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Code of Good Agricultural Practices (GAP) for coconut

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Foreword

The Philippine National Standard (PNS) Code of Good Agricultural Practices (GAP) for Coconut was developed by the Bureau of Agriculture and Fisheries Standards (BAFS) as per the request of the Philippine Coconut Authority (PCA). It has been prepared by the Technical Working Group (TWG) for the development of the Standard as per Department of Agriculture Special Order Nos. 605 and 683 Series of 2017. This Standard has been approved by the Secretary of the Department of Agriculture in 2018.

In the development of the Standard, the guide-book entitled Good Agricultural Practices in Coconut Production, 2nd ed. by Severino S. Magat, PhD published in 2008 was used as a major reference.

This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2.

Contents

1 Scope

This standard code of practice covers the general hygienic practices for the production and primary processing of coconuts cultivated for both industrial applications and human consumption. It applies for all the steps from planting material sourcing, farm establishment, to harvesting of young coconut (buko), makapuno, sap/toddy, and mature coconut fruits.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

Mara, D. and Cairncross, S. (1989). *Guidelines for the safe use of wastewater and excreta in agriculture and aquaculture: Measures for public health protection*. Geneva: World Health Organization.

Presidential Decree No. 856, *Code on Sanitation of the Philippines*

Republic Act No. 9003, *Ecological Solid Waste Management Act of 2000*

Republic Act No. 9275, *Philippine Clean Water of 2004*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
agricultural inputs
any incoming material used for the production of coconut

3.2
agricultural wastes
generally regarded as unwanted materials produced from agricultural operations directly related to the growing of coconut and other crops or animals. It covers both biodegradable and non-biodegradable materials

3.3
biological control
use of biological agents for the control of pests

3.4
biopesticide
pesticide that is manufactured from biological sources such as plant extracts

3.5
coconut fruit
large edible fruit (drupe) of the coconut palm, commonly called nut

3.5.1
young coconut (buko)
coconut fruit harvested 9 months from spathe opening, the meat (solid) is tender and water (liquid) has relatively sweet taste

3.5.2
makapuno
coconut with thick soft endosperm and viscous liquid

3.5.3
mature coconut
mainly brown colored coconut fruit harvested 11 to 12 months from spathe opening

3.5.4
sap
toddy
sweet translucent liquid obtained from tapping of unopened inflorescence (spadix) of coconut

3.6
coconut palm
Cocos nucifera L., tall pinnate-leaved palm bearing a large edible fruit

3.7
competent authority
entity/agency that has the knowledge, expertise, and authority as designated by law

3.8
composting
process where biodegradable materials are subjected to decomposition

3.9
contamination
presence of unwanted material in a commodity, storage place, conveyance, or container

3.10
debris
plant residues or materials left in the farm which include but not limited to stumps, felled palms, logs

3.11
environmentally critical area
area that is environmentally sensitive and is so listed under Presidential Proclamation (Pres. Proc.) No. 2146, Series of 1981 as well as other areas which the President of the Philippines may proclaim as environmentally critical in accordance with section 4 of P.D. No. 1586

3.12
farmer
owner, owner-tiller, tenant, or farm worker who undertakes any of the following: cultivation, harvesting, primary processing, and marketing of products for economic purposes

3.13
fertigation
application of fertilizer through irrigation

3.14
fertilizer
any substance – solid or liquid – or any nutrient element or elements – organic or inorganic applied for the purpose of promoting plant growth, increasing crop yield, or improving their quality

3.15
green manure
crop that is grown and then incorporated into the soil for the purpose of soil improvement, prevention of erosion, prevention of nutrient loss, mobilization and accumulation of plant nutrients, and balancing soil organic matter. Green manure may include spontaneous crops, plants, or weeds

3.16
hazard
biological, chemical, or physical agent with the potential to cause an adverse health and environmental effect/s

3.17
Integrated Pest Management
IPM
pest management approach that uses all available pest control methods to optimize a crop's ability to resist the pest with the least hazard to man and the environment

3.18
manure
animal excrement which may be mixed with other material and is decomposed

3.19
maturity index
indicator used to measure or predict the maturity of coconut for harvesting purposes

3.20
pest
organism, such as but not limited to insects, mites, pathogens, weeds, rodents, and birds, that adversely affects the production, quality, and safety of coconut palm and its intercrops

3.21
pesticide
any substance or product, or mixture thereof, of organic and synthetic origin, intended to control, prevent, destroy, repel, or mitigate directly or indirectly, any pest. The term shall be understood to include but not limited to insecticide, fungicide, bactericide, nematicide, herbicide, molluscicide, avicide, rodenticide, plant regulator, defoliant, desiccant, and the like

3.22
pesticide residue
any toxic substance found in food, agricultural commodities, or animal feed resulting from the use of a pesticide

3.23
pre-harvest interval
PHI
number of days between the last spraying and harvest. It is derived from a supervised pesticide residue trial where the pesticide is applied at the recommended rates and the residue levels are analyzed. Each pesticide active ingredient (AI) has its own PHI

3.24
primary processing
preparation and/or conversion of a raw material for further processing or value adding

3.25
re-entry period
period of time after the application of a pesticide during which farmers are safe to enter the field

3.26
risk
likelihood of an adverse health effect and the severity of this effect following exposure to a hazard

3.27
site
defined area on the property such as production site

3.28
soil additives
products or materials that are added to the soil to improve fertility, structure, or control weeds. Examples are decomposed animal manure, sawdust, compost, seaweed, fish-based products, biofertilizers

4 Recommended practices

4.1 Site selection and management

Coconut farms should be located in areas suitable for food production and processing, preferably with an altitude of not more than 600 meters above sea level for optimum growth. Optimum conditions for coconut production are found in Annex A.

Management of site activities conforms to country environmental legislation covering air, water, soil, biodiversity and other environmental issues.

In the case of new site(s), the risk of causing environmental harm within or outside the site should be assessed for the proposed use. Risk assessment should consider the prior and present use of the site and potential impact of adjacent sites to the new site(s).

If results of the evaluation of the production or adjoining sites lead to the conclusion that potential hazard exist, the sites should be further evaluated through analysis and characterization of the identified contaminants.

If the contaminants are found to be at unacceptable levels, the site should not be used for production and primary processing until corrective or control measures are carried out.

Whenever remedial action is required to manage the risk, the action taken should be monitored to ensure that contamination of the produce is eliminated or kept within acceptable levels.

4.2 Farm planning and production site mapping

A production site map should be prepared to show the condition of the farm or how the farm is intended to be developed. It should indicate the topography and the locations of the following:

- coconut production area (density, coconut spacing, variety, distance from markets);
- primary processing area;
- intercrops and livestock areas (if applicable);
- sources of water used on the farm (well, reservoir, rivers, lakes, farm ponds, etc.);
- chemical pesticides and fertilizer storage and mixing areas;
- tools and equipment cleaning and disinfection areas;
- storage area for tools and equipment;
- water storage, distribution networks, drainage, and discharge points of waste water;
- solid waste disposal area;
- composting areas;
- toilet facilities and hand-washing areas; and
- property buildings, structures, and road networks.

Each production area, in case of multiple production areas in a site, should be identified by a name or code, and shall be indicated in the property map.

All hazard and risk areas to humans should be clearly indicated.

All facilities and structures for coconut production should be properly designed, constructed, and maintained to minimize postharvest losses and risk of contamination. All premises should adhere to the guidelines set by the competent authority.

