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PHILIPPINE NATIONAL STANDARD

NON-FOOD CROPS — ABACA — CODE OF GOOD AGRICULTURAL PRACTICES (GAP)

Republic of the Philippines
Department of Agriculture
BUREAU OF AGRICULTURE AND FISHERIES STANDARDS

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Foreword

The Philippine National Standard (PNS) Code of Good Agricultural Practices (GAP) for Abaca was developed by the Bureau of Agriculture and Fisheries Standards (BAFS) as per the request of the Philippine Council for Agriculture and Fisheries (PCAF) Commercial Crops Resolution No. 11 Series of 2016. It has been prepared by the Technical Working Group (TWG) for the development of the Standard as per Department of Agriculture Special Order Nos. 650 and 763 Series of 2017. This Standard has been approved by the Secretary of the Department of Agriculture in 2019.

This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part2.

Introduction

This Code addresses Good Agricultural Practices (GAP) that will provide specific guidance to abaca stakeholders in the production of quality fiber that ensures biosecurity relating to workers' health, safety and welfare, and environmental hazards associated with the production, postharvest, handling and transport of abaca.

It adopts the relevant provisions and follows the format of the Philippine National Standard (PNS) for Good Agricultural Practices (GAP) for Non-food Agricultural Commodities (PNS/BAFS 204:2017), Abaca Sustainability Manual, PhilFIDA Farmer's Manual on Abaca Production and Abaca Techno guide, and other relevant national and private standards intended for the production and postharvest handling of abaca fiber. It provides additional and specific guidelines for the production of abaca fiber and should be read in conjunction with the PNS GAP for Non-food Agricultural Products, Abaca Sustainability Manual, PhilFIDA Farmer's Manual on Abaca Production and Abaca Techno guide.

The development of GAP for Abaca aims at assisting the farmers to produce quality fiber that will enhance its competitiveness in the domestic and international market. It also helps the farmers in improving productivity and protecting the crop from pests and diseases through proper use of natural resources that promote sustainable agriculture.

1 Scope

This Code covers the relevant practices in the production, postharvest, handling, storage, and transport of abaca fiber. The provisions of this Code address the production of quality fiber, worker's health, safety and welfare and environmental management.

2 Normative References

There are no normative references used in this document.

3 Terms and definitions

3.1
abaca
plant scientifically known as *Musa textilis* Nee of the Family Musaceae, is endemic in the Philippines, resembling banana plant but with slenderer stalk; narrower pointed and smaller leaves; and many-seeded fruit. The different parts of an abaca plant are shown in Annex A

3.2
abaca fiber
filament extracted from the stalks of abaca plant. It is internationally known as Manila Hemp used in the production of pulp for industrial use, cordage, fiber craft, and fabrics

3.3
agricultural input
any incoming resources like planting materials, organic and inorganic fertilizers, water, and labor used for the primary production of abaca

3.4
bacbac / umbac
dried outer leaf sheaths

3.5
biological control
use of other living organisms such as insects, microorganisms and/or microbial metabolites for the control of pests and diseases

3.6
biosecurity
strategic and integrated approach to analyze and manage risks in food safety, animal and plant life and health, and biosafety. It provides a policy and regulatory framework to improve coordination and take advantage of the synergies that exist across sectors, helping to enhance protection of human, animal and plant life and health, and facilitate trade.

3.7
bundling
packing of dried abaca fiber into desired weight or volume

3.8
contaminant
any material causing hazard intentionally or unintentionally mixed to abaca fiber during the production and postharvest processing transporting and trading

3.9
contamination
introduction or occurrence of a hazard during the production, postharvest, handling/on-farm processing and transport of abaca

3.10
disinfection
reduction in the number of microorganisms on/in the commodity and on the production sites including facilities through chemical agents and/or physical methods to a level that does not compromise product quality or suitability

3.11
drying
removal of excess water from the fiber which is done either by sun-drying or air-drying the abaca fiber before storage

3.12
farm
any premise, establishment or immediate surroundings in which abaca is grown and harvested

3.13
fertilizer
includes any substance – solid or liquid – or any nutrient element or elements –organic or inorganic – singly or in combination with other materials, applied directly to the soil, foliage or plant for the purpose of promoting plant growth, increasing crop yield or improving the quality of abaca plant

3.14
flag leaf
last leaf appearing after planting which indicates maturity or readiness of abaca for harvesting

3.15
Good Agricultural Practices (GAP)
practices that address environmental, economic and social sustainability for on-farm processes, and which result in increased quantity of safe and quality food and non-food agricultural products and safety of workers

3.16
grading
classifying abaca fiber according to the standards set by the competent authority on the quality of abaca fiber

3.17
hardening
conditioning of plants for survival when transplanted outdoors

3.18
hill
point/place at which planting materials are planted

3.19
induced production of bacbac
deliberate incision at the base of each outer leafsheaths regardless of the maturity of the plant and allowing it to dry naturally for commercial purposes

3.20
Integrated Pest Management (IPM)
pest management approach that uses all available pest control methods including but not limited to judicious use of pesticides, to optimize a crop's ability to resist the pest with the least hazard to man and environment

3.21
leafsheath
overlapping sheaths that form the stalk (pseudostem) of abaca plant where the fiber is obtained as shown in Annex A

3.22
mat
grouping of abaca plants in a hill

3.23
pest
harmful animal, plant, and microorganism that may affect the production quantity and quality and safety of abaca. These include insects, mites, pathogens, weeds, rodents, mollusks and birds

