 3 kg - 4 kg of organic fertilizer <sup>a</sup> + 500 g - 1 kg of 14-14-14
7-8	2 kg of 14-14-14 or 4 kg - 5 kg of organic fertilizer+ 2 kg of 14-14-14
9-10	3 kg of 14-14-14 or 5 kg - 6 kg of organic fertilizer + 3 kg of 14-14-14
11-15	5 kg of 14-14-14 or 10 kg of organic fertilizer
16-20	6 kg - 7 kg of 14-14-14 + 12 kg of organic fertilizer
More than 20	10kg of 14-14-14 + 15 kg - 20 kg of organic fertilizer
<sup>a</sup> List of registered organic fertilizers can be found in Annex 3.	

3. The above mentioned fertilizer quantity can be split evenly and applied, one at the start of the rainy season and the remaining towards the end of the rainy season. It can be placed in a shallow canal or in 6-8 holes dug around the tree at a depth of 15 cm - 30 cm and a distance of 2 m and 4 m radius from the trunk. This recommendation is applicable for 10 years and above
4. At 18-25 days after flower induction and before bagging, foliar fertilizer should be applied as supplement to the soil-applied fertilizer. The foliar fertilizer should have macro and micro nutrients such as zinc, boron, magnesium and calcium.
5. A complete set of records of fertilizer applications must be kept. Information should include fertilizers used, rates (amount/tree) and dates of application as well as the names of applicator/s.

**Flower induction and management****Flower induction**

1. Prior to spraying, the leaves of trees are checked for attributes of readiness to flower as follows:
  - a) The age of the leaves should be at least 7 months from flushing;
  - b) leaves are dark green, coppery and brittle; and
  - c) buds are prominent and dormant.



2. Nitrate based products (i.e. potassium nitrate, calcium nitrate, sodium nitrate, calcium ammonium nitrate, liquid ammonium nitrate) for use as flower inducers, whether of agricultural grade or formulated products, is recommended.
3. Flower inducer is sprayed by wetting the leaves thoroughly with 1 % - 3 % spray concentration. During the rainy months, higher concentrations (2 % - 3 %) of flower inducers should be used; while during the dry months, lower concentrations (1 % - 1.5 %) may be used.
4. If it rains within six hours from spraying, a follow-up spray using a lower concentration (50 % of the initial spray concentration) of flower inducer may be applied.
5. A growth retardant (i.e. paclobutrazol) may also be used to promote early leaf maturation especially in young trees (less than 10 yrs. old) and prepares the trees for early flowering. This is applied as a soil drench.

### **Flower and fruit management**

1. Foliar application of liquid fertilizer at 18-22 days after flower induction (DAFI) may be done to promote flower growth and development.
2. Pollinating insects like blue flies & bees are encouraged by avoiding spraying of insecticide during full bloom (26-38 DAFI). A five percent (5 %) sugar or honey solution is sprayed as spot application to attract pollinators during full bloom.
3. If it rains during full bloom, spray flowers with fungicide immediately after the rain to prevent fungal growth. Fungal growth can also be prevented by gently shaking the branches to remove rainwater deposit on the flower and to remove disease-infected flowers.
4. Mango trees are irrigated weekly, approximately 100 L - 300 L of water per tree per week, to enhance the development of flowers and young fruits and minimize fruit drops. Watering is stopped one (1) month before expected harvesting schedule.
5. Bagging is recommended at 55 to 60 DAFI, if no infestation is observed. However, if cecid fly and capsid bug infestations are observed, bagging should be done 40–45 DAFI.

### **Proper harvesting**

1. Fruits should be harvested upon reaching maturity of 105-130 DAFI. On season harvesting is 105 to 115 DAFI. Off-season harvesting is 120 to 130 DAFI.
2. Other maturity indices include:
  - a) flattening or expansion of shoulders and fullness of cheeks;
  - b) presence of “bloom” or powdery deposit on the fruit;
  - c) yellow green color near pedicel and yellowing of pulp; and

- d. floatation of fruits in 1 % salt solution (100 g salt/10 L of water). Sinking of 70 %-75 % of the fruits is an indication that the fruits are already matured
3. Harvesters must wash their hands before harvesting. Good personal hygiene must be practiced to avoid cross-contamination of the produce.
4. The fruits should be harvested between 9:00 AM and 3:00 PM for lesser latex flow. When it rains, harvesting is deferred. Leave about 2.0 cm pedicel on the fruit to minimize latex flow which may burn the fruit. Farmers may use tarpaulin or fish net to catch the fruits which may accidentally fall while harvesting.
5. Minimize damage and avoid contamination of fruits with soil, pathogens, fertilizers or other agro-chemicals. Harvested mangoes should not get in contact with the soil in order to avoid microbial contamination.
6. Harvested fruits should be kept away from direct sunlight and brought immediately to the shade for sorting and other post-harvest activities.
7. Harvesting crates/containers (e.g. bamboo baskets, stackable plastic crates, etc.) should be regularly cleaned and maintained. Unfit harvesting crates/containers should be disposed if it will cause damage to the fruit or will cause contamination.
8. Containers of harvested fruits should be clearly identified with names or codes containing date of harvest, time, block number, and name of harvester/farmer. Record of this information should be kept for traceability.

### **Proper post-harvest handling**

1. Harvested fruits may be sorted/packed on-farm or may be transported to a common packinghouse facility. If transported, fruits hauled carefully in an appropriate container to the packinghouse to minimize mechanical damage. Mango fruits placed in bamboo baskets or “kaings” should be lined with newspapers not banana leaves or other organic material.
2. Fruits to be sorted out should not be placed in direct contact with the soil or the floor of the packinghouse to avoid cross-contamination of the produce.
3. Sorters/packers should wash their hands with soap or detergent before handling the produce. They should also practice good personal hygiene.
4. For packinghouse facilities, the packing room must be from toilet facilities and must be kept clean, tidy, well ventilated and free of foul smell at all times.
5. Mangoes should be sorted according to size and quality (Annex 1 – Revised PNS for Mangoes). Damaged and diseased fruits should be discarded to avoid cross-contamination of the whole lot.
6. Sorted and graded mangoes should then be inspected and trimmed of stems connected to the fruits.

7. The fruits should be washed clean with a mixture of potable water and mild soap. If required by the importing country, the fruits should be subjected to any of the following post-harvest treatments:
  - a) Hot water treatment (HWT) – The newly harvested fruits are dipped in hot water (about 52 °C - 55 °C) for about 10 mins. The fruits are then rinsed in cool running water for 10mins (hydro-cooling), air-dried for another 10 mins and packed.
  - b) Rapid HWT – The fruits are submerged in hot water (60 °C) for 30 sec to one (1) minute. Hydro-cooling is no longer required.
  - c) Extended HWT – The water is allowed to reach the temperature of 48 °C. The fruits are submerged in the water until pulp temperature reaches 46 °C. The pulp temperature is retained for 15 mins (holding temperature). The fruit is air cooled for 15 mins, followed by hydrocooling for another 10 mins - 15 mins, airdried and packed.
  - d) Vapor heat treatment (VHT) – Fruits are heated in a chamber with vapor-saturated air until the pulp reaches a temperature of 46 °C which is maintained for 10 mins. The chamber is then ventilated to cool.
8. Transported fruits should be appropriately labeled for traceability.

### **Packaging**

1. Mangoes which have been sorted, washed and subjected to post-harvest treatment(s) are then packed in suitable packaging containers. For specific packaging requirements of individual countries, the packaging specifications should be mutually agreed upon.
2. Each packaging container must be clearly labeled with the following information:
  - a) a mango grower's accreditation code
  - b) name of commodity
  - c) net weight
  - d) batch number and date of packing
  - e) name of Plant Quarantine Service (PQS) signing officer
  - f) the name "Product of the Philippines"
3. Storage facilities for packaging materials must be kept free from rodents, birds, farm animals, physical and chemical contaminants.





### **Storage facilities for fruits**

1. Storage facilities must be sanitized and free from decaying plant waste and foul smell.
2. Packed mangoes may be stored in a cold room (temperature 12 °C - 14 °C; relative humidity 85 % - 95 %) immediately after packing. Refrigeration equipment should be in good working condition with the temperature regularly monitored and recorded.
3. Cooling equipment must be cleaned and inspected frequently. Maintenance of equipment and use of appropriate sanitary procedures is critical in ensuring the safety of the produce.




#### **IV Integrated pest management**

1. Integrated Pest Management (IPM) is an effective and environment-friendly approach to pest management. To control and minimize damage, it combines the use of current and comprehensive information on the life cycles of pests; their interaction with the environment and the available pest control methods, e.g. biological, cultural, varietal selection, and chemical control. Use of chemicals should be on a need basis.
2. Mango trees are susceptible to pest attacks at various stages of development. Flowers and fruits are, however, the most susceptible to major pests.
3. The following are important factors for a successful implementation of IPM:
  - a) crop phenology;
  - b) pest identity, biology and damage;
  - c) pest/weather monitoring; and
  - d) pesticide management.
4. The detailed discussion of 3(a) to 3(c) is found in Annex IV, V and VI, respectively of this manual.
5. An IPM program has been developed to guide the mango growers in the implementation of IPM in their farms. For each month stage of mango development, the pests most likely to attack the tree identified and the corresponding intervention measures are indicated (Table 1).