4.3 Sourcing and selection of planting materials

4.3.1 General considerations

Aside from yield quantity and quality as basic considerations, varieties to be grown should be selected based on market requirements, farmer preference, and adaptability to the locality. Other considerations may include soil type and nutrient levels, water availability, prevailing temperatures and humidity, and pest and disease history.

For efficient chemical, water, and other input utilization, planting materials may be selected based on their nutrient and water use efficiencies, and pests and diseases resistance.

The planting materials should be of high quality and shall be sourced either from Philippine Coconut Authority (PCA) seed gardens and seed production centers; Bureau of Plant Industry (BPI) or PCA-accredited nurseries; PCA-recommended varieties and seednut producers; or farmer selected mother palms.

4.3.2 Sourcing and selection of seednuts

Proper sourcing and selection of quality seednuts should be done to ensure productivity of palms.

Seednuts should be sourced from selected mother palms of National Seed Industry Council (NSIC)-registered or PCA-recommended varieties. The list of NSIC-registered coconut varieties is found in Annex B.

Mother palms of open-pollinated varieties shall be selected from a block or area of highly homogenous bearing palms producing an average of at least 10 nuts per bunch every 30 days for tall varieties and 15 nuts per bunch every 25 days for dwarf varieties.

Seednuts shall be disease-free, undamaged by insects and rodents, physiologically mature, without deep punctures or cuts, with water manifested by “sloshing sound” when shaken, ungerminated, and resembles the distinct appearance of the specific variety of the mother palm.

Seednuts should be seasoned in shade, preferably soaked in water with perianth lobes removed prior to sowing in appropriately prepared seedbeds of appropriate nursery site. Seednuts should be set with the germ end at the top in either upright for tall varieties or tilted for dwarfs to ensure nut water contact with the haustorium.

Seednuts and seedlings should be appropriately watered, weeded, and inspected for disease and pest incidence. Seedlings should be fertilized as recommended. Recommended fertilization program is found in Annex C.

Healthy seedlings with characteristics typical of the variety should be selected for planting.

In case of hybrid seedlings, only F1 (Filial 1) or the first filial generation offspring of distinct mother palms shall be used for planting. Hybrid seedlings shall be sourced only from either PCA or PCA-supervised or accredited coconut hybridization farms. Likewise, seedlings produced through embryo culture such as makapuno seedlings shall be sourced from either PCA-registered producers and/or NSIC-registered varieties.

4.4 Farm establishment

Farm establishment involves thorough land preparation, proper field layout (orientation and spacing), holing, and planting.

4.4.1 Land preparation

The extent of land preparation depends upon the soil and climatic condition of the site.

4.4.1.1 Situation

On slopes or other places where erosion is likely to occur, covercropping before planting time is advisable. Terraces constructed following the contour lines also minimize erosion (constructed in areas) where water is likely to stay for several days after rains. In water-logged areas, palms generally exhibit yellowing of all leaves, stunted growth, and poor yield.

4.4.1.2 Condition

If the land has been cleared and is under cultivation, no special advance preparation is necessary.

For idle lands, the area shall be cleared first of bushes, shrubs, and grasses. When cogon (*Imperata cylindrica* L.) covers the ground entirely, land preparation by an animal-drawn plow or by a tractor (large area) is advantageous. Application of non-selective herbicide to prevent weed growth may be considered.

4.4.2 Field layout and planting

Field should be laid out in either square, triangular, rectangular, quincunx, or Group of 3 per Hill (G3pH) systems depending on the farmers' preference and intended products. The planting distance depends on the intended planting and cropping system to be used and is recommended to be from 8.0 to 10.0 meters. The longest distance between palms should be in the east-west orientation to optimize sun exposure or avoid overshadowing of palms throughout the day. The recommended planting systems and distance are shown in Annex D.

4.4.3 Planting and replanting of palms

Seedlings aged six to eight months or with height of two feet should be appropriately planted preferably in 50 cm x 50 cm x 50 cm planting holes at the onset of the rainy season. Seedling collar shall not be covered with soil nor soil be allowed to get into the leaf axils.

Organic matter rich soil amendment should be applied prior to planting. A fence or tree guard should be provided for young palms as protection from stray animals.

For newly established farms, young palms that are deformed or damaged, stunted in growth, dead, and those exhibiting weakness should be replaced or replanted with seedlings of the same age.

4.5 Farm maintenance

Measures should be taken in order to ensure farm efficiency, productivity, and safety.

4.5.1 Soil and soil conservation

Coconut can thrive in a wide range of soil textures (sandy to clay). However, it prefers fertile and well-drained soils with a minimum depth of 75 cm and with high water-holding capacity. The palm tolerates soil pH from 5.0 to 8.0. For optimum growth, however, a pH range of 5.5 to 6.5 is ideal.

Recommended soil conservation measures such as minimum tillage, contour planting, crop rotation, covercropping, green manuring, and mulching should be integrated in the coconut production practices in order to improve or maintain the soil structure and tilth, and minimize soil compaction and erosion.

Use of crop suitability maps to plan for intercropping and livestock integration is encouraged.

4.5.2 Fertilizers and soil amendments

4.5.2.1 General requirements

To optimize nutrient use and minimize nutrient losses, the farm should apply the correct amount of fertilizers based on recommendations from soil or leaf analysis.

If fertilizers are sourced commercially, only duly registered organic and inorganic fertilizers should be used to avoid the risk of heavy metal contamination.

NOTE The list of registered organic soil amendments is available at the BAFS website. Other registered fertilizers are found at FPA website.

The details of the source or supplier of all fertilizers and soil additives including potting medium used in the farm shall be recorded.

Farm tools and equipment used in the farm operation shall be well maintained.

Sprayers used for herbicides shall not be used for foliar fertilizers unless thoroughly cleaned.

4.5.2.2 Organic fertilizer

The use of organic fertilizers, whether produced in the farm or sourced commercially, is encouraged. Composting areas for the production of farm-based organic fertilizers should be located away from processing and storage areas and from drinking and farm water sources. Production procedures, such as composting, solarization, and heat drying, should be designed to reduce pathogens to tolerable limits in manure and biosolids

Human waste, dog and cat excreta, whether processed or unprocessed, shall not be used for the production of coconuts.

4.5.3 Water

The risk of chemical or biological contamination of produce from the water used for irrigation, fertigation, application of chemicals, washing, treatments, cleaning, sanitation, and other forms of handling the produce should be assessed. Moreover, the proximity of water sources on possible sources of contamination (e.g. dumping site, septic tanks, composting area) should be considered to ensure suitability.

Water used from sources that may cause environmental harm to the land and soil, waterways, and environmentally critical areas should be managed or treated to minimize the risk of health and environmental harm.

Untreated sewage water should not be used for irrigation or fertigation. Whenever treated sewage water is used, water quality shall comply with the WHO 1989 published Guidelines for the Safe Use of Wastewater and Excreta in Agriculture and Aquaculture, or the country's guidelines on the matter which is the Republic Act No. 9275: Philippine Clean Water Act and Presidential Decree No. 856: Code on Sanitation of the Philippines, specifically on use of waste water. Otherwise, untreated sewage water should not be used during production and postharvest handling of coconut.

4.5.4 Management of coconut palms

4.5.4.1 Soil tillage

Soil tillage has a beneficial effect on coconut yields, provided it is not done too frequently or too deeply. Shallow tillage, i.e. up to 20 cm deep and 2 m radius away from the base of the coconut palm, stimulates the production of new roots and incorporates organic matter into the soil. The best time to till the soil is near the end of the dry season. The soil may also be plowed before the onset of the dry season to break the soil capillaries.

