CARICOM REGIONAL CODE OF PRACTICE

Coconut – Good Agricultural Practices (GAP)

CDCRC5 13 : 202X

CARICOM Regional Organisation for Standards and Quality (CROSQ)
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Committee representation

This CARICOM Regional Standard was developed by the Regional Technical Committee – Agricultural Produce (RTC # 7) which is hosted by the CARICOM Member State, Dominica, which at the time comprised the following members:

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Mr Adrian Mangar	National Agricultural Research and Extension Institute, Guyana
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Foreword

This CARICOM Regional Standard CRS 88: 202x, Coconut - Agricultural Practices (GAP) has been developed under the authority of the CARICOM Regional Organisation for Standards and Quality (CROSQ). It was approved as a CARICOM Regional Standard by the CARICOM Council for Trade and Economic Development (COTED) at its xx Meeting in xx.

The development of the CARICOM Regional Coconut - Agricultural Practices (GAP) was carried out through a collaborative partnership between the United Nations Industrial Development Organization (UNIDO) and the CARICOM Regional Organisation for Standards and Quality (CROSQ). This partnership included a structured research process to identify and adapt an appropriate standard to enhance the CARICOM coconut value chain. This code of practice is intended to provide guidance to industry practitioners across CARICOM member states, by facilitating trade both within the CARICOM region and international markets.

This Coconut - Agricultural Practices (GAP) was identified to harmonise production practices across CARICOM member states to ensure consistency in produce quality, yield, pest and disease control, food safety and integrity, environmental management, worker health and welfare, and record keeping. The standard was carefully adapted from the Philippine National Standard PNS/BAFS 238:2018 — Code of Good Agricultural Practices for Coconut — in recognition of the shared tropical conditions, smallholder orientation, pest and disease relevance, and intercropping potential, thereby ensuring its suitability and effectiveness for the CARICOM context.

This Code also establishes the foundation for GAP certification, a critical requirement for CARICOM producers seeking to export both primary coconut products and value-added goods to regional and international markets. It serves as a practical tool to empower farmers by strengthening farm productivity and management, improving livelihoods, facilitating intra-regional trade in coconuts and coconut products, and enhancing access to and competitiveness in global markets.

In formulating this Coconut - Agricultural Practices (GAP), considerable assistance was derived from the following publications which were still current when this standard was being developed:

British Standards Institution

- BS EN 17972:2024 – Food authenticity. Food authenticity and fraud. Concepts, terms and definitions

Bureau of Philippine Standards

- PNS/BAFS 238:2018 — Code of Good Agricultural Practices for Coconut

Codex Alimentarius

- Draft guidelines for the prevention and control of food fraud.

International Organization for Standardization

- ISO 22000: 2018 – Food safety management systems — Requirements for any organization in the food chain

1 Scope

This Code of Good Agricultural Practices specifies general hygienic practices for the optimal production and primary processing of coconuts intended for both industrial use and human consumption. It applies to all stages from sourcing planting material, farm establishment, harvesting of young coconuts and mature coconut fruits and post-harvest handling and storage.

This code of practice provides recommendations for food authenticity and fraud.

2 Terms and definitions

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

2.1.
agricultural inputs
any incoming material used to produce coconut

EXAMPLES: seedlings, fertilisers, pesticides, machinery

2.2.
agricultural waste
generally regarded as unwanted materials produced from agricultural operations directly related to the growing of coconut and other crops or animals

Note 1 to entry Agricultural waste covers both biodegradable and non-biodegradable materials.
Note 2 to entry These materials are often residual or by-products that can be reused, recycled or disposed of.

2.3.
biological control
use of living organisms (microbes, fungi, insects, plants) to manage pests, diseases and weeds

2.4.
biopesticide
pesticide that is manufactured from natural sources such as plant extracts

2.5.
coconut fruit
one -seeded drupe consisting of a fibrous outer husk, a hard shell and an inner edible portion made up of coconut water (endosperm) and coconut meat (solid endosperm)

2.5.1.
young coconut
immature fruit harvested less than 9 months from spathe opening, the coconut meat (jelly-like endosperm) is tender, and water (liquid endosperm)

2.5.2.
makapuno
naturally occurring mutant coconut (Cocos nucifera) characterised by thick, gelatinous endosperm, reduced or absent coconut water and soft, almost custard-like texture

2.5.3.
mature coconut
fruit 11 to 12 months from spathe opening, with fully developed coconut pulp (solid endosperm) and water (liquid endosperm)

2.5.4.
toddy
sweet translucent liquid obtained from tapping of unopened inflorescence (spadix) of coconut

2.6.
coconut palm
Cocos nucifera L., pinnate-leaved palm cultivated primarily for its fruit, the coconut, which provides food, oil, fibre, and numerous industrial products

2.7.
coconut planting material
the seednut, seedling, hybrid or other propagative part derived from selected mother plants with specific or desirable characteristics, e.g. high yield, copra quality, disease resistance, and adaptability to climate, that is used to establish new plantations or replant existing ones

2.8.
competent authority
entity/agency that has the knowledge, expertise, and authority as designated by law

2.9.
composting
process where biodegradable materials are subjected to controlled decomposition

2.10.
contaminant
any substance not intentionally added to food or feed for food-producing animals, which is present in such food or feed as a result of the production (including operations carried out in crop husbandry, animal husbandry, and veterinary medicine), manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food or feed, or as a result of environmental contamination. The term does not include insect fragments, rodent hairs and other extraneous matter

[Source: CXS 193 – 1995 General standard for contaminants and toxins in food and feed]

EXAMPLES of major contaminants in soil: pesticide and herbicide residues; heavy metals such as lead, arsenic, cadmium, mercury), industrial waste, bacteria, solid waste materials (such as plastic, glass shards, discarded chemical containers).

2.11.
contamination
presence of unwanted material in a commodity, storage place, conveyance, or container which reduces quality, safety or functionality

2.12.
debris
plant residues or materials left in the farm which include but are not limited to stumps, felled palms, logs

2.13.
farmer
farm owner or worker who engages in activities including cultivation, harvesting, primary processing, and marketing of products for economic purposes

2.14.
fertigation
application of soluble fertiliser through an irrigation system

2.15.
fertiliser
any substance (solid or liquid), or any nutrient element (organic or inorganic) applied for the purpose of promoting plant growth, increasing crop yield, or improving their quality

2.16.
first filial generation (F1)
direct offspring produced from crossing two distinct, genetically stable parent plants (often from different varieties, species, or lines)

2.17.
green manure
plant and plant material incorporated into the soil, while still green, for the purpose of soil improvement, prevention of erosion and nutrient loss, mobilisation and accumulation of plant nutrients, and balancing soil organic matter

2.18.
hazard
biological, chemical, or physical agent with the potential to cause adverse health and environmental effect(s)

2.19.
holing
practice of digging planting holes in the field prior to transplanting seedlings or planting propagules, especially for perennial crops and fruit trees

2.20.
hybrid:
a cross between tall and dwarf varieties of the coconut palm, which combines high yield with early bearing

2.21.
Integrated Pest Management IPM
system of preventative and control measures used to prevent, minimise or eliminate pests where necessary with a combination of methods while limiting the use of pesticides and with a resultant minimum impact on human health, the environment and non-target organisms

2.22.
land lying fallow
agricultural land that is purposely left uncultivated, untilled or unseeded for at least one growing season to recover its natural fertility, moisture, and nutrients.