**Table 1- Phenological guide for integrated pest management (IPM) program  
for Mango**

Stage/s	Phenology	Illustration	Target pests	IPM interventions
1	Dormant		Scale insects Mealybugs	Prune to improve light penetration and air circulation Fertilizer application (soil application)
2	Flushing		Cecid fly Twig cutter Anthracnose	Spray insecticides and fungicides to protect flush Apply growth regulator if necessary
7-9	Leaf maturation		Twig cutter	Prune and burn infested twigs
Before flower induction			Mango leafhopper	Light trapping Field sanitation Pruning
Flower induction 0 DAFI	Mature buds and leaves		Mango leafhopper	Start of chemical induction 1.0 % - 2.5 % KNO <sub>3</sub> , with high hopper population, mix insecticide and flower inducer





**Table 1- Phenological guide for integrated pest management (IPM) program for mango (continued)**

1-8 DAFI	Bud break/bud initiation		Mango leafhopper	Monitor percent flushing/flowering Monitor for pest
9-12	Bud emergence		Mango leafhopper Tip borer Thrips	Monitor for pest Spray insecticide if needed
13-16	Post emergence Bud elongation I		Mango hopper Tip borer Thrips Anthracnose	Apply foliar fertilizer Monitor for pest Spray insecticide and fungicide if needed

**Table 1- Phenological guide for integrated pest management (IPM) program for mango (continued)**


17-22	Post emergence Bud elongation II		Mango hopper Tip borer Thrips Mealy bug Anthracnose	Monitor for pest Spray insecticide and fungicide if needed
23-25	Pre-anthesis		Mango hopper Tip borer Mealy bug	Apply foliar fertilizer Monitor for pest Spray insecticide and fungicide if needed
26-30	Full bloom		Blossom blight	No insecticide spraying to encourage pollinators Shaking of branches
31-35	Fruitset (mongo size)		Mango hopper Tip borer Mealy bug Anthracnose Scab	Monitor for pests Spray insecticide and fungicide if needed
36-42	Fruit development (corn size)		Mango leafhopper Tip borer Mealy bug Anthracnose Scab	Monitor for pests

**Table 1- Phenological guide for integrated pest management (IPM) program for mango (continued)**

43-50	Fruit development (marble size)		<p>Tip borer Mealy bug Cecid fly Anthracnose Scab</p>	<p>Spray insecticide and fungicide if needed Early bagging for cecid fly control (optional)</p>
51-60	Fruit enlargement (chicken-egg-size)		<p>Mango seed borer Helopeltis sp Mealybug Scale insect Mango pulp weevil Anthracnose Scab</p>	<p>Field sanitation Before fruit bagging, apply foliar fertilizer Spray insecticide and fungicide if needed</p>
61-90	Fruit enlargement		<p>Mango seed borer Helopeltis sp Mealybug Scale insect Anthracnose Scab</p>	<p>Monitor for fruit pests Collection and proper disposal of fruit drops Spray insecticide and fungicide if needed</p>
91-109	Start of maturation		<p>Fruit fly Mealy bug Scale insect Anthracnose Scab</p>	<p>Monitor for fruit pests Collection and proper disposal of fruit drops Spray insecticide and fungicide if needed Use fruit fly attractants and traps</p>



**Table 1- Phenological guide for integrated pest management (IPM) program for mango (continued)**

110-120	Full maturity		<p>Fruit fly Stem-end rot Anthracnose</p>	<p>Harvesting of fruits based on maturity indices Hot water treatment (HWT)</p>
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## V Pesticide management

1. Pesticide management refers to the judicious use of chemical pesticides. It focuses on maximizing the benefits of the chemicals while minimizing its harmful effects. Other means of controlling pests, i.e. biological pesticides, may be used.
2. Pesticides may be classified based on its uses, formulation type, chemical grouping, mode of action, and hazards.
3. There are specific guidelines in applying GAP to ensure that the use of pesticides in mango production is managed properly. If these are followed judiciously, residues in mango will not exceed the maximum residue limit (MRL) of the pesticide.
4. The following are the good agricultural practices (GAP) pertaining to the use of pesticides:
  - a) Use registered pesticides.  
Apply only pesticides and other agricultural chemicals e.g. plant growth regulators which have been approved by the Fertilizer Pesticide Authority (FPA).
  - b) Read and follow the label instructions.  
It is important to always read and understand the pesticide label to be able to use the product properly. The following information is found on the label:
    - i. Product information
      - 1) Active ingredient(s) (a.i.) may be present in several brand names.
      - 2) Solvent
      - 3) General use statement – summary of the approved use(s) of the product
    - ii. Directions for use
      - 1) Crops
      - 2) Target pests
      - 3) Dosage, frequency and timing of application
      - 4) Pre-harvest interval
        - a. PHI refers to the number of days between the last spraying and harvest. It is derived from a supervised pesticide residue trial (SPRT) where the pesticide is applied at the approved rate and the residue level is analyzed.
        - b. Each pesticide active ingredient (a.i.) has its own PHI.
        - c. If the pesticides are applied following the recommended PHI, pesticide residues even if present would still be at or below the maximum residue limit (MRL).
        - d. Mango fruits at harvest should not contain pesticide residue levels exceeding its MRL.
      - 5) Re-entry period
        - a. It is the length of time to be observed before re-entering the treated area after each application of pesticide.
      - 6) Compatibility
        - a. In tank mixing with other pesticides and related chemicals, check label advice for compatibility.

- iii. Pre-cautionary measures
- iv. Storage and disposal
  - 1) Please refer to the advice on the storage and disposal on the label.
- v. First aid and medical treatment in case of poisoning
- vi. Emergency contact number
- c) GAP for the proper use and handling
  - i. Before mixing
    - 1) Keep spraying equipment in good condition. Check sprayer for defects. Maintain a record of maintenance check-up of spraying equipment.
    - 2) Check and repair leaks. Leaky sprayers cause unnecessary waste and risks, so do not use faulty or leaky sprayers.
    - 3) Clean the nozzles with water or a soft-probing device. Never blow into a clogged nozzle.
    - 4) For appropriate personal protective equipment (PPEs) to be used, read the product label.
  - ii. During mixing
    - 1) Use a measuring cup or graduated cylinder in measuring the concentrated formulated pesticide, with care to avoid spillage or hand contamination.
    - 2) Use clean water for mixing pesticides to avoid microbial contamination of the mango fruits.
    - 3) When the contents of the pesticide bottle are used up, rinse the bottle 3 times with water and pour into the last sprayer tank load.
    4. Never use your bare hands for mixing.
    5. Use appropriate gloves to minimize dermal exposure.
  - iii. During application
    - 1) Pesticide residues are highest in the face area, including the neck and shoulders, so wear the necessary protection.
    - 2) Do not spray against the wind.
    - 3) Spray inner canopy first before spraying the outer canopy.
    - 4) Use a power sprayer with an extended boom such as bamboo pole, to reduce contact with the spray mist and avoid climbing of trees to minimize exposure.
    - 5) To minimize exposure while spraying: wear protective headgear.
    - 6) Maintain a record of spray application indicating information of pesticide used, volume used, area sprayed, and operator.
    - 7) To minimize exposure while spraying: wear protective headgear, cover nose and mouth, wear long-sleeved shirts and long pants, change shirt and headgear when it gets wet with perspiration or spray solution and do not rub face or other body parts with contaminated hands. Do not smoke and eat if your hands are not washed clean after spraying.

- iv. After spraying
  - 1) Clean spray equipment by flushing the remaining pesticide solution using detergent and clean water.
  - 2) Do not dispose contaminated water or rinsate into waterways.
  - 3) Change working clothes immediately after spraying.
  - 4) Remove gloves last.
  - 5) Wash your hands with soap and water.
  - 6) Do not go home in your working clothes (used in spraying) because the pesticides in the fabric can be absorbed by the skin.
  - 7) Do not hang used clothes to dry for reuse the following day.
  - 8) Soak clothes in water and detergent.
  - 9) Dispose of rinse water properly, taking care not to contaminate water and food sources.
  - 10) Launder working clothes separately from uncontaminated clothes.
- d) GAP for storage and disposal
  - i. Storage
    - 1) Store pesticides in their original labeled containers.
    - 2) Keep pesticides locked in a storeroom and out of children's reach.
    - 3) Keep pesticides out of the kitchen.
    - 4) Do not place pesticide bottles beside bottles of vinegar, oil, soy sauce, etc. Do not place pesticide powders near salt or sugar.
    - 5) Keep pesticides away from fire or open flame, stove or lamps. Liquid formulations may have flammable solvents which can be a fire hazard.
    - 6) Partially used pesticide bottles must be placed inside a thick plastic bag to avoid hand contamination.
    - 7) Do not recycle used bottles as containers for oil, vinegar, soy sauce, and for any other food and feed stuff.
  - ii. Disposal
    - 1) Dispose of empty pesticide bottles and cartons into a pesticide disposal pit.
    - 2) Dig disposal pit in an area away from people and animals, and far from water sources.
    - 3) Do not burn pesticide containers. The temperature in the burning pile is not high enough to destroy the pesticide left in the containers. It will only spread faster through the hot air generated while burning. This will lead to inhalation problems and in some cases, phytotoxicity in standing crops
- e) Insect resistance management
  - i. Use products according to the recommended dosage. Underdosing quickly affects insect populations with average levels of tolerance, while overdosing kills most of the insect population leaving only those which are tolerant or resistant. This leads to the development of a new generation of insects which are difficult to kill.
  - ii. Use appropriate, well-maintained equipment to apply insecticides/fungicides. Use recommended water volume and spray pressure in order to obtain optimal coverage of the canopy. Avoid spraying to run-off.