4.5.4.2 Crop nutrition and fertilizer application

Judicious application of fertilizers should be practiced.

The nutrient requirement at different stages of growth is shown in Annex A and C. In addition to macronutrients such as nitrogen, phosphorus, and potassium, coconut needs high quantities of chloride and sulfur. Thus, the use of fertilizer materials containing these nutrients at different stages of growth is highly recommended.

In the absence of leaf and soil analyses of a farm, the recommended rates in Annex C (Table C.1 – C.7) may be used. However, if the farm is intended for organic farming, only allowed organic soil amendments shall be used. For farms with intercrops, potassium chloride (KCl) is highly recommended for use instead of sodium chloride (NaCl) as sodium (Na) may not be suitable for other crops. Organic fertilizers should also be applied in accordance with Clause 4.5.2.2.

4.5.4.3 Integrated Pest Management (IPM) in coconut

Integrated Pest Management in coconut involves the use of a combination of different pest management strategies for the control of various insect pests, mites, pathogens, weeds, and rodents. This consists of cultural, biological, physical, mechanical, and chemical approaches in order to formulate a practical, sustainable, environment-friendly, and socio-economically acceptable control strategies.

Cultural methods should be the primary means of pest management and use of chemicals should be on a need basis. IPM strategies are found in Annex E.

4.5.4.3.1 Choice of crop protection products

Crop protection products should be appropriate for the control of pests and based on the approval of the competent authority.

Farmers should use agricultural chemicals that are registered for the cultivation of coconut and procured from licensed suppliers and approved by the competent authority. The use of such agricultural chemicals shall be in accordance with the approved label instructions for the intended purpose/s.

4.5.4.3.2 Application of crop protection products

Farmers who apply agricultural chemicals should be trained on proper application.

Farmers should use appropriate personal protective equipment (PPE) during applications.

The IPM principles and techniques should be used whenever possible to minimize the use of pesticides. A rotation strategy for agricultural chemical application and other crop protection measures should be employed to avoid the development of pest resistance, i.e. use different chemical structural groups (e.g. organophosphates, synthetic pyrethroids, carbamates) of pesticides.

Farmers/applicators should observe established pre-harvest intervals (PHIs) or the period between agricultural chemical application and harvest. Ground or aerial application of agricultural chemicals should be managed appropriately to minimize

the risk of spray drift to neighboring properties and environmentally critical areas. For public safety, areas applied with pesticides should be marked with appropriate warning signs until the established re-entry period.

Equipment used for agricultural chemical application should be maintained in good working condition and checked before each use. Agricultural chemical sprayers should be calibrated as necessary to maintain the precision of the application rate. Mixing containers, sprayers, and other equipment and tools used for agricultural chemical applications should be thoroughly washed after use, especially when used with different agricultural chemicals on different crops, i.e. to avoid contamination of the produce or damaging the crop. A guide to selection and safe handling of crop protection products is found in Annex F.

4.5.4.4 Replanting of unproductive coconut palms

Unproductive palms that show declining yield of less than 20 nuts per palm per year despite appropriate management practices should be replaced with the recommended high yielding varieties. This could be done through underplanting or spot planting. Cutting of unproductive palms should be done when the underplanted palms are already at the productive stage unless immediate cutting is approved by the competent authority.

4.6 Farm diversification

4.6.1 Intercropping

Plant crops between the coconut palms in order to utilize the spaces in between. Choice of intercrops should consider the age of coconut palms. In newly field planted palms, intercrops that are fast-growing are not recommended to prevent overshadowing that may stunt the growth of coconut. Generally, the crops would depend on the planting distance of the coconuts. Farms with coconuts that are planted at 10 x 10 meters are good for fruits and other permanent crops like coffee or cacao. Intercrops should be shade loving or shade tolerant. In farms using hedgerow planting system, there is sufficient space for planting annual crops because enough sunlight can reach the ground. Vegetables and cereals require big amount of sunlight. Crops to be used as intercrops should be selected based on site suitability, availability of market, and other value-adding activities. Recommended intercrops for coconut are found in Annex G.

4.6.2 Livestock integration

Livestock integration is another option to maximize land use and farm productivity. Livestock also provides manure that can be processed into organic fertilizer and helps control the weeds in the farm. Recommended livestock to be integrated with coconut are found in Annex G.

Animals should be kept away from intercropped areas.

4.7 Harvesting and postharvest handling

Coconuts are productive throughout the year, although yields may vary with season. Normal bearing palm produces at least one matured harvestable bunch every 23-30 days depending on the variety. Twelve (12) productive bunches per palm can be harvested annually from tall varieties. On the other hand, dwarfs and hybrids produce 14-17 bunches.

4.7.1 Harvesting

Appropriate harvesting technique should be employed to optimize the quality and other desired characteristics of produce.

4.7.1.1 Sap

It is recommended to select bearing palms with healthy unopened inflorescence. Proper bending of inflorescence should be done to prevent breakage and maximize sap yield. Tapping should be done by using sharp scythe. Frequency of collection of coconut sap is generally two to four times a day depending on the intended use. The tip of the inflorescence should be covered appropriately to prevent exposure to sun, wind, and insects.

Harvesting tools and collecting vessels should be used solely for the purpose. These should be made from food-grade materials, cleaned and disinfected regularly, and stored away from potential contaminants.

4.7.1.2 Fruit

Appropriate maturity indices should be the bases in determining the harvest time. A coconut fruit should be harvested in different ages depending on the purpose and the age is determined from flower opening: nine (9) months or less for young coconut or “buko” processing; 10 months for “bukayo” processing; 9-11 months for makapuno; and 11-12 months for oil, milk, and desiccated coconut processing and for seed purposes. For practical and economic reasons, the harvest intervals should be 45-60 days for copra production and every 30 days for virgin coconut oil and desiccated coconut processing.

Young coconut or buko should be harvested by bringing down bunches with the aid of rope to prevent breakage. It should be stored under shade.

Husked nuts should be stored away from direct sunlight and not in direct contact with the soil, and properly secured from stray animals.

4.7.2 Postharvest handling

Visual inspection of the coconut for insect pests and diseases should be done before transporting.

4.7.2.1 Transport

4.7.2.1.1 Sap

Conveyances for transporting the harvested coconut sap should be made of such material and construction that will permit easy and thorough cleaning. Facilities should be maintained clean and disinfected. All handling procedures should prevent the coconut sap from being contaminated.

For purposes other than vinegar and toddy, care should be taken to prevent fermentation and to protect against contamination.

4.7.2.1.2 Fruit

Rolling of the fruits while in transit and dropping during loading and unloading should be avoided to prevent cracking or mechanical injuries.

4.8 Storage facilities

Agricultural inputs, farm implements, and harvesting tools should have separate storage areas. The storage areas should be well-ventilated and designed for ease of cleaning spills and leaks. It should be free from waste and does not provide a breeding place for pests.

Storage of agrochemicals should be located in an area far or separate from the living quarters of the farmers, sources of water, and where the coconut is handled. If this is not possible, the fertilizer and the pesticides shall be physically separated and labelled accordingly.

4.9 Environmental safety

To prevent possible ecological imbalance, farmers should use biological controls that are authorized for the cultivation of coconut and should be used in accordance with the approved instructions for the intended purpose/s.

Farm activities should comply with country regulations covering protected plant and animal species to ensure that protected species are not damaged.

Measures should be used to control wild animals and environmental pests.

The generation of offensive odor, smoke, dust, and noise should be managed to minimize the impact on neighboring properties.

