Coconut Implementation Guide

for smallholders in the Philippines

Rainforest Alliance

Based on the Sustainable Agriculture Standard
of the Sustainable Agriculture Network (SAN)

RAINFOREST ALLIANCE CERTIFIED

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*We would like to give special thanks to the farmers who have allowed us to take pictures and use them in this Guide.

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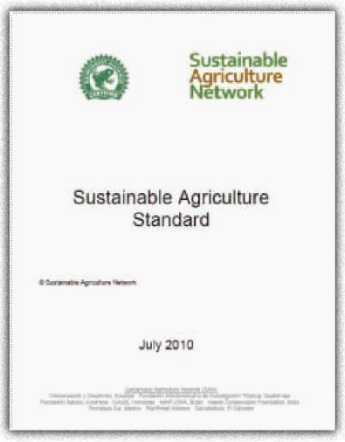
Introduction

towards sustainable agriculture

Coconut is one of the most important export crops of the Philippines, and is a source of income for countless smallholder farmers. These farmers depend on the coconut for their livelihood. However, if unsustainable practices are allowed to continue, the soil will be exhausted, the environment will be contaminated, the health of the farmers will be affected, and the harvests will drop. Coconut production cannot be sustained in the long run in such a manner.

In order to ensure that the coconut production continues long into the future, all stakeholders must work together to promote sustainable farming practices and to eliminate unsustainable practices at the smallholder level. It is important to ensure that each producer takes the responsibility to produce coconut in a sustainable way.



How can you, as a smallholder, produce coconut in a sustainable way? This “Coconut Implementation Guide” shows simple and practical implementation techniques of sustainable agriculture in smallholder coconut farms in the Philippines.

The content of this guide is based on the “Sustainable Agriculture Standard” published in July 2010 by the Sustainable Agriculture Network. This standard covers all the important areas of sustainability. This is the basic document that defines what producers need to comply with, if they opt for the Rainforest Alliance certification.

Conditions for certification

In order to achieve Rainforest Alliance Certification, following are the minimum conditions.

- Comply with 80% of all the criteria. *(There are 99 criteria in total.)*
- Comply with 50% of each principle. *(There are 10 principles.)*
- Comply with all the critical criteria. *(There are 16 critical criteria.)*

In the case of smallholders, many criteria are not applicable. In this guide, we focus on the criteria that are applicable and important for smallholder farms. Therefore, in the case of big plantations, please look at the original standard to understand the requirements.

Content of this guide

This guide consists of the following 10 chapters, each of which corresponds to a principle of the standard

Chapter 1

Integrated Crop Management

Integrated crop management means looking at all available pest control methods and coming up with an economically viable and sustainable combination. Use of pesticide is not the only way to control pests and diseases. When coconut trees are well-taken care of and are strong and healthy, they cannot be easily attacked by pests and diseases. When they are still affected, there are ways to control them without using chemicals. An important key in controlling pest is early detection through constant monitoring.

Monitoring is observing for signs and symptoms of pest and disease infestation in the crops. It also indicates whether a treatment is necessary at that stage or not. After treatment we need to determine if it gave the desired result or if it needs to be replicated. In this section, you will learn about how to prevent and manage pests and diseases in a sustainable way.

Identifying nutritional deficiencies:

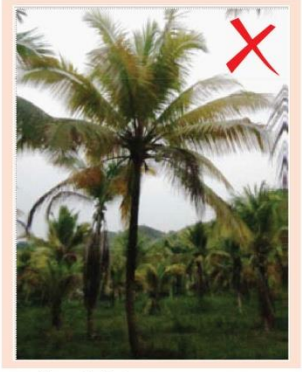
Nitrogen deficiency:
There is a yellowing of all the leaves. They appear yellowish green at first and turns to golden yellow in the latter stages. In advance stage, the tree is stunted, the stem tapers off, and flowering is reduced.

Nitrogen deficient coconut tree

Potassium deficient coconut tree

Potassium deficiency:
There is a general yellowing of leaves but younger leaves are still very green, while the lower older leaves are hanging down and reddish orange in color. The new leaves are short and the number of flowers and nuts are very low. Leaves appear light green to yellowish with numerous, tiny, dark, and rust-like spots in linear arrangement along the midrib on either sides of the whole leaflet.

Sulfur deficiency: As the deficiency progresses, the color of the leaflets change from dark green to yellowish orange particularly in the older or lower leaves. There is premature drying of the leaflets.



Sulfur deficient coconut tree

Coconut with chlorine deficiency

Chlorine deficiency: The trees produce small fruits with thin meat. Leaves droop during drought and are difficult to detach from the stem. Palms are susceptible to leaf spots.