- iii. Target the pests at their vulnerable stage, (young instars, larvae) where possible, because these are easier to control than older instars/larvae.
- iv. Use appropriate economic thresholds and spray intervals (based on label recommendation).
- v. Use alternately products of different modes of action or from different chemical groups such as pyrethroids, carbamates, organophosphates and new generation compounds.
- vi. If the efficacy of the product is no longer good, do not reapply the same insecticide/fungicide but change the to one having a different mode of action.
- vii. Mix different pesticides. This may offer a short-term solution to resistance problems. However, remember that each product used in the mixture should belong to a different class or mode of action, and is used at the recommended dose.

## **VI Farm management**

- 1. All records must be updated and kept up to two years.
- 2. Copies of laboratory analysis and certificates that verify compliance with this Code must be filed.
- 3. Each package/bulk packed produce leaving the farm must be traceable (i.e. date of harvest) to farm sources.
- 4. Records of lot number must be maintained for all produce leaving the farm.
- 5. Staff training records must also be maintained.

## **VII Workers health, safety and welfare**

- 1. Working conditions are suitable for workers and protective clothing is supplied where conditions are hazardous to workers.
- 2. All farm vehicles, equipment and tools, including electrical and mechanical devices, are adequately guarded and maintained and inspected on a regular basis for potential hazards to users.
- 3. Safe manual handling practices are followed to minimize the risk of injury from lifting heavy objects and excessive twisting and reaching movements.
- 4. Where provided by an employer, living quarters are suitable for human habitation and contain basic services and facilities.
- 5. The minimum working age shall comply with the country regulations which is more than 15 years of age.
- 6. New workers are informed about the risks associated with health and safety when starting at the worksite.

7. Workers have appropriate knowledge or are trained to a level appropriate to their area of responsibility in the following areas:
  - a) Operating vehicles, equipment and tools;
  - b) Accident and emergency procedures;
  - c) Safe use of chemicals; and
  - d) Personal hygiene.

**VIII Review of practices**

1. All practices are reviewed at least once each year to ensure that they are done correctly and actions are taken to correct any deficiencies identified or if changes occur to environmental regulations.
2. A record is kept to show that all practices have been reviewed and any corrective actions taken are documented.
3. Actions are taken to resolve complaints related to environmental management, and a record is kept of the complaint and actions taken.

## Annex I

**List of approved and registered carabao mango strains from the  
National Seed Industry Council (NSIC)**

<b>NSIC accession Name and code</b>	<b>Date approved</b>	<b>Contact person/Owner and address</b>
GES 73 PSB 91-Mn	1991	Mango National Crop Research and Development Center San Miguel, Jordan, GUimaras
GES 77 PSB 91-Mn	1991	Mango National Crop Research and Development Center San Miguel, Jordan, GUimaras
GES 84 PSB 91-Mn	1991	Mango National Crop Research and Development Center San Miguel, Jordan, GUimaras
GES 85 PSB 91-Mn	1991	Mango National Crop Research and Development Center San Miguel, Jordan, GUimaras
Carabao Lamao # 1 PSB 91-Mn	1991	Institute of Plant Breeding U.P. Los Banos, Laguna
MMSU Gold NSIC 1997 Mn 01	1997	Mariano Marcos State University Batac, Ilocos Norte
Fresco NSIC 2000 Mn 02	2000	Mrs. Preveda G. Fresco Aguilar, San Lorenzo, Guimaras
Talaban NSIC 2000 Mn 03	2002	Mr. Salvio Talaban Aguilar, San Lorenzo, Guimaras
Sweet Elena NSIC 2002 Mn 04	2002	Mrs. Nida Malabed Sta. Cruz, Zambales
Tanaleon NSIC 2004 Mn 05	2004	Mr. Dominador T. Tanaleon Camansi, Aguilar, San Lorenzo, Guimaras
Guimaras Super (Galila) NSIC 2004 Mn 06	2004	Mr. Cesar Galila Sitio Ugatan, Brgy. Poblacion, Nueva Valencia, Guimaras
Efondo NSIC 2005 Mn 07	2005	Mr. Marciano M. Efondo Milan, Sibunag, Guimaras
JTA Sweet NSIC 2009 Mn 10	2008	Ma. Luz T. Animas Constancia, San Lorenzo, Guimaras
P-1 King Rodolfo NSIC 2009 Mn 11	2008	Mrs. Hilaria Moselina dela Cruz Sabang, Sta.Cruz, Zambales

## ANNEX 2

List of established foundation/Scion groves with certified trees as sources of quality planting materials.

Region/Province	Strain	No. of trees tagged	Contact person/s
1. DA-ISS 1, Dingras, Ilocos Norte	Lamao #1	27	Ms. Wilma Ibea Station Chief Ms. Myrna Enriquez Agric. 2-HVCC Coordinator
2. DA-ISS 2, Batac, Ilocos Norte	Lamao #1 GES 77 GES #84	34 2 17	Ms. Wilhelmina Castañeda Station Chief Ms. Alma Ribac Chief, NSQCS Satellite Reg. 1
3. ILIARC-ADP, San Idefonso, Ilocos Sur	Lamao #1 GES 84	51 15	Dr. Larina G. Zabala OIC, ADP Station Mrs. Visitacion Mendoza Crops Project Leader
4. MMSU, Batac, Ilocos Norte	MMSU Gold	29	Dr. Gliceria Pascua Professor/Project Leader
5. DA-ILIARC DMMMSU, Bacnotan, La Union	GES 85	2	Dr. Consuelo N. Belarmino Asst. Manager for Technical Programs Mr. Nestor Blanco Agriculturist II
6. DA-ISS 3, Sta. Barbara, Pangasinan	Lamao #1 GES 84 GES 77	5 2 3	Mr. Wilfredo Pal-laya Station Chief Dr. Benito Andaya NSQCS Reg. 1 Chief
7. CVIARC, Ilagan, Isabela	Lamao #1	17	Engr. William Contillo Agriculturist II
8. CLIARC Lowland Zone, Paraiso, Tarlac City	GES 77	34	Dr. Irene M. Adion Station Chief
9. Lipa Experiment Station	MMSU Gold GES 84 GES 77	11 10 22	Dr. Gavina Huelgas Chief, LAES
10. BPI--Guimaras NMRDC	GES 85 GES 73 GES 77 GES 84 Lamao # 1 Talaban Fresco	52 42 40 48 12 5 10	Mr. Yondre Yonder OIC, NMRDC



Region/Province	Strain	No. of trees tagged	Contact person/s
11.DA-EVIARC, Abuyog, Leyte	GES 73	7	Dr. Carlos dela Cruz Center Chief
	GES 77	7	
	GES 84	5	
	GES 85	6	
	Galila	5	
	Talaban	5	
	Fresco	5	

### Annex III

#### List of approved organic fertilizers

1. **X-Tekh Liquid Bio-Fertilizer Microorganism**  
*c/o Alexander Acideria*  
*AA Bio-Tech Ent. Co.*  
*2727 Lico Street, Sta. Cruz, Manila*
  
2. **Unigrow Pure Organic Fertilizer**  
*c/o Jaime C. Vistar*  
*President*  
*Agricola Rich Corp.*  
*Diocesan Centrum Bldg., S. Liuch Street, Iligan City*  
*Tel. No. 221 – 7658*
  
3. **Bio-Advantage (1-14-3) Organic Fertilizer**  
*c/o Angelito B. Garcia*  
*A.B. Garcia Agri. Products*  
*Brgy. Anonang, San Fabian, Pangasinan*  
*Tel. Nos. (075) 522 – 0371 / (075) 653 – 0885*
  
4. **Crop Giant 8-8-8 Organic Fertilizer**  
*c/o Francisco S. Dizon III*  
*President*  
*Aldiz Inc.*  
*U-1905 Cityland 10 Tower II, 6817 H.V. dela Costa St., Ayala Avenue,*  
*Makati City*  
*Tel. No. 892 – 2787 / 817 – 9221*
  
5. **Green Harvest Organic Fertilizer**  
*c/o Casiano A. Ibrado III*  
*Amalia Farms Inc.*  
*# 20 Lacson Street, Bacolod City, Negros Occidental*  
*Tel. No. (034) 434 – 9439*
  
6. **Guano**  
*c/o Antonio Tible*  
*Agritech Naturale Enterprises*  
*San Vicente, Calabanga, Camarines Sur*  
*Tel. No. (054) 255 – 6082*
  
7. **Provider's Organic Fertilizer**  
*c/o Tomas D. Gajete*  
*Biocom Enterprises*  
*San Luis, Rosales, Pangasinan*  
*Tel. No. 0920 – 215 1375 / 456 – 5334*