3.24
pesticide
any substance or product, or mixture including active ingredients, adjuvants and pesticide formulations intended to control, prevent, destroy, repel or mitigate directly or indirectly any pest. The term shall be understood to include insecticide, fungicide, bactericide, nematicide, herbicide, molluscicide, avicide, rodenticide, defoliant, desiccant and the like

3.25
planting material
type of materials used to establish or replace abaca plant in the field as shown in Annex A

3.25.1
corm
rootstock; underground modified stem that contains nodes and internodes

3.25.2
eyebud
portion of the seedpiece containing one prominent bud

3.25.3
seedpiece
section of a corm containing at least three (3) viable eyebuds

3.25.4
sucker
shoot from the mother plant

3.25.4.1
immature sucker
nine (9) to eleven (11) month old sucker that is at least one (1) meter tall

3.25.4.2
sword sucker
one (1) to three (3) month old sucker with leaves without midribs and very narrow lamina that is about 0.5 m tall

3.25.5
tissue-cultured plantlet
true-to-type plantlet developed in laboratories and transferred to nurseries for hardening

3.26
postharvest
operations/primary processes undergone by abaca prior to sale

3.27
ring weeding
removal of unwanted plants around abaca. This also helps to mark newly planted areas and vacant hills

3.28
fiber extraction
process of extracting fiber from abaca

3.28.1
hand-stripping
manual method of extracting fiber by manually pulling the tuxy placed between a block and serrated or non-serrated stripping knife

3.28.2
spindle-stripping
mechanized method of extracting the fiber where the tuxy is wound around tapered-shaped spindle rotated by motor or engine

3.28.3
decortication
mechanized process of extracting abaca fiber where leafsheaths are scraped by means of revolving wheels with blades

3.29
stripping knife
metal shaped like a bolo with a long wooden handle use for hand stripping which may or may not have serrations

3.30
topping
cutting of leaves of stalks prior to tumbling

3.31
tumbling
cutting of the abaca stalk at the base

3.32
tuxy
outer layer of abaca leafsheath which contains the abaca fiber

3.33
tuxying
process of extracting the outer layer of the leafsheath using tuxying knife where incisions are made between the outer and the rest of the layers of the leafsheath. The exposed bit of the outer layer is gripped and manually pulled to separate the entire length from the rest of the leafsheath to produce the tuxy

3.33.1
locnit
method of tuxying in which the tuxying knife is inserted in the leafsheath, still attached to the stalk, in a slanting position, gripping the exposed part and pulling it through to produce the tuxy. The rest of the leafsheath is then manually separated from the stalk and discard as waste

3.33.2
bacnis
method of tuxying in which the leafsheath is first separated from the stalk. It is then cut into two to three sections depending on the size of the width the tuxero can handle. An incision is made in the cut leafsheath, the exposed part is gripped and pulled through to produce the tuxy

4 Primary Production

4.1 Production Site

Evaluation of the production site should be conducted to assess if it will pose significant risks to the primary production, postharvest, handling and transport of abaca fiber or whether the production practices to be employed will have potential negative impacts to adjoining sites. Physical risk assessment of existing and new site(s) should include considerations on flooding, wind velocity, drainage and erosion. The following risks should be evaluated and monitored:

a. history of land use and cropping pattern;
b. slope and potential for run-off from nearby field;
c. activities carried on adjoining sites;
d. pests and diseases;
e. microbial hazards including fecal and organic waste contamination; and
f. access of domestic and wild animals to the site and water sources used in primary production

4.1.1 Topography and climate

Abaca is recommended to be planted in either sloping or rolling, hilly or mountainous with fair to good drainage or well-drained flat lands less

than 1000 m above sea level. Abaca is suitable on areas with temperature of 20°C during cool months to 25°C during warm months and/or preferably, Type 2, 3 and 4 climates. Other topographic and climatic considerations for abaca production are listed in Annex B.

4.1.2 Soil

Preferably, abaca should be planted on sandy clay loam or clay loam soil that is rich in organic matter, loose, friable, and well drained with volcanic origin at pH 5.8 to 7.0.
Other considerations are listed in Annex B.

4.2 Agricultural inputs

Agricultural inputs should not contain contaminants beyond the acceptable levels that may adversely pose significant risk to the production of abaca, such as those affecting the quality of abaca fiber and the environment as well as the health, safety and welfare of the farmers.

Levels of the contaminants from agricultural inputs should be checked and monitored by the competent authority.

4.2.1 Abaca planting materials

Various planting materials such as tissue-cultured plantlets, corms/seedpieces, suckers and seeds may be used to propagate abaca in the field. All planting materials shall be pest- and disease-free. Tissue-cultured plantlets should be hardened for three (3) months to withstand transplanting stress in the field. The list of suggested abaca varieties is shown in Annex C. Planting materials shall be sourced from accredited nurseries, competent authority, and/or commercial producers.

In cases where transport of planting materials is necessary, movement should comply with the rules and regulations of the competent authority to prevent the proliferation of pests.

4.2.2 Fertilizers and pesticides

Farmers should use only fertilizers and pesticides that are registered with the competent authority for the cultivation of abaca. They should be used following the instructions printed in the label. Based on the risk analysis

categorization, residues should not exceed levels established by the Codex Alimentarius Commission, ASEAN Standards or by the Philippine National Standard (PNS).