4.10 Worker's health, safety, and welfare

4.10.1 Labor conditions

Farmers shall be treated in accordance to rules and regulations set by the Department of Labor and Employment (DOLE) and other applicable laws. All farmers shall be promptly and rightfully paid for work done and provided with appropriate social benefits. There should be no discrimination in hiring of farmers.

There should be no cases of forced labor, unlawful termination, and prohibition on membership or representation by labor union. Where provided by an employer, living quarters should be suitable for human habitation and contain basic services and facilities.

4.10.2 Safety

Farmers should comply with the Occupational Safety and Health Standards of DOLE. Wearing of appropriate PPE and safe handling of inputs and farm implements should be practiced. First aid kits should be readily available to treat farmers of minor cuts and bruises and those that have been accidentally contaminated with chemicals prior to medical attention/treatment in a hospital.

4.10.3 Training

Farmers should be trained on the proper handling of crop protection products and other inputs.

Employers and farmers shall have appropriate knowledge or proper training on their areas of responsibility that are relevant to good agricultural practice.

4.11 Waste management

Waste management shall be in accordance with the provisions of Republic Act No. 9003: Ecological Solid Waste Management Act. Processing and utilization of agricultural wastes and debris is highly recommended. Adequate areas for collection of agricultural wastes should be provided. Non-biodegradable wastes such as plastics, metal containers, bottles, sacks of fertilizers, and others should be segregated from biodegradable waste materials.

Proper disposal of empty pesticide and fertilizer containers and expired chemicals should be followed in accordance with the rules and regulations set by the competent authority.

4.12 Documentation and records

Documentation and records should be prepared and maintained to facilitate recalls and product safety investigations. Information to be recorded relevant to GAP shall follow Annex H.

Annex A
(informative)

Optimum conditions for coconut production

Factors	Description	
1. Rainfall	Total of 1,500-2,500 mm/year, almost uniformly distributed, with at least 125 mm per month. Not more than 3 successive dry months (rainfall less than 50 mm).	
2. Relative humidity	Within 80-90 %. A persistently very high humidity favors the speed of fatal fungus diseases, common in very high elevations.	
3. Temperature	Annual mean optimum of 27 °C and monthly mean of 20 °C, with diurnal variation of 5-7 °C.	
4. Soil		
4.1 Moisture	Field capacity moisture (within temperature range 25-40 °C of available moisture of 12-15 %. Water-logged conditions lasting for more than 1 week is growth-limiting and yield-reducing.	
4.2 Drainage	Well-drained and aerated at all times. Root respiration impaired and plant physiology abnormal under poor drainage conditions.	
4.3 Acidity	Soil acidity of pH 5.5-6.5	
4.4 Depth	> 75 cm (top plus sub-soil)	
4.5 Texture	Either sandy, loamy and clayey grades	
4.6 Fertility	Soil analysis:	
	Organic matter	> 2 %
	Total N	1,000 – 2,000 mg/kg
	CEC	> 15 meq/100 g soil
	Exch. K	> 0.5 meq
	Exch. Ca	> 15 meq
	Exch. Mg	> 7 meq
	Exch. Na	> 0.2 meq/100 g soil
	Available P	> 15 mg/kg
	Available S	> 20 mg/kg
	Soluble Cl	> 20 mg/kg
	Available micronutrients	B: > 2 mg/kg
		Zn: > 4 mg/kg
		Cu: > 4 mg/kg
		Fe: > 50 mg/kg
		Mn: > 100 ppm
5. Sunlight	Above 2,000 sunshine hours/year with daily full sunlight (above 4,500 ft-candle light intensity). Provides full and stable bunches of the palm crown, year round.	
6. Topography	Flat to slightly sloping, rolling to moderately sloping (below 20 %)	
7. Wind speed	Minimal frequency of typhoon for stable nut yields.	

Annex B
(informative)

NSIC-registered coconut varieties

Table B.1 – Open-pollinated varieties

No.	NSIC registration no.	Variety name	Nuts/palm	Nut/ha	Copra/nut, g	Copra/palm, kg	Copra/ha, t	Fruiting season, no. of months	Regularity of bearing	Age, yrs. after planting	Height, m	Recommended product group(s)
1	NSIC 1996 Co 08	Baybay Tall	108.1 ± 14.8	14,588.7 ± 1,995.3	294.8 ± 16.3	32.4 ± 5.1	4.40 ± 0.70	12	Regular	18	14	Oil, coir, and activated carbon
2	NSIC 1996 Co 09	PYT or Tahiti Tall	70.6 ± 14.4	9,525.1 ± 1,940.7	263.5 ± 27.2	19.2 ± 4.8	2.60 ± 0.60	12	Regular	15	12	Oil, coir, and activated carbon
3	NSIC 1996 Co 10	Laguna Tall	71.8 ± 19.5	9,691.1 ± 2,639.2	253.0 ± 36.1	19.1 ± 5.3	2.60 ± 0.70	12	Regular	19	14	Oil (VCO), coir, and activated carbon
4	NSIC 1996 Co 11	Tagnana Tall	59.8 ± 15.8	8,069.6 ± 2,139.3	320.6 ± 37.4	18.9 ± 4.3	2.50 ± 0.60	12	Regular	19	14	Oil, coir, and activated carbon
5	NSIC 1996 Co 12	Catiga Green Dwarf	74.1 ± 15.2	12,671.8 ± 2,594.6	210.4 ± 16.8	15.3 ± 3.0	2.60 ± 0.50	12	Regular	18	7	Buko, sap, sugar
6	NSIC 1996 Co 13	Bago-Ohiro Tall	72.5 ± 15.3	9,792.1 ± 2,059.2	314.9 ± 31.9	23.7 ± 5.2	3.20 ± 0.70	12	Regular	19	14	Oil, coir, and activated carbon
7	NSIC 1996 Co 14	Malayan Red Dwarf	110.6 ± 9.7	18,910.3 ± 1,661.5	193.4 ± 14.2	21.3 ± 2.1	3.60 ± 0.40	12	Regular	20	8	Sap, sugar, buko
8	NSIC 1996 Co 15	Aromatic Green Dwarf	76 ± 46	12,948 ± 7,900	117.0 ± 16.8	8.20 ± 5.8	1.40 ± 1.0	12	Biennial	21	6.98 ± 0.62	Buko, sugar, handicrafts
9	NSIC 1996 Co 16	West African Tall (WAT)	68.4 ± 19.6	9,227 ± 2,641	184.6 ± 20.8	12.6 ± 3.78	1.69 ± 0.52	12	Biennial	20	10.67 ± 0.76	Oil, coir, and activated carbon
10	NSIC 1996 Co 17	Rennel Island Tall	63.7 ± 20.2	8,602 ± 2,729	304.71 ± 40.66	18.99 ± 4.83	2.57 ± 0.65	12	Biennial	24	11.37 ± 1.25	Oil, coir, and activated carbon

No.	NSIC registration no.	Variety name	Nuts/palm	Nut/ha	Copra/nut, g	Copra/palm, kg	Copra/ha, t	Fruiting season, no. of months	Regularity of bearing	Age, yrs. after planting	Height, m	Recommended product group(s)
		(RIT)										
11	NSIC 1996 Co 18	Tacunan Green Dwarf (TACD)	99.4 ± 29.9	16,641 ± 5,225	233.5 ± 23.5	23.26 ± 7.23	3.98 ± 1.24	12	Biennial	19	4.29 ± 0.33	Sap, buko, sugar, oil (VCO)
NOTE Generally, dwarfs are shallow rooted and have slimmer trunks.												