2.23.
manure
organic material, primarily animal waste, that is used to improve soil fertility, structure, water-holding capacity and support plant growth

2.24.
maturity index
indicator(s) used to measure or predict the maturity of coconut for harvesting purposes

2.25.
micro propagated coconut planting material
laboratory produced, disease-free plantlet developed from tissue segments of the mother plant, for which they are genetically identical and grown in a sterile environment using specific nutrients and plant growth regulators

2.26.
perianth lobes
the small leaf-like structures that form part of the outer whorl of the coconut flower's outer whorl which surround and protect the reproductive organs and help in the overall floral structure

Note to entry: The male flower has **six perianth lobes** arranged around the stamens. In the female flower, the perianth lobes are less prominent but still present, surrounding the ovary

2.27.
pest
any organism (plant, animal, or microbe) that adversely affects the production, quality, and safety of coconut palms, its intercrops and coconut products

2.28.
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

Note to entry 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.

2.29.
pesticide residue
any toxic substance found in food, agricultural commodities, or animal feed resulting from the use of a pesticide

2.30.
pre-harvest interval
PHI
number of days between the last spraying and harvest

Note 1 to entry PHI is derived from a supervised pesticide residue trial where the pesticide is applied at the recommended rates and the residue levels are analysed
Note 2 to entry Each pesticide active ingredient (AI) has its own PHI

2.31.
primary processing
preparation and/or conversion of a raw material for further processing or value adding

2.32.
re-entry period
period of time after the application of a pesticide during which farmers are safe to enter the field

2.33.
risk
likelihood of an adverse health effect and the severity of this effect following exposure to a hazard

2.34.
salt fertilization
practice of adding common salt (sodium chloride) around coconut plants to supply chlorine, an essential nutrient that supports plant growth, seednut development and copra yield

2.35.
sap
the sweet liquid collected from cut flower buds (inflorescences) of the coconut palm

Note to entry: Sap has many uses including use as a fresh beverage, conversion to toddy, vinegar, sweetener or syrup and other nutritional and medicinal products

2.36.
seedling
germinated from seednuts raised in nurseries

2.37.
seednut
mature coconuts usually 11-12 months old, harvested from selected mother palms, which are high yielding and tolerant or resistant to common pests and diseases

2.38.
site
defined area on the property such as a production site

2.39.
soil additives
products or materials that are added to the soil to improve fertility, structure, or control weeds.

Example: Decomposed animal manure, sawdust, compost, seaweed, fish- based products, or biofertilizers are soil additive examples.

2.40.
virgin soil
land that has never been cultivated, ploughed, or used for agriculture, often characterised by its natural and undisturbed state

2.41.
vitrification
a process which causes the abnormal growth of plants under conditions of excessive humidity and poor ventilation, leading to weak, brittle, and often non-viable plants

3 Recommended practices

3.1. Site selection and management

3.1.1. Site selection

Site selection should consider the following

a) Optimum conditions for coconut production as recommended in Annex A
b) previous and present usage of the production area and the adjoining sites or history of prior land use
c) previous ownership/tenure records of land to ensure there should be no disputes or encumbrances.
d) compliance with the country's zoning regulations for crop production

3.1.1.1. 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:

a) the prior and present use of the site
b) the potential impacts of coconut production on adjacent farms
c) potential impact of activities carried out in adjacent sites on the new site.

Note: If an Environmental Impact Assessment is available, it should be helpful in identifying and evaluating potential environmental risks of the proposed coconut farm.

3.1.1.2. If the results of the evaluation of the production or adjoining sites lead to the conclusion that a significant risk or potential hazard exists, the sites should be further evaluated through analysis and characterisation of the identified risk or hazards, and remedial action should be undertaken.

3.1.1.3. If contaminants are found in amounts that exceed the maximum residue limits (MRLs) set by the relevant competent authority, then the site shall not be used for production and primary processing until corrective or control measures are carried out as determined by the relevant competent authority

3.1.1.4. Whenever remedial action is required to manage the risk or hazard, the action taken should be monitored to ensure that *it* is eliminated or kept within acceptable levels.

3.1.2. Site management

Management of site activities should conform to the requirements covering air, water, soil, biodiversity and other environmental considerations as set out by the relevant competent authority.

3.2. Farm planning and production site mapping

3.2.1. 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:

a) coconut production area *(e.g. density, coconut spacing, variety*)
b) primary processing area;
c) intercrops and livestock areas (if applicable);

Note: Crop suitability maps, provided by the relevant competent authority, should be utilised, where possible, to plan for intercropping and livestock integration. However, crop suitability maps, though vital in coconut farming, are specialised geographic tools that require training for interpretation

d) sources of water used on the farm (well, reservoir, rivers, lakes, farm ponds, etc.);
e) chemical pesticides and fertiliser storage and mixing and contamination containment areas;
f) tools and equipment cleaning and disinfection areas;
g) storage area for agricultural inputs including tools and equipment;
h) water storage, distribution networks, irrigation and drainage, and discharge points of wastewater;
i) solid waste disposal area;
j) composting areas;
k) first-aid treatment area;
l) toilet facilities and hand-washing areas;
m) at least two muster points; and
n) property buildings, structures, and road networks.

3.2.2. 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.

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

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

3.3. Criteria for selection and sourcing of planting materials

3.3.1. Approved planting materials

3.3.1.1. Planting materials include seednuts, seedlings and micro propagated materials.

3.3.1.2. Planting materials shall be selected based on yield, quality, market requirements, adaptability to local conditions, and farmer preferences.

3.3.1.3. Other considerations should include nutrient and water use efficiencies, pests and diseases resistance, soil type and nutrient levels, water availability, and prevailing climatic conditions.

3.3.1.4. Coconut planting materials should be of the highest quality, characterised by genetic purity, vigour, and free from pests and diseases. In addition, planting materials should demonstrate suitability to local agro-climatic conditions to ensure sustainable establishment and long-term productivity

3.3.2. Sourcing and selection of planting materials

3.3.2.1. Sourcing planting materials

All planting materials should be:

a) obtained from varieties approved by the relevant competent authority as indicated in Annex B
b) sourced from suppliers or production centres, approved or certified by the relevant competent authority.

3.3.3. Selection of planting materials

Planting materials should be selected based on the following:

3.3.3.1. Seednuts

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

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

NOTE The presence of water manifested by “sloshing sound” when shaken.

3.3.3.1.3. Seednuts should be stored in shade and, preferably, soaked in water after removing the perianth lobes. They must then be sown in well-prepared seedbeds located at an appropriate nursery site. Recommended steps for the preparation of seedbeds are given in Annex C

3.3.3.1.4. Seednuts should be set with the germ end at the top, either upright for tall varieties or tilted for dwarfs, to ensure nut water contact with the haustorium.

3.3.3.1.5. Seednuts should be appropriately watered, weeded, and inspected for disease and pest incidence.

3.3.3.2. Seedlings

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

3.3.3.2.2. Seedlings should be transplanted once they reach the recommended age for their variety and have 4-6 leaves with a strong root system to ensure they establish well in the field. The recommended age for transplanting the three coconut types should be as follows:

a) Dwarf: 6-8 months
b) Tall: 12-18 months
c) Hybrid: 10-12 months

3.3.3.3. Micro propagated planting materials

3.3.3.3.1. Micro propagated planting materials, often referred to as tissue culture plants or plantlets, should be genetically stable, disease-free, physiologically vigorous, uniform, and properly acclimatised, with full certification and traceability. In addition, they should be:

a) true-to-type and genetically identical to the donor plant of varieties approved by the relevant competent authority and verified through molecular markers or morphological uniformity
b) healthy, robust plantlets with uniform growth and free from abnormalities such as vitrification, stunted growth, or malformed leaves

c) well-developed root system and balanced shoot-to-root ratio capable of supporting transplant for successful establishment under field conditions
d) hardened under controlled nursery conditions before field transfer

3.3.3.4. Hybrid planting materials

3.3.3.4.1. Hybrids should be selected based on climate, soil type, and disease pressures in the region where the farm is being established.