If these inputs are found to be contaminated with heavy metals or other chemicals at levels that may affect the quality of abaca fiber safety and usage of such products, their use should be stopped. To minimize loss and contamination of the abaca plants, the procedures to use must follow the recommendations of competent authorities.

Unused fertilizers, soil amendments and nutrient solutions should be properly kept/disposed following the instructions printed in the label. Disposal of empty pesticide containers and packaging materials should follow the rules and regulations set forth by the competent authority.

4.2.3 Farm tools and implements

Farm tools and implements should not contain contaminants beyond the acceptable levels that may adversely pose significant risk to the production of abaca, causing the increased presence of insect pests and diseases, and posing risks to the environment and worker's health, safety and welfare.

4.3 Land preparation

For newly opened farms, prior to land preparation, soil sampling and analysis should be conducted to determine if the soil is suitable for production of abaca and to guide in the preparation of a soil fertility management program. The number of soil or foliage samples must correspond with the size of the production area, types of soil, and variations in its properties, as well as results of previous analyses. The standard protocol of collecting soil samples for laboratory analysis by the competent authority is presented in Annex D.

Land preparation should be done based on type of soil, slope and terrain, and vegetation growing within the production area. For both new and existing areas, the soil should be plowed and harrowed to reduce weed population and enhance aeration of the soil. In planting abaca as intercrop for coconut, deep plowing should be done, once or twice to loosen the soil and break densely matted coconut roots.

4.3.1 General clearing

Shrubs, bushes and grasses growing in the production site should be removed close to the ground. Debris should not be left scattered on the field, which could harbor insect and animal pests such as rodents, termites and weevils. Trees that would serve as windbreaks should be maintained.

4.3.2 Lay outing/ laying out, staking and holing

The selection of planting methods should take into consideration the topography, slope and terrain of the production site, characteristics of abaca variety to be planted and farming systems to be undertaken.

4.3.2.1 Planting orientation, distance and density

Generally, abaca should be planted using the square method at a distance not less than two (2) meters in an east to west orientation to maximize exposure to sunlight. Planting distance may vary from 2 meters by 2 meters to 3 meters by 3 meters depending on the varieties. Other recommended planting distances are listed in Annex E.

In addition, abaca should be planted at least 500 m away from corn (*Zea mays* L.) farms because corn is a host to insect vectors that transmit viruses causing diseases and destroying abaca plants.

4.3.2.2 Staking and holing

After planting distance is established, sticks or any other available materials should be used to mark each hill where abaca planting materials are to be established. When digging, top soil should be separated from the sub soil.

4.3.3 Planting of shade trees

Abaca needs 40% to 70% shade. Shading provides protection from winds and strong rains; diffuses sunlight during the dry season, conserves soil moisture and reduces temperature, which is favorable to abaca. Examples of suitable shade trees are *katuray* (*Sesbania grandiflora* L.), *anii* (*Erythrina fusca* Lour), *dapdap* (*Erythrina* sp. L.), coconut (*Cocos nucifera* L.) and *lanzones* (*Lansium domesticum* Corr.).

4.4 Planting

Preferably, abaca should be planted at the onset of the rainy season. Where rainfall is throughout the year, planting could be done at any time.

4.4.1 Transport and hauling of inputs

Any form of transport vehicle should be checked before use for cleanliness, chemical spills, foreign objects and pest infestation. It should be cleaned if contaminants are present and there is significant risk of affecting the planting materials, farm tools and implements.

4.4.2 Planting of abaca materials

Top soil should be placed at the bottom of the holes prepared before planting. Marking of places where corms and eyebuds are planted should be done.

4.5 Maintenance and sanitation

The conditions of newly planted plants should be checked by visiting the farm two (2) or three (3) weeks after planting to determine if replanting is necessary. For existing farms, maintenance of abaca plants per hill should be observed which include removal of weeds and dried leaves. Monitoring the presence of aphids and other pests should be done. The induced production of bacbac shall not be done since it will harbor pests and diseases.

Adequate areas for disposal of biodegradable and non-biodegradable wastes should be provided in the field. Non-biodegradable wastes such as plastics, metal containers, bottles and sacks of fertilizers should be segregated from biodegradable waste materials. Composting of biodegradable waste is highly encouraged.

4.5.1 Ring weeding and underbrushing

Ring weeding should be done regularly for newly emerged shoots and transplants to mark location of vacant hills. In established farms, ring weeding should be done one-half (1/2) meter around the hills, starting from the inside towards the outside. Underbrushing should also be done to remove weeds, which could be potential hosts to insect pests and diseases.

4.5.2 Replanting of missing hills

Replanting is done to replace missing hills. Immature suckers produced on mats of healthy mother plants may be used. Sword suckers are not recommended for replanting or rehabilitation of old farms because of its high mortality rate.

4.5.3 Fertilizer application

Fertilizer requirement and rate of application should be in accordance with Annex F. Soil or foliage sampling and analysis may be undertaken every after five (5) years, with advice from a competent authority. Judicious application of organic or inorganic fertilizers should be done to avoid any potential negative impacts on the environment. Organic fertilization using residues generated in the farm should be given priority.

Before fertilization is done, ring weeding should be undertaken. Fertilizers should be applied 60 cm to 90 cm away from the plants to avoid wastage and maximize effectiveness.