Table B.2 - Hybrids

No.	NSIC registration no.	Variety name	Nuts/palm	Nut/ha	Copra/nut, g	Copra/palm, kg	Copra/ha, t	Fruiting season, no. of months	Regularity of bearing	Age, yrs. after planting	Height, m	Recommended product group(s)
1	NSIC 1996 Co 01	PCA 15-1	86.7 ± 15.2	11,701 ± 2,058	245.1 ± 12.4	21.6 ± 4.1	2.91 ± 0.55	12	Regular	17		Oil, coir, and activated carbon
2	NSIC 1996 Co 02	PCA 15-2	70.7 ± 29.4	9,549.1 ± 3,969.8	256.4 ± 22.7	18.3 ± 8.8	2.19 ± 1.19	12	Regular	17	12	Oil, coir, and activated carbon
3	NSIC 1996 Co 03	PCA 15-3	71.2 ± 19.8	10,827.4 ± 3,011.5	249.3 ± 23.6	18.1 ± 6.5	2.76 ± 0.99	12	Regular	14	10	Oil, coir, and activated carbon
4	NSIC 1996 Co 04	PCA 15-4	77.5 ± 14.9	10,460.2 ± 2,011.6	267.7 ± 14.4	21.5 ± 4.4	2.90 ± 0.59	12	Regular	17	12	Oil, coir, and activated carbon
5	NSIC 1996 Co 05	PCA 15-5	74.2 ± 18.3	10,020 ± 2,475	268.3 ± 18.5	20.3 ± 5.4	2.75 ± 0.72	12	Regular	17	12	Oil, coir, and activated carbon
6	NSIC 1996 Co 06	PCA 15-6	76.0 ± 17.7	10,253.5 ± 2,390.1	227.5 ± 32.2	18.4 ± 5.6	2.49 ± 0.76	12	Regular	17	12	Oil, coir, and activated carbon
7	NSIC 1996 Co 07	PCA 15-7	78 ± 18.5	10,534.2 ± 2,501.4	230.6 ± 17.5	18.2 ± 5.6	2.46 ± 0.75	12	Regular	17	12	Oil, coir, and activated carbon
8	NSIC 1996 Co 19	PCA 15-8	72 ± 32	9,742 ± 4,282	301 ± 30	22 ± 11	2.99 ± 1.44	12	Biennial	20	7.97 ± 1.17	Oil, coir, and activated carbon
9	NSIC 1996 Co	PCA 15-	67 ± 30	8,978 ±	303 ± 36	21 ± 11	2.78 ±	12	Biennial	20	7.27 ±	Oil, coir, and

No.	NSIC registration no.	Variety name	Nuts/palm	Nut/ha	Copra/nut, g	Copra/palm, kg	Copra/ha, t	Fruiting season, no. of months	Regularity of bearing	Age, yrs. after planting	Height, m	Recommended product group(s)
	20	9		4,049			1.44				0.8	activated carbon
10	NSIC 1996 Co 21	PCA 15-10	76 ± 36	10,228 ± 4,841	262 ± 29	20 ± 11	2.75 ± 0.75	12	Biennial	20	7.45 ± 0.75	Oil, coir, and activated carbon
11	NSIC 1996 Co 22	PCA 15-11	77.6 ± 30.6	11,791 ± 4,649	205.4 ± 1.06	16.7 ± 7.0	2.54 ± 1.06	12	Biennial	18	6.76 ± 0.85	Oil, coir, and activated carbon
12	NSIC 1996 Co 23	PCA 15-12	64.1 ± 36.4	9,751 ± 5,538	273.1 ± 30.3	18.2 ± 11.7	2.76 ± 1.78	12	Biennial	18	6.70 ± 0.84	Oil, coir, and activated carbon
13	NSIC 1996 Co 24	PCA 15-13	76 ± 40	10,218 ± 5,453	252 ± 33	20 ± 12	2.68 ± 1.60	12	Biennial	20	7.97 ± 0.94	Oil, coir, and activated carbon
14	NSIC 1996 Co 25	PCA 15-14	76 ± 38	10,290 ± 5,150	269 ± 33	21 ± 11	2.84 ± 1.53	12	Biennial	20	9.37 ± 1/09	Oil, coir, and activated carbon
15	NSIC 1996 Co 26	PCA 15-15	70.7 ± 42.2	10,743 ± 6,416	230.5 ± 26.7	16.9 ± 11.5	2.58 ± 1.74	12	Biennial	18	7.71 ± 0.83	Oil, coir, and activated carbon
NOTE Hybrid palms are not suitable sources of planting materials.												

Table B.3 – Embryo-cultured varieties

No.	NSIC registration no.	Variety name	Nuts/palm	Nut/ha	Copra/nut, g	Copra/palm, kg	Copra/ha, t	Fruiting season, no. of months	Regularity of bearing	Age, yrs. after planting	Height, m	Recommended product group(s)
1	NSIC 1996 Co 27	VMAC 1	176	28,160	-	-	-	12	Perennial	9	3.62 ± 0.55	Confectioneries
2	NSIC 1996 Co 28	VMAC 2	144	23,040	-	-	-	12	Perennial	9	4.65 ± 0.77	Confectioneries

Annex C
(informative)

Recommended fertilization rates

C.1 Nursery

Table C.1 - Fertilization rates (21-0-0 + 0-0-60) of seedlings

Age (months)	21-0-0		0-0-60	
	g/seedling	kg/100 seedling	g/seedling	kg/100 seedling
2	20	2.0	25	2.5
5	40	4.0	45	4.5
Total Nursery	60	6.0	70	7.0

C.2 Nursery

Table C.2 - Fertilization rates (21-0-0 + NaCl) of seedlings

Age (months)	21-0-0		Common salt	
	g/seedling	kg/100 seedling	g/seedling	kg/100 seedling
2	20	2.0	20	2.0
5	40	4.0	40	4.0
Total Nursery	60	6.0	60	6.0

C.3 Coastal areas (palms planted within 2 km from coastline)

Table C.3 - Using $(NH_4)_2SO_4$ + KCl (21-0-0 + 0-0-60)

Palm age	21-0-0		0-0-60	
	Per palm	Per 100 palms	Per palm	Per 100 palms
Field planting	150 g	15 kg	100 g	10 kg
6 months	200 g	20 kg	150 g	15 kg
1 year	500 g	50 kg	500 g	50 kg
2 years	750 g	75 kg	750 g	75 kg
3 years	1.00 kg	100 kg	1.00 kg	100 kg
4 years	1.25 kg	125 kg	1.25 kg	125 kg
5 years or more	1.50 kg	150 kg	1.50 kg	150 kg

Table C.4 - Using $(NH_4)_2SO_4$ + NaCl (21-0-0 + common salt) for soils with adequate K

Palm age	21-0-0		Common salt	
	Per palm	Per 100 palms	Per palm	Per 100 palms
Field planting	150 g	15 kg	80 g	8 kg
6 months	200 g	20 kg	120 g	12 kg
1 year	500 g	50 kg	400 g	40 kg
2 years	750 g	75 kg	600 g	60 kg

Palm age	21-0-0		Common salt	
	Per palm	Per 100 palms	Per palm	Per 100 palms
3 years	1.00 kg	100 kg	800 kg	80 kg
4 years	1.25 kg	125 kg	1.00 kg	100 kg
5 years or more	1.50 kg	150 kg	1.20 kg	120 kg

C.4 For inland areas (palms planted more than 2 km from coastline)

Table C.5 - Using $(NH_4)_2SO_4$ + KCl (21-0-0 + 0-0-60)