- 8. Bio-N Microbial Fertilizer**  
*c/o Juliet Anarna*  
*BIOTECH (National Institute of Molecular Bo. &Biotech)*  
*University of the Philippines, College Los Baños, Laguna*  
*Tel. No. (049) 536 – 2721*
- 9. Bodega Farm Organic Fertilizer**  
*c/o Steniel C. Young*  
*Bodega Farm Enterprises*  
*Sagua Banwa, Valladolid, Negros Occidental*  
*Tel. No. 433 – 4706 / 461 – 1326*
- 10. Eco-Organic Fertilizer**  
*c/o Dr. Rodolfo Raquino*  
*BREMCAS Development Cooperative*  
*Brgy. Baua, Gonzaga, Cagayan*  
*CP Nos. 0917 – 844 5765 / 0917 – 774 9893*
- 11. Growing Mix Organic Fertilizer**  
*c/o Dojoe R. Santiago*  
*General Manager*  
*Bulacan Gardens Corp.*  
*Lugam, Malolos, Bulacan*  
*Tel. No. (044) 791 – 0412 / 911 – 4021 to 25*
- 12. Farmers Choice Organic Fertilizer**  
*c/o Rafael Pama Jr.*  
*Cleafar Agri-Business, Inc.*  
*Brgy. Inagdangan, Zarraga, Iloilo City*  
*Tel. No. 525 – 4253*
- 13. Bio-Organic Fertilizer**  
*c/o Antonio L. Rivera*  
*VP Marketing*  
*Calstar Technologies, Corp.*  
*Teodor Gener, Poblacion, Norzagaray, Bulacan*  
*Tel. No. 785 – 2122 / 749 – 3561*
- 14. Vitasol Organic Fertilizer**  
*c/o Federico F. Male*  
*Campaign Specialties*  
*3/F CIT Bldg., Paredes corner 915 Quezon Blvd. Sampaloc, Manila*
- 15. Exceed Fortified Organic Fertilizer**  
*c/o Percival F. Ceña*  
*Ceña Enterprises*  
*Brgy. Vega, Bongabon, Nueva Ecija*  
*CP No. 0917 – 566 0550 / 0920 – 901 4832*

- 16. Golden Grains Organic Fertilizer**  
*c/o Reynaldo P. Sadava*  
*Drejfyl Agri Technologies*  
*Block 2, Lot 14, Aplaya Subdivision, Rambutan Avenue, Matina, Davao City*  
*Tel. No. 298 – 2228*
- 17. Real Guano Fertilizer**  
*c/o Ernesto A. Real*  
*E. A. Real Organic Fertilizer*  
*Km. 20, Los Amigos, Tugbok, Davao City*  
*Tel. No. 0920 – 444 9988*
- 18. Extreme 3000 Organic Fertilizer**  
*c/o Lito M. Arenas*  
*Extreme Enterprises*  
*Brgy. Matulong, Manaoag, Pangasinan*  
*CP No. 0917 – 508 1881*
- 19. Everlasting Bio-Organic Fertilizer**  
*c/o Mrs. Virginia Agabao*  
*El Oro Multi-Purpose Coop.*  
*San Fermin, Cauayan, Isabela*  
*CP No. 0919 – 206 0636*
- 20. Bioearth Rooting Mix Organic Fertilizer**  
*c/o Roberto C. Espino*  
*Manager, Agri-Division*  
*Fabcon Philippines, Inc.*  
*12/F Jollibee Center Building, San Miguel Avenue Pasig City*
- 21. First Farmers Organic Fertilizer**  
*c/o Rafael T. Lizares, Jr.*  
*First Farmers Food Corporation*  
*Dos Hermanas, Talisay City, Negros Occidental*  
*Tel. No. 435 – 4019*
- 22. Orgo Plus Organic Fertilizer**  
*c/o Randy R. Lamboson*  
*Fertex Marketing*  
*Piatos, Bunawan, Davao City*  
*CP No. 0906 – 907 1103*
- 23. Alpha SP Fortified Organic Fertilizer**  
*c/o Rosalina S. Quintos Tan*  
*Galactic Resources Dev't Corp.*  
*Brgy. Masaya, Rosario, Batangas*  
*Tel. No. 363 – 6816; Telefax 415 – 3636; CP No. 0918 – 936 1181*

- 24. Green Bio Compound Microbial Inoculant**  
*c/o Yoon Chow Lai (John)*  
*Galaxy Ford International Holding Co. Ltd.*  
*931-D Kundiman Street, Sampaloc, Manila*  
*CP No. 0919 – 262 2577*
- 25. Golden Egg Organic Fertilizer**  
*c/o Marie Tess C. Lee*  
*Golden Egg Agricultural Supply*  
*Km. 19, Aguinaldo Hi-way, Bacoor, Cavite*  
*Tel. No. (046) 417 – 2498 / 502 – 2468*
- 26. Microfix<sup>TM</sup> Biofertilizer**  
*c/o Marie Teresa Ver Shih*  
*Green Gold Agrivet Marketing*  
*# 1 Canlas Apartments, Neptune St., San Fernando Subdivision, Sto. Niño,*  
*San Fernando, Pampanga*
- 27. Granary Organic Fertilizer**  
*c/o Shakespeare T. Ang*  
*Managing Director*  
*Gold Orchard Distributor, Inc.*  
*Suite 1506, Future Point Plaza 1, 112 Panay Avenue, South Triangle,*  
*1103 Quezon City*  
*Tel. No. (02) 414 – 4895*
- 28. Green Earth Organic Fertilizer**  
*c/o Mr. Nonito dela Cruz*  
*Green Earth Agriventures*  
*La Filipina, Tagum City, Davao*  
*Tel. No. (082) 218 – 2429*
- 29. Bio-Synergy Organic Fertilizer**  
*c/o Alfredo V. Alili*  
*Isabela Biotech Enterprises*  
*# 2 E.M. Puzon Subdivision, San Fabian, Echaque, Isabela*  
*Tel. Nos. (078) 672 – 2366; CP No. 0918 – 274 4071*
- 30. NBEM-21 Organic Fertilizer**  
*c/o Cristina O. Kamekawa*  
*J.P. BYM Food Mix Manufacturing & Export*  
*# 11 Baesa Road, Baesa, Quezon City*  
*CP No. 0916 – 599 6829; Tel. No. 454 – 7652*
- 31. Greenfriend Organic Fertilizer**  
*c/o Geraldine B. Denna*  
*Kapatagan Multi Purpose Cooperative, Inc.*  
*Payoga Organic Demo Farm, Guibang, Gamu, Isabela*  
*CP No. 0919 – 582 3998*

- 32. Guano Fertilizer**  
*c/o Leonila G. Abanes / Marilyn Abanes*  
*L. Abanes Guano Fertilizer Dealer*  
*Silangang Catbalogan, Western Samar*  
*Tel. No. (045) 321 – 0356; CP No. 0920 – 253 2227*
- 33. Cocorich Organic Fertilizer**  
*c/o Claro Q. Torres, Ph. D.*  
*Legaspi Oil Coco Fiber Corporation*  
*Mulanay, Quezon*  
*Tel. No. 810 – 7392 / 892 – 7961 to 72*
- 34. Happy Earth Organic Fertilizer**  
*c/o Rolando L. Sianghio*  
*Lacto Asia Pacific Corporation*  
*4000 Champaca Extension Road, UPS 4, Brgy. Marcelo Green Village,*  
*Parañaque City*  
*Tel. No. 776 – 1511 / 824 – 7975*
- 35. Pureganic Organic Fertilizer**  
*c/o Rasmiah M. Malixi*  
*Laguna Organic Enterprises*  
*Crisols Apartment, Mt. Pulog St., Umali Subdivision, Los Baños, Laguna*  
*Tel. No. (049) 559 -0800*
- 36. Magnecrop Organic Fertilizer**  
*c/o Manding Arcalas*  
*Madarca Trading*  
*U A2 168 Apo St., Mesa Height, Quezon City*  
*Tel. No. 687 – 1357 / 937 – 4618*
- 37. MIT's Lacto Plus Organic Fertilizer**  
*c/o Dr. Hector S. Caluya*  
*Madela Institute of Technology*  
*Dipintin, Maddela, Quirino*
- 38. Manila Organic Fertilizer**  
*c/o Andrea L. Gandioco*  
*Manila Fertilizer Inc.*  
*Rm. 801, West Trade Center, 123 West Avenue, Quezon City*  
*Tel. No. 928 – 7412 / 920 – 5876*
- 39. MWSI Septage Organic Based Foliar Fertilizer**  
*c/o Francisco A. Arellano*  
*Maynilad Waters Services Inc.*  
*MWSS Compound, Katipunon Road*