3.3.3.4.2. Only the first filial generation (F1) of hybrids shall be used for planting. Sevendust and seedlings should not be obtained from hybrid parents

Note: Seedlings obtained from the second filial generation (F2) tend to show highly variable characteristics, may be weak, low-yielding, or susceptible to pests and diseases.

3.4. Farm establishment

The ideal land for coconut farming should *meet the climatic and other requirements for optimum* growing conditions for coconut plants given in Annex A. It is also critical that this land should:

a) be well-drained (sandy loam or alluvial preferred).
b) not be waterlogged or in saline areas
c) ensure access to irrigation and proximity to markets or distribution points
d) be protected from potential sources of contamination from the surrounding environment including domestic and wild animals
e) comply with country regulations, such as zoning of crops and requirements for establishing cocoa farms

3.4.1. Land clearing and preparation

The establishment of the coconut farm should involve appropriate land clearing and preparation activities, depending on the type of land and soil conditions.

3.4.2. Land clearing

3.4.2.1. Prior approval from the relevant competent authority should first be obtained before clearing land for coconut production, where such authorisation is required. This measure ensures compliance with environmental regulations, supports sustainable land use, and prevents adverse impacts on ecosystems and community resources

3.4.2.2. Land clearing activities are typically done on virgin land, currently cultivated land, or fallow land. Activities should generally involve:

a) removal of weeds, grasses, shrubs, unwanted existing crop(s), crop residues, stumps and invasive species
b) removal of debris without burning (to reduce carbon emissions)
c) protecting valuable vegetation where possible to maintain biodiversity, or which can serve as intercrops, windbreaks or provide shade to the young plants
d) dry season clearance is recommended to improve efficiency, timeliness and effectiveness of land preparation

3.4.2.3. Appropriate machinery and techniques should be used in land clearing to minimise soil compaction, preserve soil structure, maintain aeration, and support healthy root development in coconut seedlings

Examples 1: Hand tools such as hoes, machetes, and augers
Example 2: Light machinery such as small tractor and chainsaws for selective felling of small trees
Example 3: Application of non-selective herbicide

3.4.3. Land preparation

3.4.3.1. Tilling

3.4.3.1.1. Tilling for coconut production should be light or minimum to break up compacted soil and incorporate crop residues and/or organic manure into the soil. This should help to enable proper aeration, drainage control, weed control, reduce erosion and maintain or improve soil fertility

Note: No till practices may be considered so as to preserve soil structure and fertility

3.4.3.1.2. Tilling should be carried out using an appropriate till machine or other suitable method

3.4.3.2. Soil testing

Soil should be tested to determine quality characteristics, such as texture, pH (ideal range: 5.5–7.0), depth (minimum depth of 1.2–1.5 m for root growth) and assess nutrient levels and organic matter (since previous crops may have depleted or altered fertility). Soil testing should be done at establishment and every two to three years in mature plantations. The farmer should undertake such adjustments that may be necessary based on the results and recommendations of the tests.

3.4.3.3. Conservation of soil moisture

3.4.3.3.1. Conserving soil moisture is essential to coconut palms as they require a consistently moist root zone to ensure healthy growth, high productivity, and resilience against drought stress. Primary measures to conserve soil moisture should consider one or more of the following:

a) using crop residues as mulch to keep the ground covered as much as possible (e.g. coconut waste materials such as husks, leaves, coir)
b) cover cropping using appropriate plants to protect soil from direct sunlight, reduce erosion, and enhance soil fertility
c) avoiding deep tillage to reduce soil disturbance
d) constructing bunds (small embankments) or trenches to slow water runoff depending on the slope of the land
e) applying organic manures, compost, or green manure to improve the soil's water-holding capacity
f) planting shade-giving plants or intercrops between rows of plants (see layout) along contours

3.4.3.4. Holing (pit preparation)

Constructing proper pits (or holes) is crucial to ensure good root establishment, moisture retention, and nutrient availability. Digging and preparing pits (or holes) should be prepared after clearing crop residues and unwanted vegetation from the area to be used for planting and should involve the following practices:

a) identify and mark exact locations for planting coconut seedlings, based on the planting system preferred as illustrated in Annex D
b) excavate pits of adequate dimensions according to soil type, with a minimum of 60 cm x 60 cm x 60 cm in sandy soils and larger pits of 90 cm x 90 cm x 90 cm recommended for clay or poorly drained soils
c) enrich pit soil with organic matter (e.g. farmyard manure), fertilisers and or soil amendments (e.g. compost or green manure for fertility) before transplanting seedlings
d) ensure drainage to prevent waterlogging around the pit while conserving moisture

3.4.3.5. Application of fertiliser

3.4.3.5.1. Based on the results of soil tests (see Clause 3.4.3.2) organic matter (compost, farmyard manure or green manure) should be applied, if necessary, to improve fertility, boost microbial activity and improve soil structure.

3.4.3.5.2. Organic fertiliser should be well-decomposed and incorporated into the topsoil so as to boost root establishment and early growth of coconut plants.

3.4.3.5.3. The current amount of organic matter or inorganic fertiliser should be applied based on the recommendation of the relevant competent authority to enrich or improve the soil**.**

3.4.3.6. Erosion control

On slopes and other places where erosion is likely to occur, the farmer should consider the following measures to reduce run-off of soil:

a) avoid complete removal of vegetation on the soil surface
b) construct contour bunds or terraces following the contour lines
c) plant cover crops or grasses before planting time
d) apply mulch to keep the ground covered as much as possible (e.g. by using coconut waste materials such as husks, leaves, coir)
e) maintain existing erosion control structures, especially on land under cultivation or fallow land, if these have been effective.

3.4.3.7. Drainage and irrigation

Good drainage prevents root rot and nutrient leaching and safeguards young palms against drought and excess rainfall. Efficient irrigation ensures steady growth during establishment. To prepare an efficient drainage and irrigation system that would ensure healthy establishment and long-term productivity of the palms, the farmer should:

a) construct drainage channels in heavy rainfall zones to carry excess rainwater away
b) ensure regular maintenance of drains to keep them clear of debris and vegetation so as to maintain the flow of rainwater
c) install efficient irrigation systems (e.g. drip irrigation, micro sprinklers) to provide water especially during dry seasons
d) consider climate-smart practices such as rainwater harvesting to conserve water for irrigation purposes.

3.4.3.8. Establishing windbreaks

Young coconut plants should be safeguarded by planting suitable trees along boundaries of the farm to shield them from strong prevailing and hurricane-force winds. (e.g., Gliricidia sepium; Casuarina equisetifolia. Windbreak trees should be:

a) fast-growing, deep-rooted and non-competitive with coconut palms for nutrients and water
b) planted in rows perpendicular to prevailing winds, 10 m – 15 m away from the first line of coconut palms with a space of 2m – 3m maintained between trees
c) pruned regularly to prevent excessive shading and remove weak or diseased trees.

3.4.3.9. Shading

3.4.3.9.1. If the farm is to be established in open land areas, planting of shade plants (banana, plantain) should be established well ahead of the planting of the coconut palms and should be arranged in a manner to shelter the young plants from direct sunlight, which can cause leaf burn, stunted growth, and water stress.

3.4.3.9.2. Additionally, other ways of shading young coconut plants should be considered, such as using temporary shelters and shade nets.

3.4.4. Field layout and planting distances

3.4.4.1. Field should be laid out in either square, triangular, rectangular or other *appropriate* system depending on the farmers' preference and intended products.