Palm with leaf spots

Coconut with sufficient chlorine supply

Solutions:

1. Bring samples to the Bureau of Soils for analysis. The soil should be analyzed every three years to monitor soil acidity and fertility levels. However, when the initial result requires large amounts of fertilizer or lime, it is recommended to test again after one year to see if the results are attained. Steps in soil sampling:
   - Collect at least ten subsamples of the soil around the farm. Sample sites should be scattered uniformly throughout the area. Make sure that the soil is not too wet when getting samples.
   - Gather all the subsamples in a pail or basin, pulverize the soil and mix thoroughly.
   - Air dry the soil.
   - Get 1 kg. of the sample and send to the Bureau of Soils for analysis.
   - Get the result of the analysis.
2. Apply the recommended lime and fertilizer. Follow the instructions in the soil analysis report.
3. Apply organic fertilizers or manure if they are available.
4. Apply salt to chlorine deficient areas.

Common Salt (Sodium Chloride) is provided by the Philippine Coconut Authority to small coconut farmers organizations in the country

How to apply fertilizers

Apply fertilizer in 6 – 8 holes dug around the tree 1-1.5 meters from the base. The fertilizers should be 3-5 inches below the surface of the soil. Cover immediately the fertilizer with soil.

Another method of fertilizing is by making a band 1-1.5 meters from the base of the tree. Place the fertilizers on the band. The fertilizers should be 3-5 inches below the surface of the soil. Cover the fertilizer with soil immediately.

Comparison between organic and inorganic fertilizers

Inorganic fertilizers:	Organic fertilizers:
1. Commercial fertilizers like urea, ammonium sulphate, Muriate of Potash, etc.	1. Can be produced at home from organic wastes of the farm and from animal manure. Common organic fertilizers are chicken dung, cow manure, vermicast, etc.
2. Contains high concentration of macronutrients like nitrogen, phosphorous and potassium. Certain fertilizers contain sulfur (Ammonium sulfate).	2. Contains lower concentration of macronutrients as compared to inorganic fertilizers. Contains micro nutrients such as magnesium, calcium, boron and zinc.
3. Commercially available in the market.	3. Some brands are commercially available but not common.
4. Immediate release of nutrients, immediate impact on plants	4. Slow release of nutrients, impact not immediately observed but last long.
5. Over-application may cause soil acidity and death of beneficial microorganisms.	5. The more organic fertilizers are applied, the better the soil becomes. Promotes microbial and earthworm activities in the soil. Improves soil structure.
6. No organic matter.	6. Contains high amount of organic matter
7. Volatile	7. Not volatile

Inorganic fertilizer (urea 46-0-0)

Vermicast - an organic fertilizer

It is good to apply a combination of inorganic and organic fertilizer. Inorganic fertilizers provide an immediate boost to the plant while organic fertilizers improve the soil and promote better growth in the long run resulting in plants with higher resistance to pests and diseases.

Integrating livestock in the farm

It is best to incorporate livestock in the farm in the absence of intercrop. Livestock provides for the manure that is needed by the trees. Small livestocks like goats and chicken are more affordable to raise because it is cheaper. Cattle can generate higher income but requires bigger investment.

Livestock can control the weeds in the farm provided that the grasses are edible to the animals. Some weeds like hagonoy are harmful to the animals.

Goats under coconuts

Cattle under coconuts

Common pests and diseases of coconuts

Coconut hispine beetle (Brontispa longissima Gistro)

Brontispa longissima is an invasive pest of coconut and other palm species. Both larva and adult are destructive, inhabiting in the developing and unopened spear leaves of the coconut where they feed on the leaf tissues.

Young coconut trees attacked by brontispa

Adult stage of brontispa

Larvae of brontispa

Symptoms:

Young leaves starting from spear leaf appear dry and burned. Adults and larvae feed and make long cuts parallel to the veins of unopened leaves. They infest unopened coconut fronds as they emerge from the heart. They feed on the parenchyma and the characteristic damage becomes apparent when the young fronds open.

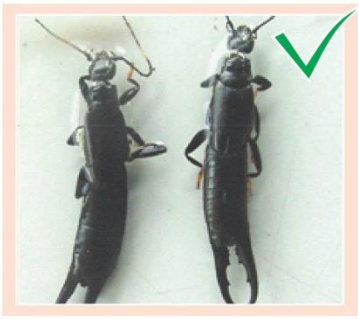
Solutions:

1. Prune or cut and burn infested fronds if young plants are infested.
2. If after pruning and burning the infestation still persists in the young plants, spray with contact insecticide. Refer to the List of Prohibited Pesticides in order to avoid using banned pesticides.
3. Use of predator and entomopathogens: black earwigs (Chelisoches morio) and pupal parasitoid Tetratichus sp. as bio-control agents should be done for mature trees.