Palm age	21-0-0		0-0-60	
	Per palm	Per 100 palms	Per palm	Per 100 palms
Field planting	150 g	15 kg	200 g	20 kg
6 months	200 g	20 kg	250 g	25 kg
1 year	500 g	50 kg	600 g	60 kg
2 years	750 g	75 kg	900 g	90 kg
3 years	1.00 kg	100 kg	1.50 kg	150 kg
4 years	1.25 kg	125 kg	1.70 kg	170 kg
5 years or more	1.50 kg	150 kg	2.00 kg	200 kg

Table C.6 - Using $(NH_4)_2SO_4$ + NaCl (21-0-0 + common salt) for soils with adequate K

Palm age	21-0-0		Common salt	
	Per palm	Per 100 palms	Per palm	Per 100 palms
Field planting	150 g	15 kg	160 g	16 kg
6 months	200 g	20 kg	200 g	20 kg
1 year	500 g	50 kg	480 g	48 kg
2 years	750 g	75 kg	720 g	72 kg
3 years	1.00 kg	100 kg	1.25 kg	125 kg
4 years	1.25 kg	125 kg	1.35 kg	135 kg
5 years or more	1.50 kg	150 kg	1.70 kg	170 kg

Table C.7 - Fertilizer nutrient recommendations for coconut (a guide)

Age	Nutrient rate per palm						
	N	P_2O_5	K_2O	MgO	S	Cl	Borax
Field planting	30 g	30 g	90 g	50 g	18 g	66 g	0
6 months	40 g	50 g	0.15 kg	85 g	25 g	0.11 kg	7.5 g
1 year	0.10 kg	0.10 kg	0.35 kg	125 g	60 g	0.26 kg	15 g
2 years	0.15 kg	0.15 kg	0.55 kg	0.25 kg	90 g	0.40 kg	15 g
3 years	0.20 kg	0.16 kg	0.77 kg	0.35 kg	0.12 kg	0.53 kg	15 g
4 years	0.30 kg	0.20 kg	1.00 kg	0.40 kg	0.18 kg	0.70 kg	15 g
5 years or older	0.40 kg	0.30 kg	1.20 kg	0.50 kg	0.24 kg	0.90 kg	15 g

Annex D
(informative)

Recommended planting systems and distance

Table D.1 – Square and triangular systems and their planting densities

Method	Population density (palms/unit area)				
	1 ha	2 ha	3 ha	4 ha	5 ha
Square					
8 m x 8 m	156	312	468	625	781
8.5 m x 8.5 m	138	277	415	553	692
9 m x 9 m	134	247	370	494	617
10 m x 10 m	100	200	300	400	500
Triangular					
8 m x 8 m	180	361	542	727	903
8.5 m x 8.5 m	160	319	479	639	799
9 m x 9 m	143	284	427	570	712
10 m x 10 m	115	230	346	462	577

Table D.2 – Rectangular system planting density

Distance between rows	Planting density (palms/ha)
8.5 m	117
9.0 m	111
9.5 m	105
NOTE 1 not recommended for monoculture	

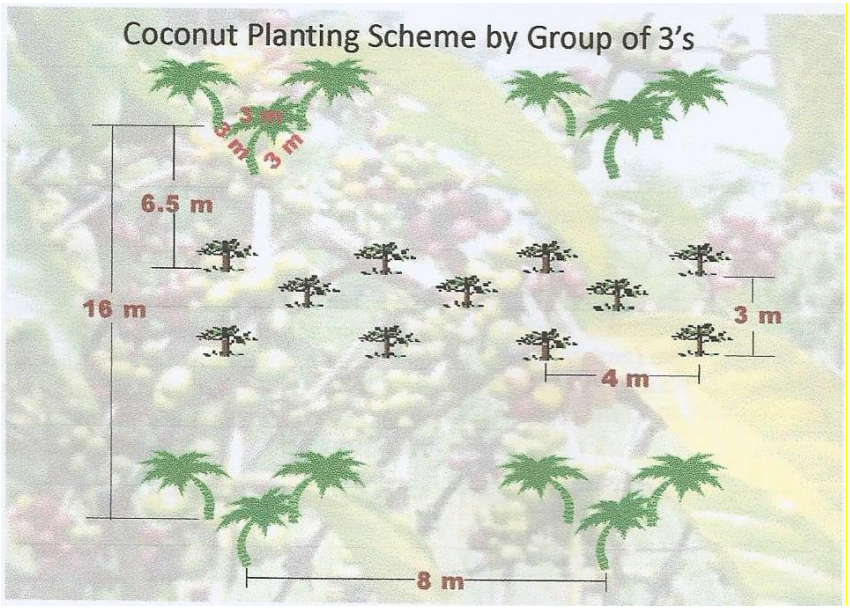

Figure D.1 – G3pH planting system

Annex E
(informative)

Integrated Pest Management strategies

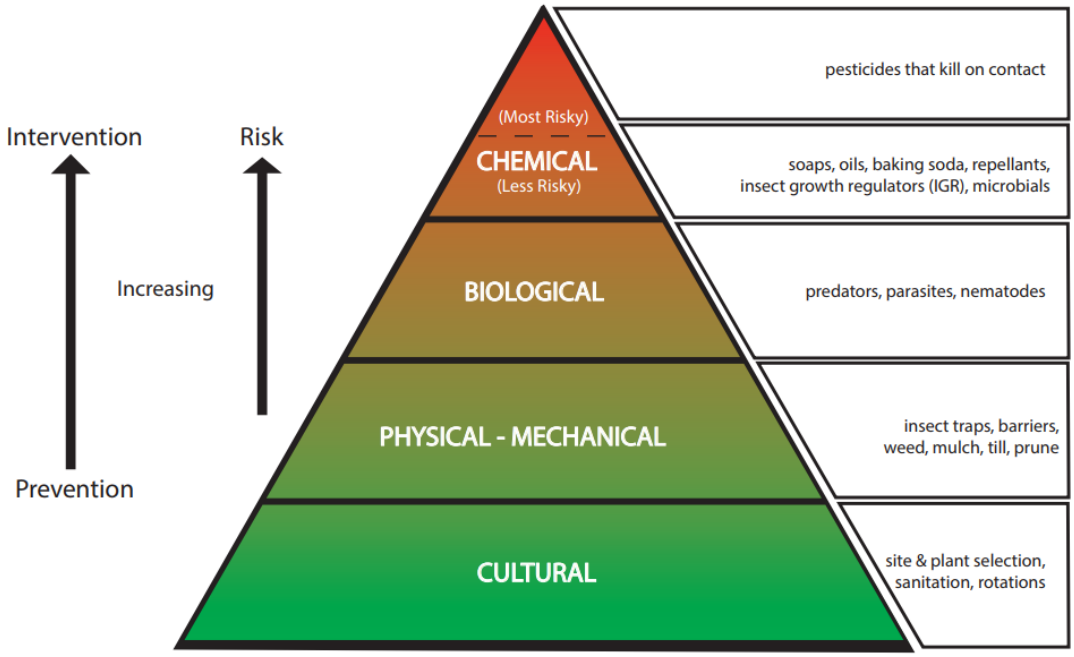

Figure E.1 – Pyramid of IPM tactics

E.1 Integrated insect pest management of coconut

1. Coconut leaf beetle	
Scientific name	*Brontispa longissima*
Synonyms	Coconut Leaf Hispine, Palm Leaf Beetle
Common name	Coconut Leaf Beetle
Family	Chrysomelidae
Order	Coleoptera
Damage characteristics	1. Yellowing of the coconut leaves 2. Wilting of developing buds 3. Curling of the leaflets
Host ranges	Coconut, Royal Palm, Chinese Fan Palm, Areca Nut Palm
Management/control • **Mechanical control**	Blockading and cutting of coconut palms up to three kilometers from the infestation spot are done to prevent the beetle from spreading.
• **Biological control**	Two parasitoid of coconut leaf beetle Tetrastichus brontispae and Asecodes hispinarum have been successfully