3.4.4.2. The recommended planting distance should be from 8.0 metres to 10.0 meters, depending on cropping systems and other factors. Recommended planting systems and distances are shown in Annex D.

3.4.4.3. To optimise sun exposure or avoid overshadowing of palms throughout the day, the longest distance between palms should be in the east-west orientation.

3.4.4.4. The farmer should seek guidance from the competent relevant authority to determine the planting system best suited for the variety of seedlings to be transplanted.

3.4.5. Planting and replanting of palms

3.4.5.1. Root pruning

Seedlings should be pruned before transplanting to prevent them from becoming heavily root bound as this causes coiling and poor future growth. For good practices:

a) select seedlings which are about 6-12 months old and with 5-6 leaves (See Clause 3.3.3.2.2) for the recommended ages for transplanting seedlings of the three coconut types)
b) water seedlings thoroughly 1-2 days before pruning
c) prune roots 4 -5 days before transplanting seedlings
d) cut away roots that are damaged, diseased or excessively long (coiled)
e) keep seedlings in a shaded area for 4 -5 days after pruning to prevent sun stress
f) after transplanting seedlings allow for 2 – 3 days before heavy watering which encourages roots to rebuild

3.4.5.2. Seedlings should be appropriately planted preferably in holes or pits as recommended in 3.4.4.2, at the onset of the rainy season.

3.4.5.3. Seedling collar should not be covered with soil nor soil be allowed to get into the leaf axils.

3.4.5.4. Young palms should be protected from stray animals.

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

3.5. Farm maintenance

All farm maintenance activities should be done in order to ensure farm efficiency, productivity, profitability, and safety.

3.5.1. Soil and soil conservation

Appropriate soil conservation measures recommended in Clause 3.4.3.3.1 should be integrated in the coconut production practices

3.5.2. Fertilisers and soil amendments

3.5.2.1. General requirements

3.5.2.1.1. To optimise nutrient use the farm should apply the correct amount of fertilisers based on recommendations from soil or leaf tissue analysis provided in Annex E and or as recommended by a relevant competent authority.

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

3.5.2.1.3. The details of the source or supplier of all fertilisers and soil additives including potting medium used in the farm should be recorded and maintained.

3.5.2.1.4. Farm tools and equipment used in fertilisation activities on the farm operation should be well maintained to ensure efficiency and safety.

3.5.2.1.5. Sprayers used for herbicides should not be used for foliar fertiliser application.

3.5.2.2. Organic fertiliser

3.5.2.2.1. Organic fertilisers, whether produced on the farm or sourced commercially from certified suppliers, should be used to improve soil health, if necessary.

3.5.2.2.2. Composting areas for the production of farm-based organic fertilisers should be located away from processing and storage areas and from drinking and farm water sources.

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

3.5.3. Water and irrigation

3.5.3.1. The water used for farm operations should be assessed, treated and managed to minimise potential harm to coconut products, humans and the surrounding environment.

3.5.3.2. The risk of contamination of water sources due to proximity to possible sources of contamination (e.g. dumping site, septic tanks, composting area) should be assessed to ensure suitability.

3.5.3.3. Corrective actions to be undertaken should be based on recommendations of the relevant competent authority.

3.5.3.4. Where insufficient soil moisture hinders coconut growth and production, an irrigation system should be used. The irrigation system should be designed to save water, minimise effort and provide the right amount of water required to support coconut growth and production.

3.5.3.5. An irrigation schedule should be prepared for:

a) young plants
b) plants at pre-bearing stage
c) plants at bearing stage, and
d) plants at mature stage

3.5.3.6. If treated wastewater is to be used for irrigation or fertigation, the water quality shall comply with the guidelines by the relevant competent agricultural authority or other relevant body.

3.5.4. Management of coconut palms

3.5.4.1. Soil tillage for established field

Soil tillage has a beneficial effect on coconut yields and should not be done too frequently or too deeply as this can damage the root system and reduce the yield of the plant. For best practices:

a) shallow soil tillage should be carried out up to 20 cm deep and within a 2- m radius away from the base of the coconut plant.
b) till the soil near the end of the dry season. The soil should also be ploughed before the onset of the dry season to break the soil capillaries.
c) the farmer should be guided by the relevant competent authority to determine the frequency and best times for soil tillage.

3.5.4.2. Crop nutrition and fertiliser application

3.5.4.2.1. Application of fertilisers should be practised, based on an established schedule and method of application.

3.5.4.2.2. The use of fertilisers containing essential nutrients, such as nitrogen, phosphorus and potassium, is highly recommended and these should be applied at different stages of plant growth as indicated in Annex E. Farmers should also be guided by the recommendations of the relevant

competent authority regarding fertilisation rates and frequency based on the results of soil testing and tissue analysis.

3.5.4.2.3. In addition to these macronutrients, coconuts need high quantities of chloride and sulphur. It is highly recommended that fertilisers containing these nutrients should be applied at different ~~st~~ages of plant growth as indicated in Table E.7.

3.5.4.2.4. If the farm is intended for organic farming, only approved organic fertilisers and soil amendments should be allowed.

Examples of soil amendments: lime (limestone); compost; aged manure; gypsum

3.5.4.3. Integrated Pest Management (IPM) in coconut

3.5.4.3.1. An Integrated Pest Management (IPM) strategy should be developed to sustainably manage pests and diseases on the coconut farm. It should emphasise prevention, monitoring and informed decision-making. using a mix of cultural, biological, mechanical, and chemical methods. The following major steps should be considered in developing an appropriate IPM strategy for the farm:

a) ensure there is good sanitation, intercropping, proper spacing, mulching and pruning to promote healthy plant growth, improve biodiversity and reduce pest and disease build-up
b) undertake regular monitoring to detect pest or disease infestation early before they cause significant damage
c) correctly identify, if possible, the pest or disease affecting the coconut palms
d) keep appropriate records of the biology and impacts of the pest or disease infestation, e.g. location, population, environmental conditions, time at which pest/disease is most vulnerable, etc.
e) assess the extent of damage to coconut palms
~~f)~~ if immediate intervention is necessary, consider a range of least risky options first, focusing on non-chemical methods (cultural, biological, physical) that could be undertaken as recommended in Annex F
g) seek the guidance of the relevant competent authority to fully develop an effective strategy, that could include the application of chemical methods, to bring the pest or disease infestation under control

3.5.4.3.2. Effective solutions to suppress weed control should include intercropping and mixed cropping systems.

3.5.5. Choice of crop protection products

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

3.5.5.2. 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 should be in accordance with the approved label instructions for the intended purpose/s.

3.5.6. Application of crop protection products

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

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

3.5.6.3. The IPM principles and techniques should be used whenever possible to minimise 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.

3.5.6.4. 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 minimise the risk of spray drift to neighbouring properties and environmentally critical areas.

3.5.6.5. For public safety, areas applied with pesticides should be marked with appropriate warning signs until the established re-entry period.

3.5.6.6. Equipment used for agricultural chemical application should be maintained in good working condition and checked before each use.

3.5.6.7. Agricultural chemical sprayers should be calibrated as necessary to maintain the precision of the application rate.

3.5.6.8. 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.

3.5.6.9. Good practices for the selection and safe handling of crop protection products should be followed as described in Annex G

3.5.7. Replanting of unproductive coconut palms

3.5.7.1. Coconut palms that produce less than 25% of the optimum annual yield for their variety, due to age and despite the application of appropriate management practices, should be replaced with recommended high-yielding varieties. This could be done through underplanting and spot planting.

3.5.7.2. Replacement of unproductive palms should be done when the underplanted palms are already at the productive stage unless immediate removal is approved by the competent authority.