- 40. Greenland Organic Fertilizer**  
*c/o Rolando R. Lagaya*  
*Nadines Marketing*  
*Macalintal Avenue, Brgy. Taysan, San Jose, Batangas*  
*Tel. No. (043) 726 – 2281 / 726 – 3602*
- 41. Bio Advantage Organic Fertilizer**  
*c/o Noe E. Penera*  
*Narra Multi Purpose Cooperative*  
*Casantiagoan, San Manuel, Pangasinan*  
*Tel. No. (075) 614 – 3281*
- 42. Nofarco Bio-Organic Fertilizer**  
*c/o Engr. Nestor T. Bautista*  
*Norphil Farmers MPCl*  
*Sampaguita, Solana, Nueva Viscaya*  
*CP No. 0915 – 507 8905*
- 43. Nova Pure (PCM) Processed Chicken Manure**  
*c/o Emma F. Gonzales*  
*Operations Manager*  
*Novatech Agri Food Industries*  
*Rm. 503 Anita Bldg., # 1399 Quezon Avenue corner Timog Avenue,*  
*Quezon City*  
*Tel. No. 371 – 9581 / 371 – 6382*
- 44. Siglat Organic Fertilizer**  
*c/o Norvy A. Abyadeng*  
*NS Northern Organic Fertilizer & Farm Supply*  
*Brgy. Coliling, Rosales, Pangasinan*
- 45. Yasai PCM Organic Fertilizer**  
*c/o Cenas Aldog*  
*Northline Entertainment*  
*Km. 50 Cruz, La Trinidad, Benguet*  
*Tel. No. (074) 422 – 3713*
- 46. Ormaco Zoom Organic**  
*c/o Graciano Balbon*  
*Orient Marketing Cooperative (ORMACO)*  
*Jojo Magbanua St., Bantayan Dumaguete City, Negros Oriental*
- 47. Pecuaría Bio-Organic Fertilizer**  
*c/o Miller S. Bicaldo Pecuaría*  
*Development Cooperative, Inc.*  
*Lanipga, Bula, Camarines Sur*

- 48. Nutri Smart Organic Fertilizer**  
*c/o Rosalina B. Rondon*  
*Phil. Agrow, Inc.*  
*Philgrow Inc., 4F HMS Center, 596-510 JP Rizal Street, Makati City*
- 49. Allgrow Humus Maker Harvest King Organic 8-8-8 Fertilizer Allgrow Fertihumus Organic Fertilizer**  
*c/o Nestor P. Caoili*  
*Vice-President & General Manager*  
*Pine Valley Corporation*  
*JB-012 Km. 4, La Trinidad, Benguet*  
*Tel. No. 63-744-222-008; Fax No. 63-744-222-756*
- 50. Texas Bio-organic Fertilizer**  
*c/o Engr. Milwanie J. Mones*  
*Polomolok Balik Buhay Lupa MCI*  
*Purok Malinawon, Brgy. Poblacion Polomolok, South Cotabato*  
*Tel. No. 0920 – 595 4204*
- 51. Rancap Organica**  
*c/o Olivia L. Padilla*  
*Rancap Manufacturing Corp.*  
*Brgy. Jolongajog, Pontevedra, Capiz*  
*Tel. No. (Makati) 810 – 6481 to 83 CP No. 0919 – 348 1406*
- 52. Probio Gold Organic Fertilizer**  
*c/o Raymund Baltazar*  
*Randan Agrisystem Inc.*  
*Barangay Cabalero, Palayan City, Nueva Ecija*
- 53. Maxicrop Organic Fertilizer**  
*c/o Nicole Aberasturi*  
*RC Narc Corporation*  
*163 Clementino Chaves St., Macasandin, Cagayan de Oro City*  
*Misamis Oriental*
- 54. Yama BYM Organic Fertilizer Bio-N Microbial Inoculant**  
*c/o Encarnacion P. Castillo*  
*Romark Enterprises*  
*Km. 14, National Road, Cutcot, Pulilan, Bulacan*  
*Tel. No. 922 – 7965 / 434 – 6205; (044) 676 – 3730 / 215 – 6292*  
*CP No. 0917 – 849 7316*
- 55. D & T Compost**  
*c/o Rodolfo T. Torreda, Jr.*  
*RS Agro Industrial Corp.*  
*Brgy. Igang, Pototan, Iloilo*  
*Tel. No. (033) 329 – 6406*



- 56. Sagana 100 Fortified Bio-Organic Fertilizer**  
*c/o Atty. Roberto S. Salido*  
*Sagana 100 Phils. Inc.*  
*Brgy. Inarawan, Marcos Highway, Antipolo City*  
*Tel. No. 922 – 5683 / 928 – 9791*
- 57. Phela Bio-Organic Fertilizer**  
*c/o Patricio Amadeo*  
*Southern Matumtum Highland Dev't Inc.*  
*(Formerly PHELA RESOURCES CORP.)*  
*MCDC Compound, San Isidro, General Santos City*
- 58. Sagrex Duofos Guano Powder**  
*c/o Ferdinan Y. Maranon*  
*President*  
*Sagrex Corporation*  
*Dasma Technopark, Governor's Drive, Paliparan 1, Dasmariñas, Cavite*  
*Tel. No. (02) 520 – 8036; (046) 852 – 2706*
- 59. Sander's Organic Fertilizer**  
*c/o Crisanto R. dela Cruz*  
*Sander's Organic Mfg. Corp.*  
*# 69 Bagbaguin, Sta. Maria, Bulacan*  
*Tel. No. (044) 641 – 2497*
- 60. Providence Organic All Fertilizer**  
*c/o Arnold G. Cortez, Sr.*  
*Sharing Agro Revival*  
*Pattao, Bugeuy, Cagayan*  
*Tel. No. (078) 854 – 4905; CP No. 0916 – 334 7757*
- Planergy Organic Fertilizer Model SL-1000**  
*c/o Cathy Galura*  
*SL Agritech Corp.*  
*2302 Sterling Place, Pasong Tamo Extension, Makati City*  
*Tel. No. 813 – 7828 loc. 818, 817*
- 61. Nitro-Fix Nitrogen Fixing Inoculant Fertilizer**  
*c/o Luis A. Guillen*  
*Summa Biotechnologies Corp.*  
*G/F Right Wing, Narra Hotel, Butuan City*
- 62. Greenbase Fortified Organic Fertilizer**  
*c/o Alex J. Amor, Jr.*  
*Siquijor Island Phosphate*  
*West Boloc-Boloc, Sibulan, Negros Oriental*  
*Tel. No. (035) 225 – 2732*

**63. V-4 Organic Fertilizer**





*c/o Steven C. Young  
V-4 Swine & Poultry Farms, Inc.  
Sagua Banwa, Valladolid, Negros Occidental  
Tel. No. 435 – 1525 / 434 – 8871 / 434 – 6918*

**64. Vimaca Bio-Organic Fertilizer**





*c/o Jose Ledesma IV  
VMC Farmers Corp., Inc.  
2/F Bank of Commerce Bldg., Corner 12<sup>th</sup> Lacson Street, Bacolod City  
Tel. No. 709 – 9077 / 709 – 8703; 717 – 0721*

Annex IV





**Crop phenology**  
**Stages of panicle development and fruit maturation**

	<p>Bud break (6-8 DAFI)</p>
	<p>Bud emergence (9-12 DAFI)</p>
	<p>Panicle elongation (13-22 DAFI)</p>
	<p>Pre-anthesis (23-25 DAFI)</p>

**Annex IV (continued)**  
**Crop phenology**  
**Stages of panicle development and fruit maturation**

	<p align="center">Full-bloom (26-30 DAFI)</p>
	<p align="center">Fruit set (mungbean size) 31-35 DAFI</p>
	<p align="center">Fruit enlargement (corn size) 36-42 DAFI</p>
	<p align="center">Fruit enlargement (marble size) 43-50 DAFI</p>

**Annex IV (continued)**  
**Crop phenology**  
**Stages of panicle development and fruit maturation**

		<p>Fruit enlargement (chicken-egg size) 51-60 DAFI</p>
		<p>Fruit enlargement 61-90 DAFI</p>
		<p>Start of maturation 91-109 DAFI</p>
		<p>Full maturity 110-120 DAFI</p>



## Annex V

## Pest identity, damage and management

Part of the Mango Plant	Pests	Disease
Flowers	Mango leafhopper Mango tip/twig borer Mealy bugs Scale insect Mango thrips	Anthracnose Sooty mold
Fruits	Fruits flies Mango seedborer Pulp weevil Mango thrips Mealy bugs Scale insect Capsid bug Cecid fly Ants	Anthracnose Scab Sooty mold Diplodia stem-end rot


## Annex V (continued)

## Pest identity, damage and management

Insects	Damage	Management
<p><b>Ants</b> Ant infestations in mango trees are encouraged by the presence of scale insects and mealy bugs that produce honeydews, which are ants' excellent food source.</p> 	<p>Ants do not really create harm or damage the tree or fruit, but they can make harvesting very cumbersome because of the painful bites they can inflict on to the farmers/harvesters.</p>	<ul style="list-style-type: none"> <li>- Prune the mango tree and remove all unnecessary branches that provide favorable environment for ants.</li> <li>- Control mealy bugs, scale insects and leafhoppers.</li> <li>- Apply insecticides during heavy infestation, particularly directed on the nests.</li> </ul>
<p><b>Capsid bug</b> The adult insect looks like a small rice bug. Its pair of antennae is twice as long as its body. The female adult capsid bug has a black body with an orange thorax. Its eggs are white while young nymphs are red or orange.</p> <p>The bug stays in wild vegetation and is active in the evening. It feeds on developing fruits, up to the size of a chicken egg.</p> 	<p>The bug excretes toxic materials that produce dry, brown irregularly-shaped corky spots on the fruit's skin. These spots are locally known as "kurikong," "saksak walis", "armalite", or "nora-nora" depending on the area or region.</p>	<ul style="list-style-type: none"> <li>- Bag the fruits at 55 to 60 days after flower induction.</li> <li>- Remove weeds, underbrush shrubs and small trees under the mango canopy as well as infested fruits.</li> <li>- Remove alternate hosts of adult bugs such as cashew, guava and cacao from the orchard.</li> <li>- If infestation is heavy, apply registered insecticides, preferably at night.</li> </ul> <p><i>Prevention:</i> Prune trees after harvesting or before flushing.</p>