For organic fertilizer, farmers must neither use undecomposed farm wastes nor liquid sewage and human and animal waste. If the farm produces its own organic fertilizer (e.g. compost), proper treatment procedures should be adopted to reduce or eliminate the pathogens present in the raw material and to minimize the probability of environmental contamination and decrease yield. The procedures adopted by the farmer in the production of its own organic soil amendments should be recorded. The composting site should also consider the source of water and substrate, topography and proximity to the farm and residential areas to prevent cross contamination from run off or leaching.

4.5.4 Pest and disease management

Farmers are encouraged to apply the principle of Integrated Pest Management (IPM) wherein the use of chemical pesticides should be on need basis to minimize negative environmental impacts.

To control or manage insect pests and diseases of abaca, chemical pesticides and biological control agents (BCA) should be used.

The list of abaca insect pests and diseases is listed in Annex G.

4.5.4.1 Integrated Pest Management (IPM)

IPM for abaca concerns the prevention of pathogens, insects and weeds from causing economic crop losses by using a variety of pest management method that are cost effective and cause the least damage to the environment. The program must give priority to the use of modified cultural management practices, regulatory, biological control method and the judicious use of chemicals through training and information dissemination. The component of IPM is presented in Annex I.

4.5.4.2 Pesticide application and chemical control

Only trained farmers should handle agrochemicals. They should also have knowledge on pest, type of pesticide and its dosage, type of sprayer and nozzle, and the method of application. Protection of farmers from pesticide exposure through use of Personal Protective Equipment (PPE) should be ensured. Examples of PPE are shown in Annex H.

Only green-labelled pesticides shall be used. Banned pesticides known for their negative impacts to human health and natural resources must not be used to control insects and animal pests and diseases in the farm.

To minimize the excessive application and waste of pesticides, proper procedures and equipment for mixing these products, maintenance and calibration should be observed. Handling and application of pesticides should be done according to the manufacturer's instructions or as indicated in the label.

When insecticidal spray is necessary, the recommended dosage of green-labelled insecticide should be followed. Protective gears must be provided. Abaca should be sprayed with insecticide from its top going downward of the base of the plant.

4.5.4.3 Biological control

Only recommended BCA or products should be used following the instructions of authorized manufacturer/crop protection specialist.

All insect pests are affected by natural control that limits their reproduction, growth and population. The most practical method of biological control is to create favorable conditions that increase population of indigenous predators and parasites. Predatory biological agents such as spiders, beetle (*Scymnus* sp.), earwig and ants are naturally present in abaca farms. They feed on aphids harboring the plants that regulate their population. The cultural and agronomic practices that will enhance the growth of natural enemies should also be employed.

4.6 Harvesting

Harvesting should be done based on maturity indicators to produce quality fiber. Abaca should be harvested when the flag leaf appears. Subsequent harvest may be done at three (3) to four (4) months interval or as frequent depending on the appearance of a mature abaca. This will give time for the stalks to mature, avoid gaps for proliferation of weeds and prevent over maturation.

Appropriate tools such as bolo, knives and sickles that have direct contact with abaca planting materials and harvested leafsheaths and tuxy should be regularly cleaned, disinfected and maintained in good condition to prevent contamination and assure the production of quality fiber.

4.6.1 Topping

Topping should be done before tumbling the stalk to avoid damage. Leaves should be cut at the base of the petioles using a sickle fastened at the top of bamboo pole.

4.6.2 Tumbling

The stalk should be cut in a slanting position at least 8 cm from the base to avoid water accumulation in the cut portion after tumbling.

4.6.3 Tuxying

After tumbling, tuxying follows with the use of a thin ledge, double bladed knife, and employing either the *locnit* or *bacnis* method. Tuxying should be done immediately after tumbling (within 24 hrs) to prevent

discoloration of the tuxies that will cause the quality of the abaca fiber to downgrade tuxies should be segregated based on the location of the leafsheath in the stalk, to facilitate proper fiber grading.

4.6.4 Pre-classification and hauling of tuxies

At the farm level, abaca should be pre-classified according to the location of the leafsheath in the stalk (i.e. inner, middle and outer) to facilitate final grading. Abaca fiber should be graded and classified according to PNS/BAFS 180:2016 and PNS/BAFS 181:2016.

Before using any form of transport vehicle, it should be checked for its cleanliness, chemical spills, foreign objects and pest infestation

5 Fiber extraction

Extraction of fiber should be done within the day after tuxying to prevent discoloration of the tuxy. Three (3) methods of fiber stripping may be done to extract the fiber as follows:

5.1 Manual or hand stripping

Pre-classified tuxies to extract abaca fiber by manual method should be utilized. The recommended stripping knives set forth by the competent authority should be used to produce the desired grades. The information regarding stripping knives is shown in Annex J.

Supplementary information regarding spindle stripping is shown in Annex K.

5.2 Spindle stripping

Spindle stripping is a mechanical process of fiber extraction using zero serrated knife where tuxies are used like manual stripping. With a regular spindle stripping machine, a stripper can produce maximum of 120 kg of dried fiber in a day of operation.
For safety of the operators, at least 1.5 m from all sides of the machine of waste fiber, tuxy waste and other debris that tangle with the rotating spindle or flywheel should be cleared. Only experienced operators should use the machine. Non-authorized personnel especially children should not be allowed near the machine during stripping operation. Operators

should not wear long sleeves, or shirts with exposed buttons, accessories and any other paraphernalia that may tangle with the fiber during the operation. Operators are not allowed to drink alcoholic beverage at all times during the stripping operations. The machine should only be operated during daytime. Stripping during nighttime may be allowed only under proper lighting.