Collecting infested fronds

Burning of infested fronds to kill the brontispa

Biological control of brontispa



Earwigs - Chelisoches morio

Earwig devourning orontispa larna

Earwig *(Chelisoches morio)* also known as black earwig, are active at all times of the day and prefer wet habitats. They prey on brontispa in all its developmental stage.

How to apply:
Release cultured earwigs to the infected trees. For more information on supply of cultured earwigs and its release contact the Philippine Coconut Authority (PCA).

Tetrastichus

Tetrastichus emerges from mummified larva of brontispa

Mummified larva of brontispa infested with tetrastichus

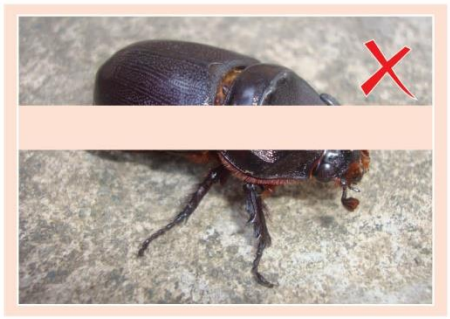
Tetrastichus spp is a parasitoid of brontispa. It is very tiny and host specific. It attacks both the larval and the pupal stages where it lays its eggs. The parasitized beetle larvae usually pupate before succumbing to their internal parasites. Adult tetrastichus emerge from the parasitized pupae ready to attack brontispa.

How to apply:
Release cultured mummified brontispa larvae into the infected trees. For more information contact PCA.

Rhinoceros Beetle (Oryctes rhinoceros L.)

The rhinoceros beetle is one of the most destructive and widely distributed pest of coconut. Its adult attacks coconut of all ages and feeds on young developing leaves, boring into the bud or growing point which often results to death of the palm.

The infestation is heavy when the insect's breeding sites such as decaying coconut logs, stumps, sawdust heaps, farmyard manure, sugarcane trashes, and other decaying organic matter are abundant.



Adult rhinoceros beetle

Larvae of Rhinoceros beetle

Entry point of rhinoceros beetle found in the bud of the coconut

Coconut tree attacked by Rhinoceros beetle

Symptoms and manner of attack:

Adults bore into the bud and feed on unopened leaves. Emerging fronds appear symmetrically cut and scissors-trimmed with either single, double or triple cuts.

Solutions:

1. Farm sanitation; proper disposal of debris which could become breeding sites.
   a. Fallen coconut trees should be removed, used as firewood or cut for timber.
   b. If they could not be removed, they should be covered with cover crops to conceal them from the adult beetles.
   c. Dead trunks still standing should be removed.
   d. Spread accumulated sawdust heaps thinly (not more than 6 inches thick) in the field to prevent beetle breeding.
   e. Do not allow manure and other organic waste to accumulate in heaps.
2. Destroy all larvae and beetles found.
3. Inspect palms and hook out the beetles.
4. Make a log trap to attract the beetles.
   a. Make a heap using coconut logs as shown in the photo.
   b. Fill the area with coconut sawdust. This will lure the beetles into laying their eggs in the site.
   c. Apply green muscardine fungus (GMF) on the sawdust. GMF is available at PCA. For more information contact PCA.

A log trap inoculated with green muscardine fungus

Inspecting palms and hooking out the beetles

Larvae of a beetle attacked by green muscardine fungus

Asiatic Palm Weevil (Rhynchophorus ferrugineus O. and R. shach)

The Asiatic Palm Weevil (Rhynchophorus ferrugineus O. and R. shach) vary from one area to another. R. ferrugineus is predominant in Luzon while R. shach is in Mindanao. Young trees aged 3-15 years old are very susceptible to the attack of the weevils. The female lays its eggs in the crevices of the coconut trunk or in any damaged portion. Upon hatching the larvae tunnel into the soft portion by voraciously feeding until the whole bud is consumed. The outer shell of the trunk is left intact camouflaging the damage inside until it is too late to save the affected tree. The young crown usually wilts when the bud is totally destroyed.

Solutions:

For control measures, all weevil encountered must be collected and destroyed. Close watch for weevil infestation on a year round basis must be kept and unnecessary wounding of the coconut trunks and peduncles must be avoided. Also, plantation sanitation must be observed. In case surgery is still feasible, the larvae must be extracted and killed by opening and enlarging th trunk tunnels with a sharp bolo or any suitable instrument. The wound should be treated with chemicals to avoid reinfestation.