## Annex V (continued)


## Pest identity, damage and management

Insects	Damage	Management
<p><b><i>Fruit Fly</i></b> The adult fruit fly is almost similar in size to the house fly. It has a light brown body, bright yellow spots on the shoulder and thorax, and has transparent wings.</p> <p>The female fruit fly punctures the peel of a mature fruit and lays eggs on it. Its larvae grow and feed on mango fruits.</p> 	<p>punctures on the fruit are not readily recognizable. However, after four to five days, soft brownish spots appear, liquid oozes from the spots and the underlying tissue rots. The continuous feeding of the larva and the secondary microbial activity further destroy the fruit making it unsuitable for consumption.</p>	<ul style="list-style-type: none"> <li>- Collect the infested fruits and bury deep into the soil to prevent the insect from completing its life cycle.</li> <li>- Bag the fruits with appropriate bagging materials such as old newspapers at 55 to 65 days after flower induction or when the fruits are about the size of chicken-egg.</li> <li>- Harvest fruits at mature green stage since fruit flies are attracted to them as soon as their surfaces become yellow.</li> <li>- Do not intercrop with the following fruits trees: guava, papaya, jackfruit, sineguelas and santol since they are also preferred hosts of the fruit flies.</li> </ul>




## Annex V (continued)

## Pest identity, damage and management

Insects	Damage	Management
<p><b><i>Mango cecid fly</i></b> Cecid fly is a very small and delicate fly with long legs and antennae, and hairy transparent wings. Its larvae are tiny bright yellow maggots.</p> <p>The adult cecid fly stays on wild vegetation while the larva stays in young mango leaves or fruits.</p> 	<p>The developing larvae cause gall formation in the leaves and round sunken spots on the fruits.</p>	<p><i>Management:</i></p> <ul style="list-style-type: none"> <li>- Prune crowded branches and infested leaves, particularly flushes.</li> <li>- Remove weeds, underbrush shrubs and small trees under the mango canopy.</li> <li>- Collect and dispose the infested fruits properly.</li> </ul> <p><i>Prevention:</i></p> <ul style="list-style-type: none"> <li>- Bag fruits at 40 days after flower induction or at marble size or spray registered insecticides up to 55 days after flower induction.</li> <li>- Bag fruits one to three days after insecticide application.</li> </ul>


## Annex V (continued)

## Pest identity, damage and management

Insects	Damage	Management
<p data-bbox="188 376 561 667"><b>Mango Leafhopper</b> Adult mango leafhoppers are wedge-shaped insects which are greyish-green or brown. The young leafhoppers or nymphs are very small, wingless and yellowish.</p> <p data-bbox="188 707 561 846">They can be found hiding underneath the leaves, main stalk of the panicle and in emerging flowers.</p> 	<p data-bbox="587 376 959 846">The nymph and adult mango leafhoppers pierce and suck plant sap resulting in the withering and falling of individual flowers. High hopper infestations results to production of sticky fluid “honey dew” which serves as medium for the growth of sooty mold beneath the leaves, flower buds and panicles.</p> <p data-bbox="587 887 959 994">Under severe leafhopper infestation, the entire canopy will turn black.</p>	<ul style="list-style-type: none"> <li data-bbox="984 376 1356 555">- Prune all dead branches after harvest to improve light penetration and air circulation.</li> <li data-bbox="984 560 1356 734">- Do light trapping before flower induction to reduce initial leafhopper population in the field.</li> <li data-bbox="984 739 1356 958">- Induce early flowering. This can minimize heavy leafhopper infestations that usually occur during the summer months.</li> <li data-bbox="984 963 1356 1137">- Avoid excessive application of fungicides to conserve beneficial fungi that attack the leafhopper.</li> <li data-bbox="984 1142 1356 1507">- Apply insecticides only when there are at least three leafhoppers per panicle. Check the presence of mango hopper seven days after flower induction or once flower buds are formed or have elongated.</li> </ul>



## Annex V (continued)

## Pest identity, damage and management

Insects	Damage	Management
<p><b><i>Mango pulp weevil</i></b>            The mango pulp weevil is a hard-bodied weevil, usually 6 mm long and brownish black in color. Due to its color and habit, it cannot easily be seen in the tree. Its larvae, which feed on the mango flesh, develop inside the mango fruit.</p> <p>This insect is found only in Southern Palawan but because of its destructive nature, it has placed the island under quarantine. Mangoes from this area are not allowed to be transported or brought out of the province.</p> 	<p>The damage created by the weevil is not visible externally. But inside the fruit, tunnels and discolored pulp are formed due to larval feeding. An adult weevil does not leave the fruit until it falls to the ground and rots.</p>	<ul style="list-style-type: none"> <li>- Prune the tree, preferably open-center pruning, to allow the sunlight to penetrate the tree canopy. Sunlight kills weevils.</li> <li>- Keep the orchard clean. Remove all weeds, twigs, fallen leaves and other debris under the tree canopy.</li> <li>- Dispose of infected fruits properly by burying the fruits two feet below the ground.</li> <li>- Bag the fruits at 55 to 60 DAFI.</li> </ul>


## Annex V (continued)

## Pest identity, damage and management

Insects	Damage	Management
<p><b>Mango seed borer</b> The adult mango seed borer moth is light brown and 16 mm long. The larva is white with red inter-segmental bands.</p> 	<p>The damage starts when the larva enters the fruit through the apex or the narrow tip area of the fruit. The growing larva feeds on the seed and flesh. Later, the damaged area collapses and the apex bursts. When the seed is totally consumed, the fruit will fall to the ground.</p> <p>A single larva can consume the entire seed in a short period of time.</p>	<ul style="list-style-type: none"> <li>- Remove infested fruits from the tree to prevent movement of larva from one fruit to another and to minimize damage to other fruits.</li> <li>- Dispose of infected fruits properly to prevent the insect from completing its life cycle. This can be done by burying the fruits two feet below the ground.</li> <li>- Bag the fruits at 55 to 65 DAFI.</li> <li>- Monitor infestation and when necessary, apply insecticide at 50-55 days after flower induction.</li> </ul>
<p><b>Mango thrips</b> Mango thrips are minute, slender-bodied insects and about 4 mm long. When fully-developed, the insects have four long, narrow fringed wings.</p> <p>Thrips are sensitive to light.</p> 	<p>Adults and nymphs attack the flowers. They suck the plant sap, which causes the flowers to wither and fall off. They can extend damage to the fruits resulting to scabby appearance locally called "chico-chico".</p>	<ul style="list-style-type: none"> <li>- Prune or cut off excess branches to improve aeration and to allow more light to penetrate the canopy.</li> <li>- Spray registered insecticides as a fine mist to protect the upper and lower surfaces of the leaves.</li> </ul>



Annex V (continued)

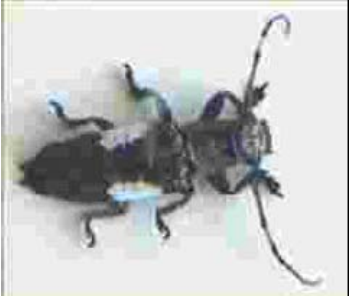
Pest identity, damage and management

Insects	Damage	Management
<p><b>Mealy bugs</b>                      Mealy bugs are small (2 mm long), oval-shaped, soft-bodied insects with white cottony filaments on their body. Male adult mealy bugs have two wings while females are wingless. They are usually found on flushes, flowers and fruits.</p> <p>Mealy bugs have symbiotic relationship with red ants. They excrete sticky fluid called "honeydew", which serves as food for red ants. The ants protect and transport mealy bugs to the different parts of the tree.</p> 	<p>Mealy bugs suck vital plant sap and affects leaves, flowers and fruits. Affected parts turn yellow, dry-up and eventually, fall-off.</p> <p>The honeydew produced by the mealy bugs promotes growth of sooty molds on leaves, which eventually affects the photosynthetic activity.</p>	<ul style="list-style-type: none"> <li>- Prune heavily infested plant parts.</li> <li>- Spray registered insecticide immediately before bagging.</li> </ul>