Supplementary information regarding spindle stripping is shown in Annex K.

5.3 Decortication

Unlike in manual and spindle extraction processes, strips of leafsheath are used instead of tuxies.

In operating the decorticating machine, the safety measures should be observed.

Supplementary information regarding decortication is shown in Annex K.

5.4 Disposal of extraction wastes

Wastes like leaves, stalks, and debris should be properly disposed. Waste discharge from postharvest must not degrade receiving bodies. Recycling or composting such as but not limited to: growing medium for mushroom and substrate for vermicomposting should be recommended.

6 Drying, sorting and bundling

6.1 Drying

Abaca may be sun-, air- or mechanically-dried before storing. Thorough drying must be done, at least a day of sunlight or air-dried two (2) to three (3) days to bring down the moisture to at least 15% to avoid fungal and bacterial growth that affects the fiber quality.

Abaca fiber should be dried immediately after extraction to avoid discoloration which will cause its downgrading. The fiber is either sun-dried by hanging in a bamboo pole or laying in a clean concrete pavement for at least two (2) to three (3) hours. For quick and good

drying results, abaca fiber should be hanged in thin layers and reversed after two (2) hours. Period of drying longer than the recommended should be avoided since this will cause the fiber to be brittle and its tensile strength to decrease. During the process, contamination with foreign materials should be avoided.

6.2 Sorting

Before bundling, abaca fibers should be segregated according to the location of the leafsheath where fibers are extracted in accordance to its cleaning and fiber color

6.3 Bundling

Hanks of abaca fiber are bundled manually. The size and weight of a bundle varies according to the type of transport used (i.e. capability of the farmer to carry the bundles).

Manually twisted abaca fiber of the same grade/quality is recommended for use as to tie the fibers into bundles. Plastic materials should not be used to tie the hanks. Two (2) to three (3) manually twisted abaca fiber are laid down on a clean pavement parallel, equidistant to each other, and long enough to tightly tie the bundle, to an approximate circumference of four (4) to six (6) feet.

The hanks should be arranged in such a way that the butt ends of the fiber are in the same position. Then these are laid across the manually twisted abaca fiber and folded in halves until the desired size of the bundle is met and tied securely.

The farmer is recommended to carry at least 30kg of bundled abaca fiber.

7 Storage and transport

Proper postharvest handling of abaca fiber should be done to minimize contamination and ensure optimum quality of the product.

7.1 Storage

The storage area should be well-ventilated and clean. The dried fibers are piled on top of a wooden pallet placed above the ground to prevent

moisture setting and discoloration in the fiber. Abaca fiber should be stored separately from other commodities (e.g. copra), tools and implements.

7.2 Transport

Transporting of abaca fiber from the farms after drying, sorting and bundling, to the traders and buying station may be done by any means convenient to the farmer provided that it is not mixed with other commodities that will contaminate the fiber.

Polyethylene bags may be used to wrap abaca bundles prior to hauling or transporting especially during the wet season.

8 Establishment: design and facilities

The stripping, drying, bundling and storing structure should be properly designed, constructed and maintained to minimize postharvest losses and risk of contamination of abaca fiber. The building and its structures should allow thorough cleaning and/or disinfection, if necessary and drying of pavements to ensure that pathogens would not grow in the facility.

8.1 Stripping area

The stripping area should be located in an enclosed structure to protect the stripping equipment from the changes of weather.

Cleanliness shall be maintained in the stripping area. The area shall be dry and free from contaminants such as leaves, stems, food waste and other foreign matter. The stripping area should be free from insects, mites and other urban pests. The size of the area depends on the occupants/ number of strippers. A stripping area with single stripper may occupy a space of about four (4) square meters (2 meters by 2 meters).

8.2 Drying area

The drying area could be an open space where bamboo poles supported by sturdy posts structures can be horizontally laid parallel to one another. The posts should be high enough such that when the fiber is hung, the ends will not touch the ground. The area should be free from any contaminants.

Due to changing climate pattern, an enclosed drying shed is desirable with proper lighting and ventilation.

8.3 Storage area

Abaca fiber should not be stored adjacent to structures of combustible materials. Storage area should have proper roofing and walls to protect the fiber from changes in weather conditions. There should be no unintended opening in the roof and wall that will cause the fiber to get wet when it rains.

9 Treatment and working conditions for farmers

All farmers must be treated in accordance with the rules and regulations set by the competent authority the agricultural sector.

9.1 Conditions on labor

The farm management should not hire based on race, color, gender, age, religion, social class, political tendencies, nationality, union membership, sexual orientation, civil status or any other motive. All workers should comply with the country's regulation of the minimum working age, which is 18 years of age and above, and not be subject to any form of child labor. All employees, workers and farmers should have their rights implemented and protected, be able to negotiate their working conditions and be paid at least minimum wage.

There should be no cases of forced labor and forced eviction. There should be no prohibition on membership or representation by labor union.

9.2 Health, safety and welfare of workers

All agricultural workers including contractors or visitors should maintain an appropriate degree of personal hygiene in order not to contaminate the produce. Wearing of protective clothing, gadgets and safe manual handling practices should be followed. In cases of emergency, the farm should be able to provide first aid measures and appropriate fire prevention and control measures. Farmers concerned in the application of agrochemicals must undergo training in interpretation, techniques, correct use of equipment, handling and transportation of these materials.

Where provided by an employer, living quarters should be suitable for human habitation (disease-free, hygienic and safe) and contain basic services and facilities such as access to safe and clean drinking water.