Asiatic palm weevil pupae

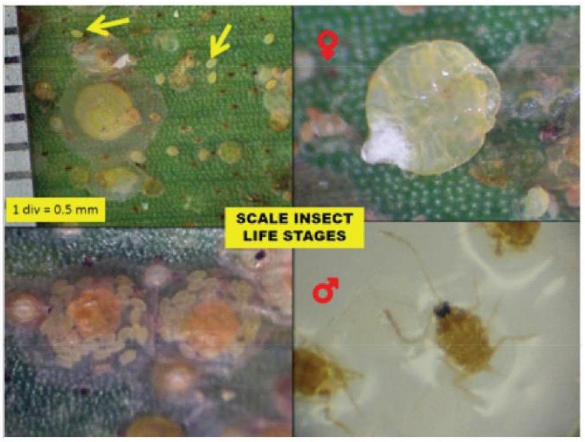
Attack on the base of the plant

Attack on the bud

Adult Asiatic palm weevil

Scale insects (Aspidiotus rigidus, Chrysomphalus ficus Armead, Aspidiotus destructor)

There are three known species attacking coconuts. In the province of Cebu, Chrysomphalus ficus (Armead) is predominant while in Luzon, Aspidiotus destructor is most often encountered. A third species, Aspidiotus rigidus is more destructive and has attacked the provinces of Batangas, Laguna, Quezon, Cavite and Basilan. The present infestation is becoming a serious problem of the coconut producing areas as effective control measures are still on the developmental stage.



These are tiny insects found attached to coconut leaves and fruits. They suck the sap even at crawler or mobile stage. They secrete a wax like fluid which serves as their covering. A female scale was observed to attach itself to the leaf and keep laying eggs for 1 ½ months and produce as much as 350 eggs within that period. Eggs hatched into crawlers in 1 to 36 hours.

The insect attacks the coconut leaflet resulting in general yellowing of the leaves hence a reduction on the photosynthetic activities. For bearing trees, the yield may be reduced significantly.

Other host plants include cacao, citrus, banana, nipa, rubber and other fruit and ornamental plants.

For more information contact the Philippine Coconut Authority.

Solutions:

Current control measures are spraying banole and cochin, pruning and burning of infected leaves, and mass releasing of biological control agents.

Rats (Rattus rattus mindanensis)

Immature nuts fall to the ground due to attacks by the rats.

GI sheets band prevent the rats from climbing to the top of the coconut trees.

Symptoms:

Falling of immature nuts due to holes after rats feed at the base of the fruits.

Solutions:

1. Clear the coconut crowns of rat nests to drive away hiding rats.
2. Use galvanized iron (GI) sheets as bands at least 10" wide and install in the coconut trunk. This will prevent the rats from returning to the crown.
3. Practice good farm sanitation.
4. Encourage owl population to increase by leaving big trees in the farm as habitat.

Leaf Spot (Pestalotiopsis palmarum and Helminthosporium sp)

Leaf spot disease infects both young and old palms. It affects the leaves thus, reducing the photosynthetic activity of the plant and affecting its food processing function. In severe infection, seedlings become unfit for planting. Leaf spots also delay bearing and reduce the yield of coconut palms.

Leaf spots on seedlings

Generally, the fungi are weak parasites that thrive on poorly nourished palms which are physiologically weak to resist fungal infection.

Symptoms:

Leaf spots appear first as small, yellowish brown, circular to oblong spots on the leaflet. The spots gradually turn brown with ashen gray center surrounded by dark brown bands. In advance stages of infection, the spots enlarge and fuse making the leaf appear blighted or burnt.

Solutions:

In the nursery space seedlings at a minimum of 60 x 60 cm triangular distance to provide adequate room for developing plants thus, avoiding a condition favorable to disease outbreak. Fertilize the seedlings to improve their vigor and resistance to disease. Follow recommendation from PCA.
For bearing trees fertilize the soil according to the soil analysis recommendation.

Do not plant GMO (Genetically Modified Organisms)

GMOs are plants whose genes are altered in the laboratory using genetic engineering techniques. At present only GMO corn is being allowed for cultivation in the country. The long term effect of the GMO to the environment is not yet known. In order to ensure that the seeds you buy are not GMO look at the label and ensure that it does not contain the letters BT or RR.

GMO corn planted as intercrop under the coconut trees.