## Annex V (continued)


## Pest identity, damage and management

Insects	Damage	Management
<p><b>Mango tip borer</b> The adult mango tip borer is a grayish black moth, usually about 8 mm long. Its larva can grow to as long as 10 mm and light-brown to purple in color. It is considered as a serious pest of flowers and young shoots.</p> 	<p>Mango tip borer destroys the flowers from bud emergence to elongation. Its larva bores into the tip of the shoots and developing flowers and feeds on the inner tissues. The affected shoots wilt and terminal parts die while the affected panicles split-open and gradually shed off the flowers.</p>	<ul style="list-style-type: none"> <li>- Prune and burn the infested parts to prevent the insects from multiplying and spreading.</li> <li>- Spray registered insecticides recommended for tip borer control.</li> </ul>
<p><b>Scale insect</b> Scale insects are small (1 mm long), stationary, convex and scale-like organisms.</p> 	<p>High population of scale insects causes the canopy to turn black due to the growth of sooty mold. Since the leaves are covered with sooty mold, photosynthetic or food production activity is reduced considerably.</p> <p>Punctures created by insects on the fruit result in whitish spots which lower the fruit's market value.</p>	<ul style="list-style-type: none"> <li>- Look for scale insects on leaves, flowers and fruits. Check if infestation is widespread or occurring only in small patches. If infestation is widespread, prune heavily-affected parts before spraying registered insecticide. If it occurs in patches, remove affected parts mechanically.</li> <li>- Check if there are ipil-ipil or kakawate trees nearby. These are alternate hosts of scale insects and serve as a source of infestation.</li> </ul>

		<p>-Destroy the red ants infesting the mango tree because these facilitate the spread of scales from one tree to another.</p>
<p><b>Twig cutter</b>          The larva of twig cutter grows to as long as 18 mm, is colored white and legless. It can be found inside the twigs where it feeds on woody tissue. It pupates inside the twig and will get out only when it has become a fully-grown beetle. The adult twig cutter is a gray-spotted long-horned beetle and around 20 mm long.</p> <p>This insect is very destructive during the dry season, particularly in many growing areas of Central Luzon.</p> 	<p>The twig cutter cuts or girdles the twig before it lays eggs. The infested twig breaks off easily at the point of incision or die. A twig cutter-infested tree is characterized by the presence of dead twigs and leaves on its canopy.</p>	<ul style="list-style-type: none"> <li>- Prune and burn infested twigs to prevent the development and spread of insects.</li> <li>- Apply insecticide during flushing stage, the time when the adults lay eggs on the twigs.</li> </ul>

## Annex V (continued)


## Pest identity, damage and management

Insects	Damage	Management
<p><b><i>Anthracnose</i></b> Anthracnose is a major post harvest problem of mango fruits and is the most serious fungal disease of mangoes in the Philippines.</p> 	<p>Anthracnose causes irregular brown spots on young leaves while mature leaves get distorted with “shotholes” in various shapes and sizes. It also blackens and withers the flowers and produces “blossom blight” while causing brown to black sunken spots on the fruits.</p> <p>Other damage caused by anthracnose:</p> <ul style="list-style-type: none"> <li>- reduced tree vigor</li> <li>- unproductive terminal branches</li> <li>- withering of flowers</li> <li>- failure to set and retain fruits</li> <li>- rotting of fruits</li> <li>- total crop failure</li> </ul>	<p><u>Field Management</u></p> <ul style="list-style-type: none"> <li>- Maintain good light penetration and air circulation in each mango tree.</li> <li>- Collect and burn trash to reduce sources of disease.</li> <li>- Bag fruits using appropriate bagging materials to reduce further field infestation.</li> <li>- Fertilize and irrigate trees to improve tree vigor.</li> <li>- When flushing occurs on rainy days, protect emerging flushes from leaf spots by spraying registered contact fungicides. DO NOT use systemic fungicides.</li> <li>- Apply protectants/systemic fungicides to protect inflorescence against blossom blight and fruit rot infection on developing fruits.</li> </ul> <p><u>Post Harvest Management</u> Subject newly harvested fruits in hot water treatment</p>




Annex V (continued)

Pest identity, damage and management

Insects	Damage	Management
<p><b>Scab</b>                      Scab is a fungal disease which primarily infects young developing fruits. It is prominently seen in panicles and young developing fruits, particularly on the pedicel.</p> <p>The surface of infected fruit has grayish brown spots with dark irregular margin. As the spots enlarge, the surface develops cracks and fissured corky tissues. Heavily infected fruits look like common scab-infected calamansi fruits.</p> <p>Heavier infestations occur during the rainy season.</p> 	<p>Infected fruits are misshapened with unsightly looking surface, thus are downgraded and have lower market value.</p>	<p>Follow the protection management used against anthracnose.</p> <ul style="list-style-type: none"> <li>- Use the recommended cultural practice to maintain vigorous and productive trees, which are less prone to diseases.</li> <li>- Maintain good light penetration and air circulation in each mango tree through regular sanitation and pruning. Prune after harvest to increase ventilation and reduce humidity inside the canopy.</li> <li>- Collect and burn trash to reduce sources of diseases.</li> <li>- Bag fruits using appropriate bagging materials to reduce further field infection.</li> <li>- Spray registered fungicides in scab prone areas during the young fruit stage or around 35 to 50 days after flower induction to control the disease.</li> </ul>


## Annex V (continued)

## Pest identity, damage and management

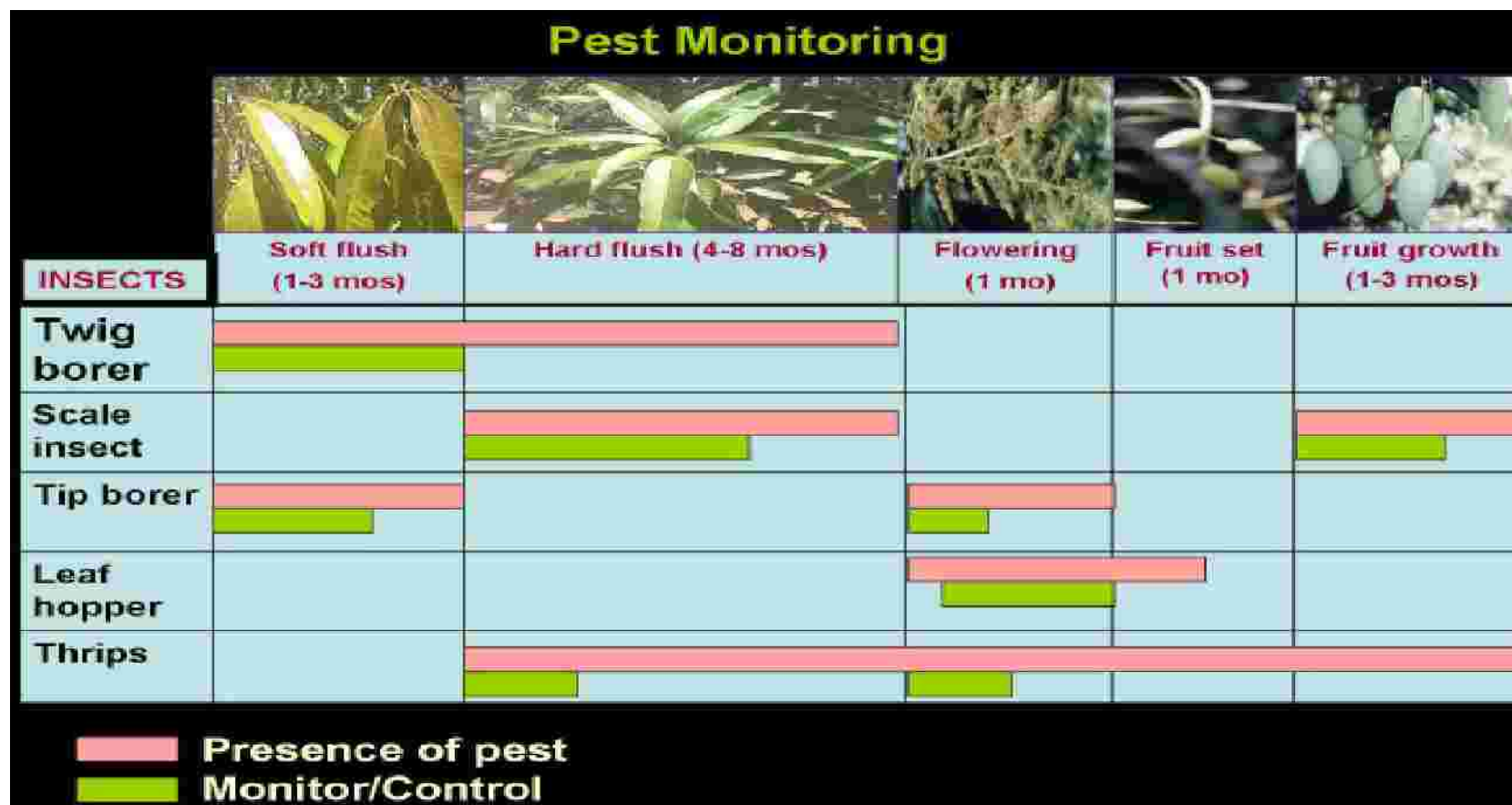
Insects	Damage	Management
<p><b>Sooty mold</b> Sooty mold is a fungal disease that grows and obtains nourishment from the honeydew excreted by insects such as leafhoppers, scales and mealy bugs. The disease develops on the leaf surface and on fruit as black velvety covering.</p> 	<p>The sooty mold on leaves interferes with the photosynthetic activities of the plant. It reduces the tree's vigor and fruit bearing capability and downgrades the fruit's market value.</p>	<ul style="list-style-type: none"> <li>- Eradicate or manage the population of the honeydew-excreting insects.</li> <li>- Bag clean fruits with appropriate bagging materials.</li> <li>- Practice pruning.</li> </ul>