	used in the control of beetle.
2. Asiatic palm weevil	
Scientific name	*Rhynchoporus ferrugineus*
Synonyms	Indian Palm Weevil, Coconut Weevil
Common name	Asiatic Palm Weevil
Family	Scarabaeidae
Order	Coleoptera
Damage characteristics	1. Wilting of leaves 2. Hollowed stems due to internal feeding 3. Presence of holes in the stems
Host ranges	Coconut, Sugar Palm, Sago Palm, African Oil Palm
Management/control • **Cultural control**	Practice proper sanitation; avoid wounding palms; destroy infested palms
3. Coconut scale insect	
Scientific name	*Aspidiotus destructor* or *Aspidiotus rigidus*
Common name	Coconut Scale Insect
Local name	Cocolisap
Family	Coccoidae
Order	Hemiptera
Damage characteristics	1. Scales with yellow spots 2. Entire leaves turning yellow to brown and fall 3. The leaves tend to dry-out in extreme cases
Host ranges	Coconut; Breadfruit, mango, cocao, papaya, cotton, oil palm, rubber, sugarcane, and tea
Management/control • **Cultural control**	Coconut scale insect can be eradicated from new areas by destroying infested plants and plant parts.
• **Biological control**	The most common predators of the coconut scale insect include Coccinelid beetle, *Chilocorus* spp, *Cryptognatha nodiceps*, *Pseudocymnus anomalus*, and *Telsimia nelida.* parasitoid of CSI.
4. Slug caterpillars	
Scientific name	*Delia platura; Thosea* spp, *Microthosea* spp., *Setora* spp., *Darna* spp.
Common name	Slug Caterpillars
Family	Limacodidae
Order	Lepidoptera
Damage characteristics	Larvae feed at night on mature, firm leaves, initially scarifying surface and later making holes; can defoliate plants at high population densities (outbreaks)
Host ranges	Corn, Broccoli; Cauliflower; Radish; fruit trees; coconut
Management/control **Cultural control**	Make row covers, speed-up germination, avoid green manure
Biological control	Predacious soil beetles, a predatory pentatomid,

	Eocanthecona furcellata (Wolff) and Reduviid bug, *Sycanus* sp.

E.2 Integrated disease management of coconut

Technology	Brief description
1. Bud and fruit rots (*Phytophtora palmivora* Butl.)	
a) Colored coconut varieties are more susceptible to bud and fruit rots	• The apparent susceptibility of colored coconut populations (reference to the immature nuts), the yellow (MYD) and red (MRD) as parent materials of coconut hybrids. A nationwide survey showed that MAWA (Malayan Yellow Dwarf x West African tall) hybrid found highly susceptible to the disease while the local green dwarfs and tall varieties showed high levels of tolerance to the disease. Moreover, artificial inoculation (in-vitro) in the laboratory showed that colored (yellow, red or brown) populations are generally highly susceptible to *Phytophthora* infections than the green populations.
b) Fungal species as biocontrol agents against *Phytophthora* under laboratory condition	• *In-vitro* bioassay tests showed that *Trichoderma* sp. and *Chaetomium* sp. were found as potential biocontrol organisms/agents against the disease.
c) Farm sanitation as preventive control of the *Phytophthora*	• Farm sanitation, cutting and burning of infected palms/nuts and other alternate infected hosts (e.g. affected with durian stem canker and cacao pod rot) to prevent further spread of the disease.
d) Chemical application to control *Phytophthora* in young plantings	• Application of cupric hydroxide at 25/g/l/palm every 6 mo. significantly lowered disease incidence. Treatment application is done through canopy spray and solution directed to axils of leaves and fruits.
2. Leaf spot [*Pestalozzia palmarum* (Cooke) Steyart and *Helminthosporium* sp.]	
a) Resistant coconut variety to fungus leaf spots	• Catigan Dwarf coconut variety has high tolerance to leaf spot disease in the nursery. Other varieties such as Tacunan dwarf, Yellow dwarf and Red/Orange dwarf population are more susceptible to fungus leaf spot infection.
b) Clean culture to prevent leaf spot incidence in the nursery	• Practice of cultural management through clean culture, removal of pruning of infected leaves prevents leaf spot occurrence in the nursery.
c) Potassium chloride (KCl) fertilizer included resistance of palms to leaf spot	• Application of potassium chloride (KCl) fertilizer on mature coconut farms induced resistance to coconut leaf spots. Common salt (NaCl), a cheaper and effective source of Cl nutrient and a.i., has been recommended, especially in coconuts grown in K-rich soils.

Technology	Brief description
3. Socorro wilt	
Integrated disease management strategies against the Socorro wilt	• Cutting and burning of infected palms at the earliest sign of infection minimize the spread of the disease as it had been observed to spread up to 12 km radius from coconut farm where it was first identified to occur (Socorro, Oriental Mindoro). Strict quarantine regulations by restricting outward movement of coconut products and by products from areas of disease occurrence contained the disease.
4. Stem bleeding [*Thielaviopsis paradoxa* (de Seynes) Von Hohnel]	
Integrated control of stem bleeding	• Scrap out tissues affected with stem bleeding and apply fungicide paste and chemical repellent to prevent secondary infestation by other pest. Use of Cl-based fertilizers reduce it. • Avoid unnecessarily wounds on trunk • Alliete and Benlate were found to inhibit growth of *T. paradoxa in vitro.*
5. Cadang-cadang	
a) Control directions of the disease spread	• A feasible step in managing viroid diseases in planting certified disease-free-materials and removing sources of inoculum in the field. The advent of modern molecular technologies proved that recognition of the disease at the earliest possible stage by reliable means is the key factor in the success of the above strategy. Very low yield (productivity) per tree or per hectare can be very when multiplied over the vast coconut areas and the oil palm plantations that could be possibly afflicted by the disease coming from a symptomless or latent source.

E.3 Integrated weed management of coconut

Technology	Brief description
1. Cogon [*Imperata cylindrica* (L.) Beau] a) Replacement of cogon vegetation under coconut with leguminous covercrop	• Establishment of leguminous covercrops after glyphosate application is a practical and effective way of suppressing the cogon weed infesting coconut plantation. Advantages from covercropping are: 1) elimination of tough crop-weed competition; and 2) substantial reduction in weeding operations, hence less expensive and crop yield improvement in the long run. Improvement of soil fertility and erosion control are also benefits derived from the practice
b) Adaptability of winged	• Demonstrated the adaptability of winged bean as a

bean (*Psophocarpus tetragonolobus* L.) as profitable covercrop under coconut	profitable weed suppressant complementing as a covercrop in coconut farms. It can improve soil fertility in addition to producing edible pods and seeds as a protein source.
2. Purple Nutsedge (*Cyperus rotundus* L.) a) An effective herbicide combination Io control *Cyperus rotundus* L. in coconut nursery establishment	• Control of *Cyperus rotundus* L. in coconut nursery by using glyphosate followed by paraquat. This method was found to be more practical and economical than manual weeding alone especially in large scale polybag coconut nurseries. Use of these herbicides ensured faster weed control, thereby allowing time for labor-intensive nursery activities"
3. Hagonoy [*Chromolaena odorata* (L.) R.M. King & M. Robinson] a) Voracious foliage feeder, *Pareuchaetes pseudoinsulata* on 'Hagonoy'	• An arctiid moth, *Pareuchaetes pseudoinsulata*, as a biological control agent is a voracious foliage feeder. Total defoliation was attained after continuous exposure to the arctiid larvae.
b) A gall fly *Procecidochares connexa*, as biocon agent of 'Hagonoy'	• Successfully developed mass rearing of the imported gall fly, a specific galling fly against *C. odororata*. A total dieback of the *C. odorata* was attained in 6 mos. due to gall pressure. The fly had been observed to be definitely host specific to *C. odorata*.