9.3 Training

All workers should be trained for Good Agricultural Practices. Thorough training should be given to workers operating dangerous or sophisticated equipment. Workers should receive basic training in cleanliness requirements. The training program should outline the need for general safety.

10 Documentation and records

The farmer should keep farm record to facilitate recalls and product safety investigations. The following should be recorded:

- soil analysis
- weather condition during harvesting of produce (when applicable)
- types, varieties/clones and sources of planting materials
- types and usage of agricultural inputs (pesticides, fertilizer, growth regulators, etc.)
- suppliers of agricultural inputs
- lot number of agricultural inputs
- production site with lot codes
- water management practices
- water source and quality
- processing including the date, method and final volume of product
- pest control (dosage, schedule, frequency, and cleaning schedules of equipment, etc.)
- raw material used, start and end date of treatment in case of farm producing its own inputs.

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Annex A
(informative)

Abaca plant

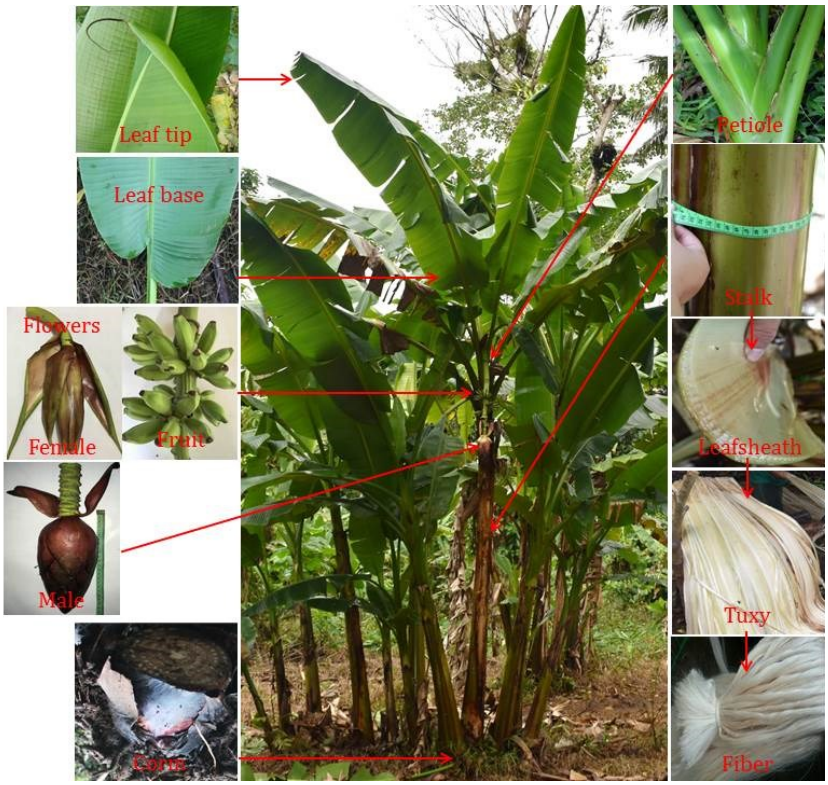
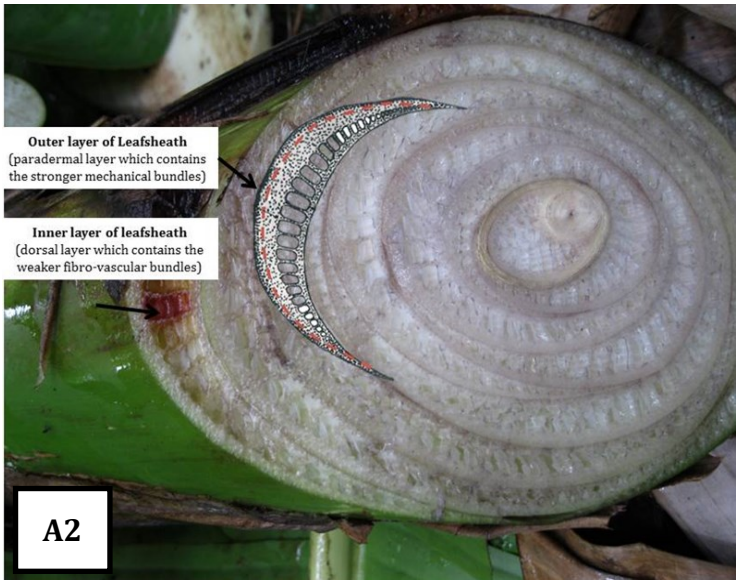