## Annex V (continued)

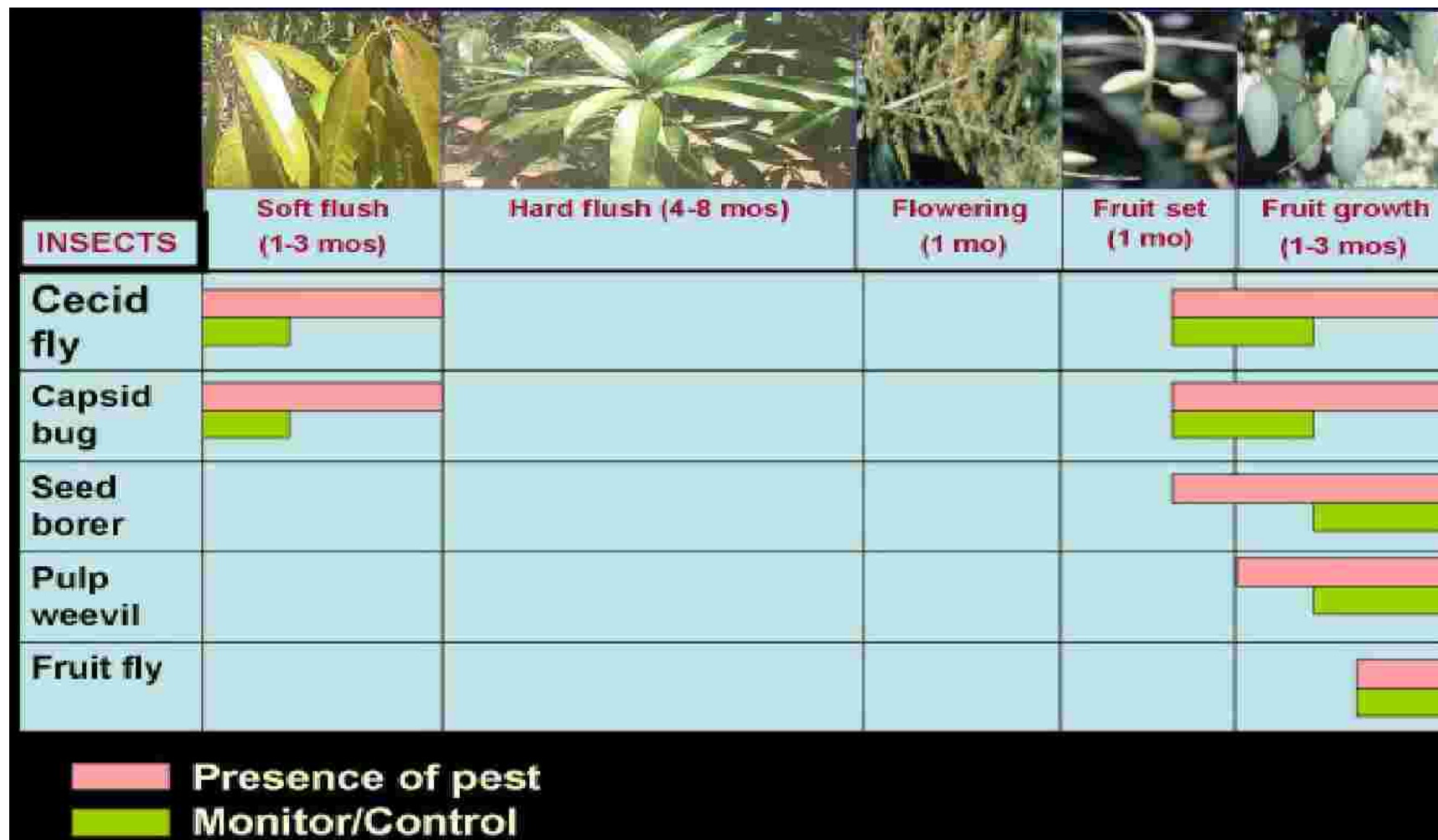
## Pest identity, damage and management

Insects	Damage	Management
<p><b><i>Diplodia/ stem -end rot</i></b>  Diplodia stem-end rot is a fungal disease caused by complex fungal organisms. It is characterized by dark lesions developing at the pedicel end of the mango fruits after they are harvested. Under warm and moist conditions, the infected area extends towards the end of the fruit. The fruit turns from dark-brown to purplish black and the tissues become watery and produce unpleasant odor.</p> <p>Diplodia stem-end rot produces soft rot unlike anthracnose which produces hard rot.</p> <p>This disease also infects inflorescence, young developing fruits and terminal branches.</p> 	<p>Stem-end rot causes post-harvest losses due to rotting of fruits. It also reduces tree vigor because of severe drying of twigs and defoliation.</p>	<ul style="list-style-type: none"> <li>- Remove and burn primary sources of the disease such as dead twigs, barks and other trashes.</li> <li>- Harvest the fruits with about 1 cm to 2 cm of the stalk attached. It was observed that there is a high incidence of stem-end rot on fruits without stalk.</li> <li>- Follow the disease management interventions developed for anthracnose. They are known to substantially reduce incidence of stem-end rot.</li> </ul>

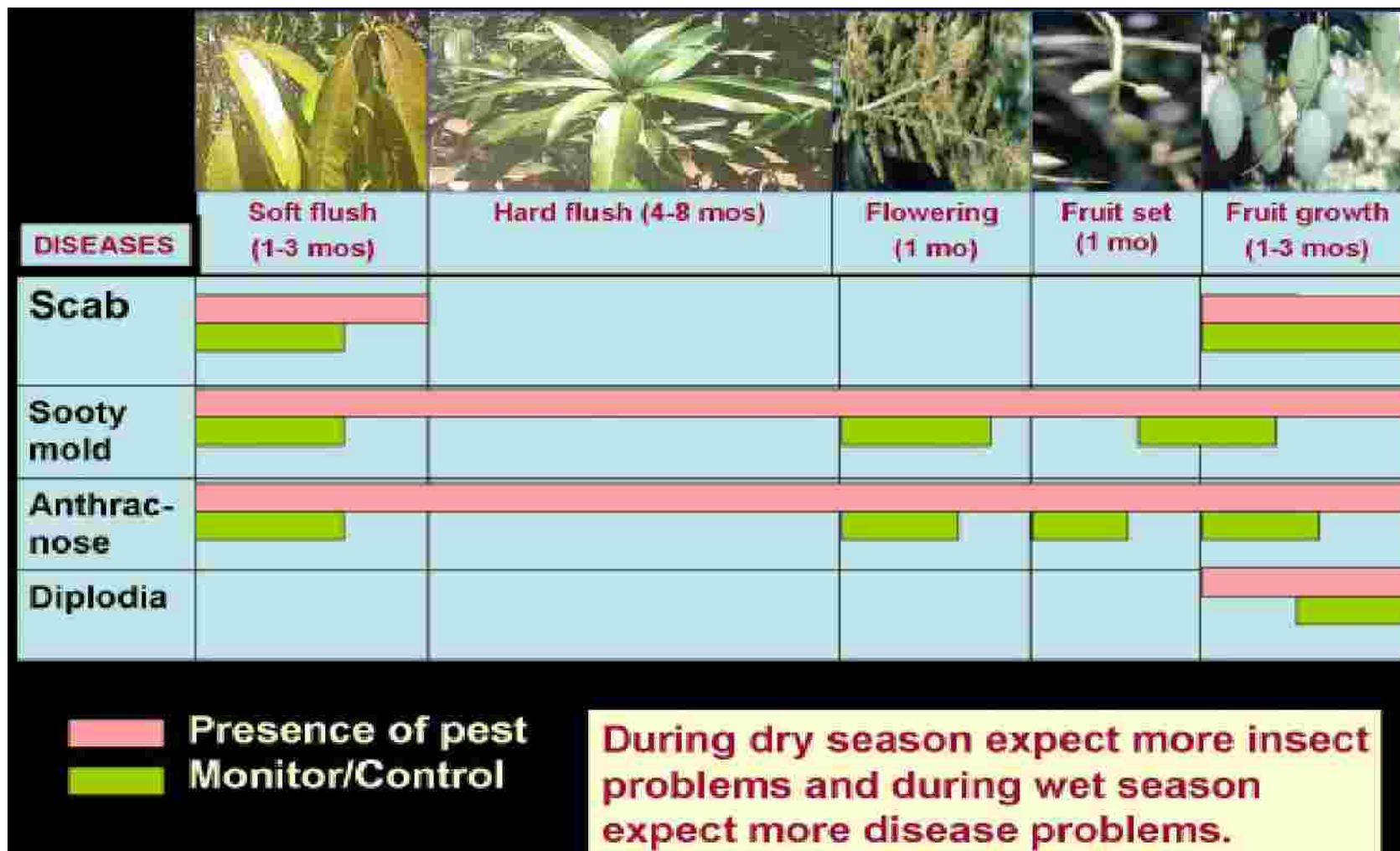
Annex VI  
Pest and weather monitoring



Annex VI (continued)  
Pest and weather monitoring



Annex VI (continued)  
Pest and weather monitoring



## References

**PNS/BAFPS 45:2009**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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## Technical Working Group for the Establishment of Good Agricultural Practices (GAP) Manual for Mango

Department of Agriculture  
Special Order No. 107  
Series of 2008

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