3.6. Farm diversification

3.6.1. Intercropping

Regardless of the planting system adopted on a coconut farm, there will be sufficient space for intercrops. When properly managed, these intercrops should enhance soil health, suppress weeds, diversify farm income, and reduce production risks. For good intercropping practices:

a) The choice of intercrops should consider the age of coconut palms, conditions for optimum growth, suitability, availability of market, and other value-adding activities.

b) Intercrops should be shade-loving or shade-tolerant. Recommended crops to be integrated with coconut farming are shown in Annex H.

Note: Intercropping could be year-round or seasonal depending on the age of coconut palms and seasonal suitability off the crop(s) to be used

c) Intercrops should be planted in rows or strips between palms for systematic management.

d) Overcrowding of intercrops should be avoided to reduce competition for light and nutrients.

Note 1: Fruits and other permanent crops like coffee or cacao are good intercrops for farms with coconuts
Note 2: Vegetables and cereals require a considerable amount of sunlight for healthy growth.

e) Fast-growing intercrops should be avoided in newly established coconut fields, as they can create excessive shade and stunt the growth of young coconut palms.

f) Both coconut palms and intercrops should be inspected regularly and diseased plants removed promptly to prevent spread.

g) Adequate irrigation should be provided, especially for water-demanding intercrops.

h) Intercrops should be rotated to maintain soil health and reduce pest buildup.

i) The fertiliser needs of both coconut and intercrops should be determined and inorganic and/or organic fertiliser applied to sustain soil fertility where necessary.

3.7. Livestock integration

3.7.1. Livestock integration should be employed, where possible, to maximise land use, farm productivity, and provide manure that can be processed into organic fertiliser to help control the weeds in the farm. Animals to be integrated with coconut production are recommended in Annex H.

3.7.2. Animals should be kept away from intercropped areas.

3.8. Harvesting and postharvest handling

3.8.1. Harvesting

Coconuts are productive throughout the year and the yield should vary with the season and the variety. Appropriate harvesting techniques should be employed to optimise the quality and other desired characteristics of coconuts and other farm produce.

3.8.2. Sap

3.8.2.1. For collecting sap, coconut palms with healthy, unopened inflorescence should be selected. Proper bending of the inflorescence should be done to prevent breakage and maximise sap yield.

3.8.2.2. Tapping should be done by using a sharp scythe. The frequency of collection of coconuts should depend on the intended use. The tip of the inflorescence should be covered appropriately to prevent exposure to sun, wind, and insects.

3.8.2.3. 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.

3.8.3. Fruit

3.8.3.1. Coconuts to be used for various purposes should be harvested at the correct stage as recommended below:

a) coconuts intended for fresh water should be harvested at the tender nut age of 6 – 7 months after flowering, when it is full of liquid endosperm, every 45-60 days
b) coconuts for copra production should be harvested when fully mature at 11-12 months old and the harvesting interval should be every 45 days
c) for virgin coconut oil, the **h**arvest age should be 10–12 months, when the kernel is thick and oil content is highest, and the copra harvest cycles should be 45–60 days
d) for the desiccated coconut process, the harvest age should be 10–12 months and the harvest cycle every 45–60 days, when nuts are fully mature.
e) for makapuno production, coconuts should be harvested 9-11 months after flowering, when the jelly-like endosperm has fully developed and the harvest cycle should be every 45–60 days.

3.8.3.2. Young coconuts should be harvested by bringing down bunches with the aid of a rope or other suitable method, to prevent breakage. They should be stored in the shade.

Note: Other possible methods include using a harvesting pole, mechanical lifts or platforms, or a rope and pulley system

3.8.3.3. De-husked nuts should be stored away from direct sunlight, should not be in direct contact with the soil and should be properly protected from pests.

3.8.4. Postharvest handling

3.8.4.1. Storage of harvested nuts

3.8.4.1.1. To maintain the quality of and avoid injury to coconut nuts during storage, they should be:

a) inspected to identify pests and diseases
b) washed to reduce microbial contamination
c) handled hygienically to maintain water quality
d) stored vertically in cool, dry and well-ventilated areas
e) protected from direct sunlight and high humidity to prevent sprouting and fungal attack
f) protected from rats, insects and molds using fumigation or natural repellents where appropriate
g) inspected regularly in the storage area to ensure optimum conditions prevail to ensure product quality is not compromised

3.8.4.1.2. For copra processing of harvested nuts:

a) kernels should be scooped out from split nuts before drying
b) appropriate drying method shall be used, e.g. sun drying, kiln drying, or mechanical dryers.
c) properly dried copra should be stored in moisture-proof bags or containers
d) product quality of copra should meet standards for market value and consumer satisfaction.

3.8.4.2. Transportation of sap

3.8.4.2.1. Conveyances for transporting the harvested coconut sap should be made of such material and construction that will permit easy and thorough cleaning.

3.8.4.2.2. Facilities should be maintained clean and disinfected. All handling procedures should prevent the coconut sap from being contaminated.

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

3.8.4.3. Transportation of fruit

a) Coconuts should be transported and delivered promptly after harvest to designated clean market areas or collection centres to maintain freshness

b) Coconuts should be sorted and graded before transport to reduce damage and ensure quality.

c) Transport vehicles should be clean, dry, well-ventilated and free from contaminants.

d) Transport vehicles should not be overloaded and to prevent or minimise crushing, coconuts should be stacked properly with cushioning material (e.g., straw, husk)

e) During transport coconuts should be covered with tarpaulin or nets to protect against dust, rain, and direct sunlight.

f) Rolling of coconuts while in transit and dropping during loading and unloading should be avoided to prevent cracking or mechanical injuries

g) Prolonged storage of coconuts in vehicles under high temperatures should be avoided

h) Workers should handle coconuts with clean hands and equipment.

i) Coconuts should not be mixed with chemicals, fuel, or other goods that may cause contamination

j) Coconuts should be unloaded and handled carefully to prevent damage.

k) Records of transport batches for traceability should be kept

l) Documentation for certification and quality assurance should be maintained.

3.9. Storage facilities

3.9.1. 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.

3.9.2. Storage of agrochemicals shall 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 fertiliser and the pesticides shall be physically separated and labelled accordingly.

3.10. Environmental safety

3.10.1. To prevent possible ecological imbalance, farmers should use biological controls for the cultivation of coconut that are recommended by the competent authority.

3.10.2. Farm activities should comply with relevant national legislation covering protected plant and animal species

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

3.10.4. The generation of offensive odour, smoke, dust, and or noise generated from farm activities should be managed to minimise the impact on neighbouring properties.

3.11. Health, safety and welfare of workers

3.11.1. Farmers shall be treated in accordance with legislation set by the relevant authority on labour and other relevant guidelines. All farmers shall be promptly and rightfully paid for work done and provided with appropriate social benefits. There should be no discrimination in the hiring of farmers.

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

3.12. Safety

Farmers shall comply with the relevant Occupational Safety and Health Standards and applicable laws. 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.

3.13. Training

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

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

3.14. Waste management

3.14.1. Waste management should be in accordance with the provisions of relevant Solid Waste Management Standards and Legislation.

3.14.2. Adequate areas for the collection (and/or storage) of all wastes generated on the coconut farm should be provided. Non-biodegradable wastes such as plastics, metal containers, bottles, sacks of fertilisers, and others should be segregated from biodegradable waste materials and disposed of in accordance with the legislation set by the competent authority.

3.14.3. Proper disposal of empty pesticide and fertiliser containers and expired chemicals should be followed in accordance with the legislation set by the competent authority.

3.14.4. Farmers should adopt the principles of reuse, recycling, reduction and recovery of all types of agricultural waste generated on the farm to transform them into valuable products that will help to minimise adverse environmental impacts and, at the same time, maximise their economic returns from coconut production.