Figure A.1 – The distinct parts of a mature abaca plant



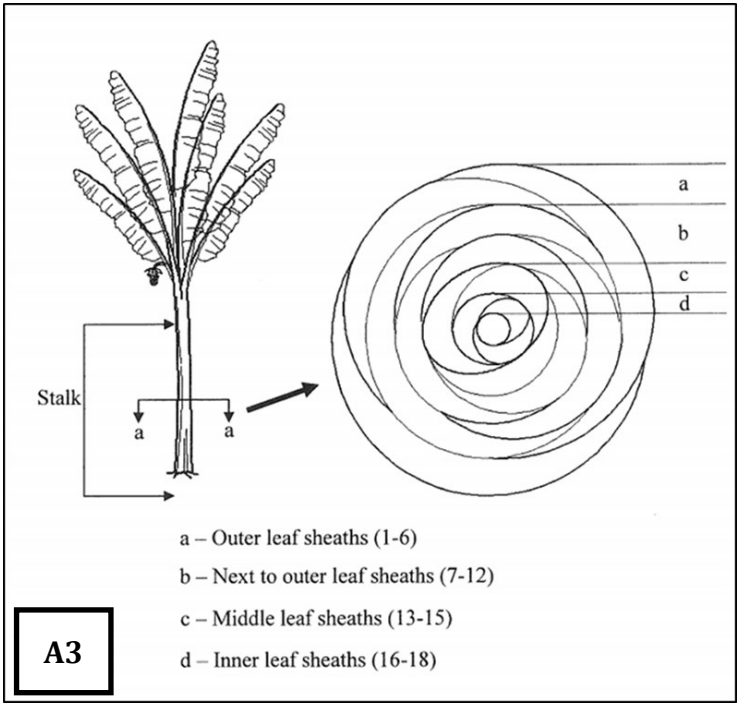


Figure A.2-3—Layers of an abaca stalk

Figure A.3 – Corm

Figure A.3 – Eyebud

Annex B
(informative)

Other considerations for abaca production

Table B — Other topographic, climatic and soil considerations for abaca production

Consideration	Description
Atmospheric humidity	78% to 85%
Depth of horizon	Top and sub soil should be approximately 60 cm to 90 cm deep
Water table	Preferably 80 cm with 60% to 80% saturation
Soil aeration	Well aerated soil
NOTE Types of climate in the Philippines: *Type 1* – Dry season from December to May and wet season from June to November. During the months of June to September, rain periods are at maximum. Places that have this type of climate are exposed to southwest monsoon. *Type 2* – No dry season occurs from December to January. Places that have this type are exposed to northeast monsoon. Tropical cyclones are frequent in these areas. *Type 3* – Seasons are not very pronounced and relatively dry. For 6 months, places experiencing this type of climate are located inland. Southwest monsoon greatly affects these areas. *Type 4* – Rainfall is more or less evenly throughout the year. Northeast Luzon, southern part of Luzon, southern Mindanao and few areas in Visayas experience this type of climate.	

Annex C
(informative)

Varieties of abaca

Table C— List of PhilFIDA Suggested Abaca Varieties

Location	Variety	Potential yield per Hectare per Year kg/ha/yr[2]
Bicol	Musa Tex 51	2000
	Abuab[1]	1700
	Tinawagan Puti	1600
Visayas	Linawaan	1300
	Inosa[1]	1200
	Laylay	1000
	Hagbayanon	1400
Mindanao	Maguindanao	2100
	Bongolanon	1700
	Tangongon[1]	1500
	Kutay-kutay	1700

NOTE

[1]NSIC registered

[2]When proper care and maintenance are instituted

Annex D
(informative)

Standard protocol in collecting soil samples for analysis by BSWM

1. The following should be in hand: pail, shovel, bolo, plastic and meter stick.

2. Divide your farm according to the kind of crops grown or to be grown, type of soil (sandy, clayey or loamy) and topography (level, flat, sloping or hilly). Collect soil samples separately from the different soil unit areas and place them in separate containers.

3. Brush away stone, rubbish, trash or grass on the surface of the land.

4. Using the shovel, push it down the surface or topsoil to a depth of approximately 15 cm and get a slice of soil sample 2 cm thick and 5 cm wide. Place this in a container.

5. Get similar samples at random from as many as 10 sites and mix them in a container. Get a composite soil sample of about 1 kilo to represent the soil unit area (any section of farm where the soil type, its topography and vegetation are more or less similar.)

6. Air dry the soil samples by spreading them in old newspapers or mats under the shade or indoor. Be sure to avoid contaminations among the samples and keep them away from dirt or foreign matters especially cigarette ash. Divide representative soil samples into four (4). Remove soil samples 1 and 3 and retain soil samples 2 and 4. Repeat the process four times until you obtain one (1) kilo.

7. When air dried, get at least one (1) kilo from each composite soil sample and place it separately in a cloth or plastic bag. (one (1) kilo air-dried soil is equivalent to 3 cans of condensed milk-full of soil).

8. Label the bags properly and send them to the nearest Regional or Provincial Soils Laboratory.

Annex E
(informative)

Plant distance when intercropping

When intercropping, planting distance using the quincunx or triangular method should be adopted. Using this method, plants are set two (2) meters apart from each other and can accommodate 2822 hills/ha or 322 hills more than the square method. This is usually done when planting abaca in coconut farm.

Annex F

Time of Application Months after Planting (MAP)	**Number of bags**	**Recommended fertilizer**
0	2	Ammonium sulphate $[(NH_4)_2 SO_4]$
8	4	Ammonium sulphate $[(NH_4)_2 SO_4]$
21	4	Complete fertilizer (14-14-14 NPK)

(informative)

Fertilizer requirement and rate of application

Table F — Recommended fertilizer and time of application

For established farms, complete fertilizer should be applied once, before

Insect	Characteristics	Control measures
Root or corm weevil (*Cosmopolites sordidus* Germar)	Larvae prefers feeding directly on corms of young than on mature abaca plants	Clean sanitation; gather, chop and spray corms of harvested stalks with any suitable insecticide; Baits of freshly cut abaca stalks may be laid then destroyed; avoid exposure of corms to the insect. Soak seedpieces or suckers in appropriate insecticide; apply granular insecticide at the root zone of the plant in a radius from 45 to 50 cm around the pseudostems
Slug caterpillar (*Thosea sinensis* Walker)	Larvae feeds directly on leaves producing numerous holes Seasonal during dry spell	Using protective glove handpick the larvae and kill; cut the infested leaves; collect and destroy the cocoons around the base of the plant; use of natural enemies like birds and chicken; and spray with contact insecticide the infested plants at 7-10 days interval
Banana aphid (*Pentalonia nigronervosa* Coquerel)	Sap feeding insect; vector of abaca bunchy top and banana bract mosaic	Spray with green labelled pyrethroids;

or after the rainy season at the rate of ¼ kg per hill or 12 bags per hectare per year.