Annex F
(informative)

Guide to selection and safe handling of crop protection products

Mixing of crop protection products

The mixing area should be located and chosen in such a way that the risk of contaminating the farmers and the environment are minimized.

Mixing of agricultural chemicals should be carried out in a manner that will prevent ground and surface water contamination and the land in the surrounding areas.

The filling and mixing areas for the crop protection product should be equipped with appropriate tools for precise measurements and calibrations. The functionality of such should be checked before every cropping season by the farmer/applicator. The filling and mixing areas should have floor brush, dustpan, plastic bags and adsorbent materials such as sand. These materials should be placed in a fixed location within the specific area, to be used in case of spillage of crop protection product.

Emergency facilities in the event of accidental spill during mixing should be readily available.

Prepare only the necessary volume of spray solution to avoid surplus application mix.

Surplus application mixes are disposed of in a manner that does not present a risk of contaminating the produce.

Annex G
(informative)

Recommended intercrops and livestock to be integrated with coconut

G.1 Recommended intercrops

Vegetables/Legumes

- Pole Sitao (sitaw)
- Cabbage (repolyo)
- Mungbean (mungo)
- Okra (okra)
- Burst Sitao (sitaw baba)
- Cowpea (paayap)
- Onion (sibuyas)
- Peanut (mani)
- Musk Melon (melon)
- Tomato (kamatis)
- Squash (kalabasa)
- Eggplant (talong)
- Bitter gourd (ampalaya.amargoso)

Spice and Herbs Crops

- Hot Chili (sili-labuyo)
- Sweet Pepper (sili)
- Black Pepper (palay tigang)
- Basil
- Rosemary
- Tarragon

Cereals

- Corn (mais)
- Upland Rice (palay tigang)

Root Crops

- Sweet Potato (kamote)
- Gabi (gabi)
- Cassava (kamoteng kahoy)
- Ubi (ubi)
- Arrowroot (arorot)
- Ginger (luya)
- Turmeric (luyang dilaw)

Fruitcrop/Fruit Trees

- Banana (saging saba)
- Durian (duriyan)
- Lanzones (lansones)
- Pineapple (pinya)
- Rambutan (rambutan)
- Citrus (Mandarin, Pomelo, Calamansi)

Beverage Crops

- Coffee
- Cacao

G.2 Growth duration and productivity periods, levels of sunlight transmission and suitable intercrops

Phase (Stage)	Duration	Level of available sunlight/highly suitable intercrops
I	Field-planting to 6 years	<u>High to Moderate/Highly Suitable Intercrops:</u> Cereals – corn, upland rice Legumes – cowpea, peanut, mungbean, sitao, beans Root crops – sweet potato, gabi Fruit crops – pineapple, citrus, watermelon, papaya, banana Vegetables – tomato, cabbage, eggplant, sweet pepper, hot pepper, okra
II	7-25 years[a]	<u>Moderate to Low/Highly Suitable Crops:</u> Black pepper, cacao, coffee, tomato, vanilla, ginger, lanzones, rambutan, durian, mangosteen, gmelina tree (for wood and lumber)
III	26-60 years	<u>High/Highly Suitable Crops[b]:</u> Cereals – corn, upland rice Legumes – peanut, mungbean, cowpea, beans Vegetables – tomato, eggplant, cabbage, sweet pepper, hot pepper, okra, ginger Root crops – sweet potato, gabi, cassava, ubi Beverage crops – coffee, cacao Fruit crops – lanzones, rambutan, durian, mangosteen, citrus (pomelo, calamansi) Wood and lumber tree – gmelina Fiber crops – ramie, abaca

[a] Except tomato, usually the suitable crops indicated requires lower sunlight or moderate shade during the pre-bearing stage of the crops, thus field-establishment best done during this stage.

[b] Should more sunlight transmission to intercrops needed for normal growth and high yields, coconut leaf pruning (CLP) technique (removal of older lower leaves of the crown, maintaining the upper 20-23 leaves); allowing 0.5 meter of cut frond attached to the trunk.

G.3 Recommended livestock to be integrated with coconut

Animals as cattle and carabao, small ruminants as goat, pig, and poultry and game birds can be raised under mature stands of coconut, singly or in combination.

For cattle raising, 1-2 animal units per hectare is recommended, but for cut and carry or feed lot system, more animals per hectare is suitable provided adequate pasture grasses and legumes are available year-round.

In case of goat and/or sheep production system, these should be only raised in areas without intercrops. Not more than 12 adult small ruminants per hectare is

recommended. Also, the dung and urine of these could serve as cheap source of fertilizer to increase coconut yield.

Annex H
(normative)

Information to be recorded relevant to GAP certification

Section	Records
Site selection and management	New sites - cropping history for at least 2 years - potential hazards during assessment and remedial action, if any
	Existing sites - cropping history
	Multiple production areas - name or code of each production area
Planting material (for new sites and replanting)	From accredited nurseries - name and specifics of cultivar - name of supplier - date of procurement
	From with-in farm or non-accredited sources - chemical used for treatment, if applicable - purpose of the treatment - varietal classification (tall, dwarf, hybrid)
Fertilizer and soil additives	Type of fertilizer used (organic or inorganic)
	Name of fertilizer
	Source - brand name - supplier - lot number
	Date
	Quantity
	Expiration date (for liquid fertilizer)
	Fertilizer grade
	Application - date - location of area fertilized - number of fertilized farms - application rate (per palm) - application method - name of applicator
Water quality	Water source
	Test results or certification from LGU
	Corrective actions, if there is a presence of contamination
	Treatment method used and monitoring results, if water treatment is done
	Irrigation use, if applicable - schedule and frequency of irrigation

Section	Records
	- location in the farm that is irrigated - volume of water applied/duration of irrigation - name of personnel who managed the irrigation activity
Crop protection	Type of pesticide used (biopesticide, chemical pesticide – synthetic or organic)
	Target organism(s)
	Source of pesticide
	Type of pesticide - common name - brand name/trade name - chemical name - lot number
	Date of purchase
	Quantity purchased
	Expiration date
	Active ingredient
	Pre-Harvest Interval
	Application - date and frequency of application - location of area applied - number of treated palms - application rate (per palm) - application method - name of applicator - stage of growth
	For biocontrol agents - date and frequency of release - name of biocontrol agent(s) - target organism(s) - brand of biocontrol agent(s) - quantity released - area treated - stage of growth - method of application
	For stored chemicals - - date and quantity obtained - expiry date and date when completely used or disposed of
	Maintenance and calibration activities for agricultural chemical sprayers
Harvest	Date of harvest
	Volume of harvest
Worker's health, safety, and	Proof of training

Section	Records
welfare	Medical certificate
	Record of salary and wages received by farmers
	Social protection (e.g. SSS, PhilHealth, insurance)
Waste management	Types of waste products generated practices to minimize waste generation Procedures for reuse and recycling of waste storage and disposal of waste

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