Note:
Not Planting GMO is a critical criterion

Chapter 2

Productivity Improvement

Improving productivity is one of the most important pillars of sustainable farming. Increasing production compensates for the limited area of the farm. Smallholdings need higher yield and maximum utilization of space. If the farm produce enough harvest then the income will make farming profitable.

Planting coconuts as monocrop makes the farm vulnerable to constant fluctuation of prices. Experience shows that changes in the copra prices vary widely from time to time. Because of this it is wise to plant other crops under the coconuts. Intercropping with permanent or short term crops provides the farmer with additional income to protect him in case the price of copra slides.

Other practices such as replanting, proper drainage and proper distancing will improve the stand of the crops thereby increase the harvests.

Replanting

Replace dead trees as early as possible using recommended varieties. Do not plant seedlines that have doubtful origin. Plant new trees as replacements when the existing coconuts are 60 years or older. Productivity of the old trees is on the decline and harvesting costs is high.

Seedlings from reliable sources should be used for planting

Dead trees are replaced

60 year old trees

Selection of coconut variety:

In replanting, quality seedlings should be used. Below is a list of some PCA recommended varieties. Contact the Philippine Coconut Authority for availability of the seedlings. In case there is no supply, get seedlings from the farm by selecting mother plants which are prolific nut producers with good nut size, and are resistant to pest and diseases.

Tall	Dwarf
NSIC 1996 Co 08	NSIC 1996 Co 12
Baybay Tall	Catigan Green Dwarf
NSIC 1996 Co 09 PYT or Tahiti Tall	NSIC 1996 Co 14 Malayan Red Dwarf
NSIC 1996 Co 10 Laguna Tall	NSIC 1996 Co15 Aromatic Green Dwarf
NSIC 1996 Co 11 Tagnanan Tall	NSIC 2000 Co 18 Tacunan Green Dwarf
NSIC 1996 Co 13	Galas Green Dwarf
Bago-Oshiro Tall NSIC 2000 Co 16	Kinabalan Green Dwarf
West African Tall (WAT) NSIC 2000 Co 17	Magtuod Green Dwarf
Rennel Island Tall (RIT)	
Makapuno Tall	
San Ramon Tall	
Orgullo Tall SV San	
Ramon	
JAVA Tall	

Recommended varieties for coconut replanting

Traits	Tall	Dwarf
Years to start reproductive maturity	Late (5-7 years)	Early (3-4 years)
Expected lifespan	More than 50 years	Less than 50 years
Nut size (whole)	Very small to large	Very small to medium
Root distribution	Generally more dense and plentiful	Less dense and few
Reaction to adverse conditions	Generally less sensitive	Sensitive to hyper sensitive
Cultural requirement	Average	High input required
Leaf and bunch attachment	Very strong	Fragile

Comparison between tall and dwarf varieties of coconuts

The PCA developed hybrids by crossing the tall and dwarf varieties. The results were hybrids with medium nut size requiring 3 to 4 nuts to produce 1 kg of copra. They usually flower earlier (3-4 years from field planting) and bear nuts 1-2 years earlier than most local cultivars. In areas that have 4 to 5 dry months per year, the hybrids have a potential yield of 5 tons copra/hectare.

For more information please contact your nearest Philippine Coconut Authority office.

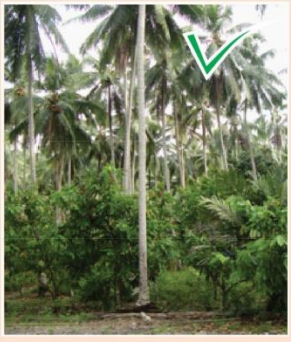
Proper distances between the coconut trees

Use a planting system (spacing and arrangement) that is suitable for a wide selection or flexibility of intercrops (annual, biennials or perennials). Wider rows are recommended to allow the farmers to use different crop mix. Removal of old plants should be staggered based on the current yield performance.

Under storey of closely spaced trees heavily shaded

Do not allow trees to grow close to each other in an unplanned manner as this will not produce good fruits. Very close distances will cause competition for sunlight resulting in tall trees with few fruits and a very shaded under storey where no crop can be grown.

Trees planted too close to each other results to poor bearing trees



10m x 10m allows shade loving intercrops to be grown under the coconut trees

Proper distances allow other crops to be grown under the coconut trees. Select shade loving intercrops. Coconuts may be planted in hedgerows and spaced farther apart between rows. This will allow planting of annual crops like corn and beans, or semi permanent crops like papaya and other sun loving plants.

Planting coconut closer within the rows but wider between rows

Other crops like coffee planted along the rows with coconut

Two coconuts planted together and spaced farther to allow papaya to be planted in between