Examples 1: Husk fibres can be spread around crops to retain soil moisture (mulching) and suppress weeds or be reused as bedding for livestock
Example 2: Husk fibres can be processed into ropes, mats, brushes, and mattresses
Example 3: Efficient harvesting methods help to reduce waste.

3.14.5. Proper disposal of empty pesticide and fertiliser containers and expired chemicals should be followed in accordance with the legislation set by the competent authority.

3.15. Documentation and records

Documentation and records should be prepared and maintained to facilitate recalls, product safety, investigations and traceability of farm products. Information to be recorded relevant to maintaining good documentation and records for GAP certification is given in Annex I.

3.16. Food authenticity and food fraud

Measures to safeguard food authenticity and fraud prevention are necessary to ensure that products are genuine, safe, and traceable while protecting consumer trust and market integrity. Recommended actions include:

a) The farm should assess and identify its vulnerabilities and risks of food fraud across all inputs and outputs, including mislabelling, seed and/or fertiliser substitution, and counterfeiting of agricultural inputs.
b) Staff should be trained to recognise potential risks, follow proper receiving procedures, source only from approved suppliers, and control access to the produce.
c) The farm's mitigation plan should be reviewed at least annually, to ensure all crops, inputs, and packaging are covered and any changes in varieties or practices are addressed.
d) The farm should undertake regular testing of soil and quality control measures to detect contaminants and adulterants.
e) Records should be kept, and farm data, such as input and production logs, should be accurate and up to date to maintain ongoing protection against fraud, ensure traceability and certification of products.
f) The farm should undertake consumer education programmes to identify with consumers and build trust and demand for its genuine products.

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 favours the speed of fatal fungal 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 are growth-limiting and yield-reducing.	
4.2 Drainage	Well-drained and aerated at all times. Root respiration is impaired and plant physiology is 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-candlelight 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 hurricanes for stable nut yields.	
Source: information adopted from base document (PNS/BAPS 238:2018) and desk research Coconut cultivation technology, India Coconut Development Board; https://coconutboard.in/images/Packageofpractice.pdf; and Sustainable production guide of coconut | FAO: https://resources.colead.link/en/ebibliotheque/sustainable-production-guide-of-coconut		

Annex B
(Informative)
Commercial coconut varieties in CARICOM

Table B.1 – Open-pollinated varieties

No.	Variety name	Nuts/palm	Nut/ha	Copra/nut, g	Copra/palm, kg	Copra/ha t	Fruiting season, no. of months	Regularity of bearing	Firt bearing age years	Height, m	Recommended product group(s)
1	Jamaica Tall (JAT)	90.0±20.0	13000.0±4600.0	160.0±20.0	14.0±4.0	2.0±0.8	10.5±1.5	Moderate to regular	7.0±1.0	24.0±4.0	Oil, coir, and activated carbon
2	Trinidad Tall (TRT)	100.0±20.0	14400.0±4800.0	180.0±20.0	17.5±4.5	2.6±1.0	12	Regular	6.5±0.5	22.0±4.0	Oil, coir, and activated carbon
3	Panama Tall (PNT)	110.0±20.0	15800.0±5000.0	155.0±15.0	15.0±3.0	2.2±0.8	12	Regular	6.0±1.0	26.0±4.0	Oil (VCO), coir, and activated carbon
4	Puerto Rico Tall (PRT)	92.5±17.5	13300.0±4300.0	170.0±20.0	15.5±4.5	2.2±0.9	11.0±1.0	Regular	6.5±0.5	23.5±3.5	
5	Dominican Tall (DMT)	125.0±25.0	18000.0±6000.0	195.0±25.0	22.5±5.5	3.2±1.2	12	Regular to high	6.5±0.5	21.0±3.0	
6	Grenada Tall (GNT)	102.5±17.5	14700.0±4500.0	165.0±15.0	16.5±3.5	2.4±0.8	10.0±1.0	Moderate to regular	7.0±1.0	21.5±3.5	
7	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
8	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

Table B.2 – Hybrids

No	Hybrid Code/Name	Parentage	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	Jamaica Tall × Malayan Dwarf (JAM × MD)	Tall × Dwarf	145.0± 25.0	23200 ±4000	170.0±20.0	23.0±5.0	3.7±0.8	12	High	4.0±0.5	16.0±2.0	
2	PB121	Malayan Red Dwarf × West African Tall (MRD × WAT)	165.0 ±25.0	26400 ±4000	180.0±20.0	28.0±6.0	4.5±1.0	12	Very High	3.5±0.5	14.0±2.0	
3	PB132	Malayan Yellow Dwarf × Panama Tall (MYD × PNT)	155.0 ±25.0	24800 ±4000	167.5±17.5	24.5±5.5	3.9±0.9	12	High	4.0±0.5	16.5±2.5	
4	PB212	Malayan Green Dwarf × Cameroon Tall (MGD × CMT)	170.0 ±30.0	27200 ±4800	190.0±20.0	31.0±7.0	5.0±1.2	12	Very High	3.5±0.5	15.0±2.0	
5	MAWA	Malayan Dwarf × West African Tall	152.5 ±22.5	24400 ±3600	180.0±20.0	26.5±5.5	4.2±0.9	12	High	3.8±0.8	15.0±2.0	

NOTE: Hybrid palms are not suitable sources of planting materials.

Source: Information from base document (PNS/BAPS 238:2018) and supplemented by desk research : Technical Report "Coconut Industry Development for the Caribbean" under ITC/CARDI Contract No: 2015-57-EF June2016: https://www.coconuts.cardi.org/wp-content/uploads/2023/06/2.2.1.1-assessment_coconut_pgr_caribbean_-_reviewed_rb_final.pdf

Annex C
(Informative)

Preparing seedbeds for coconut seedlings

Proper seedbed preparation ensures healthy germination, uniform growth, and strong seedlings ready for transplanting. A well-prepared seedbed provides optimal soil conditions, moisture, and protection for young coconut plants. The principal steps are as follows:

1. **Site Selection**
   - Choose a well-drained area with fertile soil.
   - Ensure access to irrigation or natural water sources.
   - Select a location protected from strong winds and livestock.

2. **Land Preparation**
   - Clear weeds, debris, and stones.
   - Clear, plough and rotovate soil to a fine tilth
   - Apply organic matter (compost or farmyard manure) to enrich fertility.

3. **Seedbed Layout**
   - Construct beds of 10 - 20 cm in height and 2 m in width for easy management
   - Provide pathways of 60 cm between beds for ease of inspection, irrigation, seedling care and transfer activities.

4. **Soil Treatment**
   - Mix in well-decomposed organic manure.
   - Apply lime if the soil is acidic, based on soil test results.
   - Incorporate biofertilizers or beneficial microbes to improve seedling vigour.

5. **Seed Placement**
   - Place seed-nuts in bed at a distance of 15cm between two seed-nuts along the row and at a distance of 15-20 cm between rows
   - Lay seed-nuts in trenches of 10 – 15 cm depth.
   - Place selected nuts horizontally, with the stalk end slightly raised.
   - Plant seed-nuts by firmly setting them either horizontally or vertically or slightly tilted with the embryo end at the top
   - Space nuts 30–45 cm apart to allow adequate root and shoot growth.
   - Cover lightly with soil or mulch to conserve moisture.
   - Cover 2/3 of the seed-nuts with topsoil so that 1/3 of their upper surface is visible.

6. **Watering and Care**
   - Spread dry coconut fronds (ensure free of pests) and/or coir evenly as a mulch for the seedbeds.
   - Water regularly to maintain consistent moisture.
   - Protect seedbeds with shade nets or palm fronds to reduce heat stress.
   - Monitor for pests and diseases; remove affected seedlings promptly

Source(s): https://www.coconuts.cardi.org/wp-content/uploads/2023/03/Brochure-Nursery.pdf?utm_source=copilot.comwhich (authoritative source)

(2): Best Practices for Coconut Seedling Nursery Management: ***https://agriculture.institute › production-tech...***

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: Not recommended for monoculture	

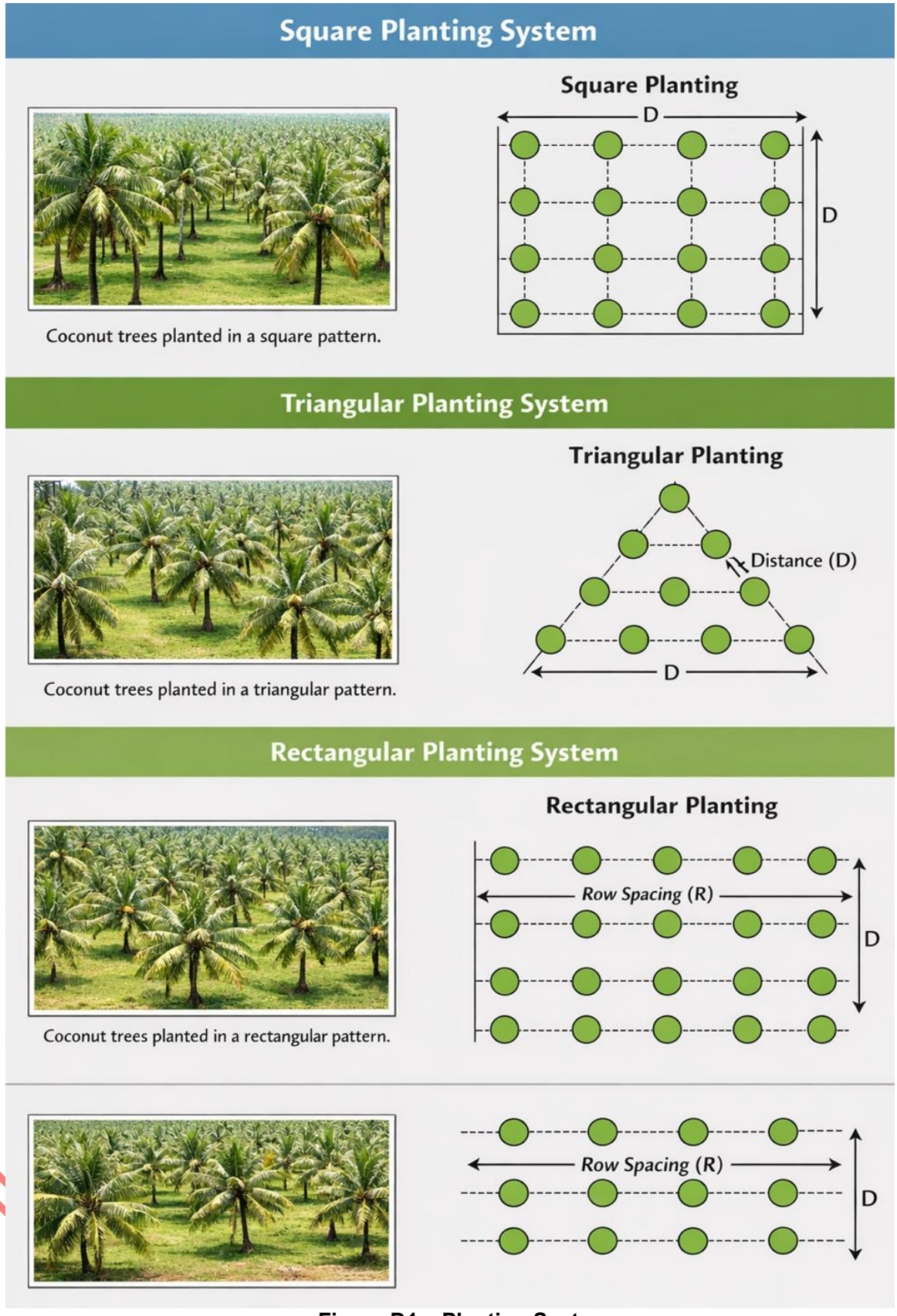

Figure D1 – Planting Systems

Source(s): Adopted from base document (PNS/BAPS 238:2018) and Recent Developments and Possible Future Trends (Cont'd) : https://www.fao.org/4/af298e/af298e23.htm and https://coconutboard.in/images/Packageofpractice.pdf

Annex E
(Informative)

Recommended fertilisation rates

E.1 Nursery

Table E.1 - Fertilisation 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 5	20 40	2.0 4.0	25 45	2.5 4.5
Total Nursery	60	6.0	70	7.0

E.2 Nursery

Table E.2 - Fertilisation 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 5	20 40	2.0 4.0	20 40	2.0 4.0
Total Nursery	60	6.0	60	6.0

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

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 E.4 - Using (NH4)2SO4 + 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
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

E.5 For inland areas planted more than 2 km from the coastline

Table E.5: Using (NH4)2SO4 + 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 E.6 - Using (NH4)2SO4 + 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 E.7 - Fertiliser nutrient recommendations for coconut (a guide)

Age	Nutrient rate per palm						
	N	P2O5	K2O	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

Source(s): Adopted from base standard (PNS/BAPS 238:2018) and supplemented by:

Fertilizer recommendations for coconut based on soil and leaf analyses (FAO AGRIS, Philippine Journal of Coconut Studies, Vol. 16, Issue 2). Available at:
(1): fao.org
(2): https://agris.fao.org › search › en › providers › records

Annex F
(Informative)

Integrated Pest Management strategies

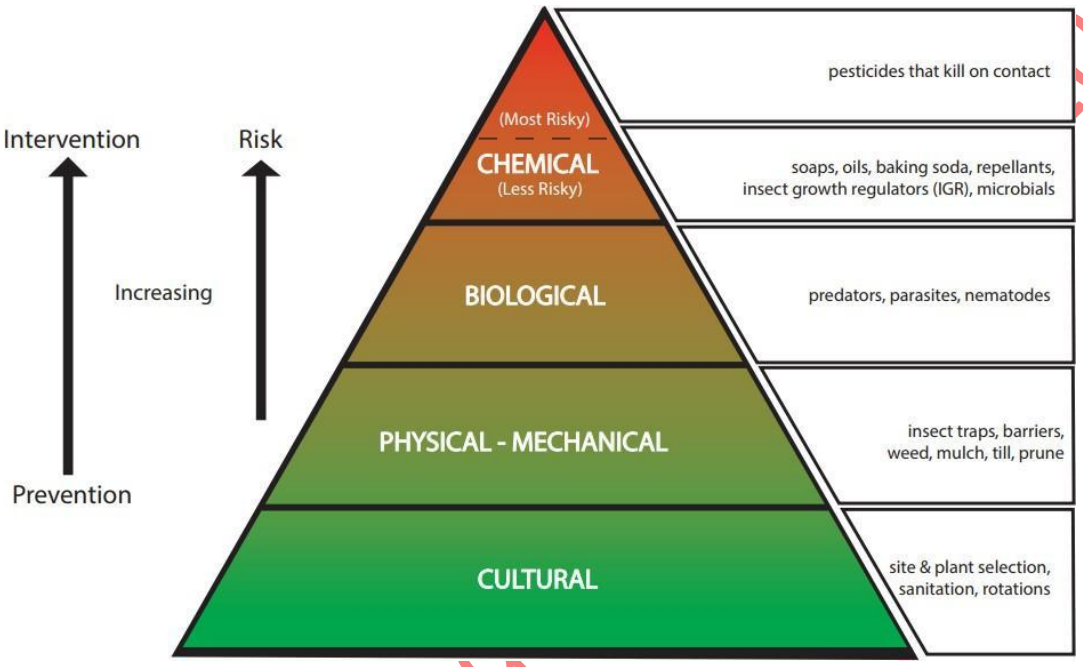

Figure F.1 – Pyramid of IPM tactics

F.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	Coleopterl
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 kilometres from the infestation spot are done to prevent the beetle from spreading.
• **Biological control**	Two parasitoids of the coconutleaf beetle, Tetrastichus brontispae and Asecodes hispinarum, have been successfully used in the control of the beetle.
2. Asiatic palm weevil	
Scientific name	*Rhynchoporus ferrugineus*
Synonyms	Indian Palm Weevil, Coconut Weevil
Common name	Red 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
Family	Coccoidae
Order	Hemiptera
Damage characteristics	1. Scales with yellow spots 2. Entire leaves turning yellow to brown and falls 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 the 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, and avoid green manure
Biological control	Predacious soil beetles, a predatory pentatomid, *Eocanthecona furcellata* (Wolff) and Reduviid bug, *Sycanus* sp.
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 the MAWA (Malayan Yellow Dwarf x West African tall) hybrid was 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 more than the green populations.

b) Fungal species as biocontrol agents against *Phytophthora* under laboratory conditions	*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 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 the axils of leaves and fruits.
2. Leaf spot [*Pestalozzia palmarum* (Cooke) Steyart and *Helminthosporium* sp.]	
a) Resistant coconut variety to fungal 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 populations, 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) fertiliser included resistance of palms to leaf spot	Application of potassium chloride (KCl) fertiliser 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.
3. Socorro wilt	
Integrated disease management strategies against the Socorro wilt	Cutting and burning of infected palms at the earliest sign of infection minimises the spread of the disease as it has been observed to spread up to 12 km radius from the coconut farm where it was first identified to occur (Socorro, Oriental Mindoro). Strict quarantine regulations by restricting the 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 pests. Use of Cl-based fertilisers reduces it. • Avoid wounds on the trunk • Alliete and Benlate were found to inhibit the growth of *T. paradoxa in vitro.*
5: Algal leaf spot caused by Cephaleuros virescens and lethal yellowing disease caused by Candidatus phytoplasma palmae	
Integrated disease management strategies based on underlying causes such as nutrient deficiency, water and environmental stress and pests and diseases	Treatment technologies focus on correcting soil nutrition, improving water management, pest control, and—where lethal yellowing is present—using resistant cultivars or therapeutic injections. For lethal yellowing disease, there is no cure once the palms are infected. Management strategies include: • prompt removal and destruction of infected plants • planting resistant varieties • adopting strict quarantine and nursery hygiene, implementing vector control measures
Source(s): Adopted from base document (PNS/BAPS 238:2018) and supplemented by **Pesticide management | Pest and Pesticide Management … available at:** Food and Agriculture Organization *https://www.fao.org › pest-and-pesticide-management...*	

Annex G
(Informative)

Guide to selection, mixing and safe handling of crop protection products

G.1 The mixing area should be located and chosen in such a way that the risk of contaminating the farmers and the environment is minimised.

G.2 Mixing agricultural chemicals should be carried out in a manner that will prevent ground and surface water contamination and the land in the surrounding areas.

G.3 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 a 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.

G.4 Emergency facilities in the event of accidental spill during mixing should be readily available.

G.5 Prepare only the necessary volume of spray solution to avoid surplus application mix.

G.6 Surplus application mixes are disposed of in a manner that does not present a risk of contaminating the produce.

Source(s): Adopted from base document (PNS/BAPS 238:2018) and supported by Guidelines for the safe and effective use of crop protection products
CropLife International *https://croplife.org › wp-content › uploads › pdf_files › ...* · PDF file

Annex H
(Informative)
Recommended intercrops and livestock to be integrated with the coconut

H.1 Recommended intercrops

Vegetables/Legumes

- Cabbage
- Okra
- Onion
- Peanut
- Musk Melon
- Tomato
- Squash
- Eggplant
- Bitter gourd

Root Crops

- Sweet Potato
- Cassava
- Arrowroot
- Ginger
- Turmeric

Fruit crop/Fruit Trees

- Banana
- Pineapple Citrus (Mandarin)

Beverage Crops

- Coffee
- Cacoa

Spice and Herbs Crops

- Hot Chilli
- Sweet Pepper
- Black Pepper
- Basil
- Rosemary
- Tarragon

Cereals

- Corn
- Rice

H.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	High to Moderate/Highly Suitable Intercrops: Cereals – corn, upland rice Legumes – peanut, beans, Root crops – sweet potato Fruit crops – pineapple, citrus, watermelon, papaya, banana Vegetables – tomato, cabbage, eggplant, sweet pepper, hot pepper, okra
II	7-25 years[a]	Moderate to Low/Highly Suitable Crops: Black pepper, cacao, coffee, tomato, vanilla, ginger
III	26-60 years	High/Highly Suitable Crops[b] Cereals – corn, upland rice Legumes – peanut, beans Vegetables – tomato, eggplant, cabbage, sweet pepper, hot pepper, okra, ginger Root crops – sweet potato, cassava, Beverage crops – coffee, cacao Fruit crops –citrus Wood and lumber tree – Fibre crops –

[a] Except for tomato, usually the suitable crops indicated require lower sunlight or moderate shade during the pre-bearing stage of the crops, thus field establishment is best done during this stage.
[b] Should more sunlight transmission to intercrops needed for normal growth and high yields, the coconut leaf pruning (CLP) technique (removal of older lower leaves of the crown, maintaining the upper 20-23 leaves), allowing 0.5 meters of cut fronds attached to the trunk.

H.3 Recommended livestock to be integrated with coconut

Animals, such as cattle, small ruminants such as goats, pigs, 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 the cut and carry or feed lot system, more animals per hectare are suitable, provided adequate pasture grasses and legumes are available year-round.

In case of goat and/or sheep production systems, these should be raised only 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 a cheap source of fertiliser to increase coconut yield.

Sources: Adopted from base document (PNS/BAPS 238:2018) and supplemented with Recommended intercrops and livestock to be integrated with coconut - Plantations International https://www.plantationsinternational.com/coconuts/ ……. and https://www.fao.org/4/af298e/af298E00.htm#TOC

Annex I
(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 within farm or non-accredited sources - chemical used for treatment, if applicable - purpose of the treatment - varietal classification (tall, dwarf, hybrid)
Fertiliser and soil additives	Type of fertiliser used (organic or inorganic)
	Name of fertilizer
	Source - brand name - supplier - lot number
	Date
	Quantity
	Expiration date (for liquid fertiliser)
	Fertilizer grade
	Application – date - location of the area fertilised - number of fertilised farms - application rate (per palm) - application method - name of applicator
Water quality	Water source
	Test results or certification
	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 - 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)

Section	Records
	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 the 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 welfare	Medical certificate
	Record of salary and wages received by farmers
	Social protection (e.g. National insurance, health/medical insurance)
Waste management	Types of waste products generated, practices to minimise waste generation, procedures for reuse and recycling of waste, storage and disposal of waste

Source(s): Adopted from base document (PNS/BAPS 238:2018) and supplemented with information from Global GAP Certified Coconuts: A Win-Win for Importers and Consumers*; available at:* grofarm.eu *https://grofarm.eu › global-gap-certified-coconuts-a...*

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