Disease	Symptoms/ features	Control measures
Abaca mosaic (caused by potyvirus, Abaca Mosaic Virus, transmitted by two principal non-persistent or stylet-borne aphid vectors under field condition namely Corn aphid, *Rhopalosiphum maidis* (Fitch); Cotton aphid (*Aphis gossypii* Glover) Other vectors: Soybean aphid (*Aphis glycines* Mats.); Water lily aphid (*Rhopalosiphum nymphaeae* (L.)); Citrus aphid (*Toxoptera citricidus* Kirkaldy Oat bird –cherry aphid *Rhopalosiphum padi/ prunifoliae* Green bug (*Schizaphis graminum* (Rondani) Grass aphid (*Schizaphis cyperi* van der Goot Transmitted mechanically	Mottling of leaves; green to yellowish pale green on both sides of the midrib running to the margin of the leaves; Limited growth, thin pseudostem and of little or no commercial value Transmissible by aphid vector and mechanically A single aphid is capable of transmitting the virus within 15 seconds Transmitted sequentially Abaca to abaca; abaca to corn vice versa; grass virus to abaca and vice versa	Roguing of infected plants; Herbicides are effective in eradicating infected plants Disinfect the tools used in the eradication before and after using.
Abaca bunchy top (caused by Banana/Abaca Bunchy-top virus) persistent virus transmitted by the Banana aphid (*Pentalonia nigronervosa* Coq.) f. *typica* (Musaceae); f. *caladii* (Araceae)	Crowding of the leaves into more or less rosette arrangement; transparent appearance of the main and secondary veins of the leaves; stunted growth, leaves are stiff, brittle and tear along the margin, curl upward and dry up Infected plants may remain alive for two years but gradually become smaller and die	Do not transport abaca, banana and their relatives or parts and of soil from infected areas to disease–free one; Use clean and disease planting materials Rogue infected plants immediately once the disease is observed. Use herbicide for the eradication of infected plants. Disinfect the tools used in the eradication before and after using

Annex G

Disease	Symptoms/ features	Control measures
Abaca bract mosaic (caused by Banana Bract Mosaic (BBrMV) Aphid vectors: Banana aphid (*Pentalonia nigronervosa* Coq.); Cotton Aphid (*Aphis gossypii* Glover); Corn Aphid (*Rhopalosiphum maidis* Fitch)	Stringing of young leaves with chlorotic stripes; Spindle-shaped chlorotic streaks parallel to the vein; Greenish to yellowish streaks or spindle shaped lesions in the petioles; Dark reddish brown mosaic pattern on the bract of inflorescence; Spindle streaks on dead leafsheaths	Rouging of infected plants; Use herbicide in the eradication of infected plants Spray green –labelled insecticide; practice regular indexing Disinfect the tools used in the eradication before and after using.
Abaca wilt (caused by *Fusarium oxysporium* Schelecht. var. *cubense* Wr. & Rkg	Inward curling of the leaf blades or near the tip of the lower leaves and slow growth; drooping of leaves, leaves turn from yellow to brown and new leaves wilt. Wilting of the plant; reddish discoloration of the vascular bundles	Sanitation; eradication of diseased clumps; disinfection of tools used as well as shoes and hands of the worker Apply with fungicide; Quarantine Destruction of entire severely infected fields.
Abaca sheath rot (caused by *Marasmiellus inoderma* (Berkeley) Singer (grows favorably under high temperature and moisture condition	The affected stems turned brown and water soaked in appearance and the infected leafsheath are easy to remove, pale plants and stunted , the outer leafsheath and leaves become dry.	Eradication of diseased plants; use of disease free planting materials and wider spacing
Abaca pseudostem rot and leaf spot (caused by *Deightoniella* *Torulosa* (Syd.) Ellis	Pinhead lesions on the outer leafsheaths, lesions enlarge and coalesce and become depressed at the middle; dark-brown oval-oblong blemish on the pseudostem and results of the girdling and weakening of the stem and break	Rouging of infected plants; irrigate during the dry season; field sanitation; remove dead and diseased leaves, timely harvest, proper distancing and fungicide application (Bordeaux mixture) Plant shade trees in high arid areas

(informative)

Insect pests and diseases of abaca

Table G.1—Feeding habits and control of insect pests

Table G.2 - Sign, symptoms and control of abaca diseases

Annex I
(informative)

The components of IPM include the following activities:

A. Modified cultural practices

1. *Establishment of abaca farm. Observe proper distance of planting* Establish a new abaca farm 500 meters away from possible source of inoculum such as mosaic, bunchy top, provided that adjacent farms are inspected to be disease free.
2. *Follow land preparation techniques.* Plowing and harrowing of the farm destroy insect, diseases and weeds and prevent the growth of weeds, which are likely to harbor viruses and serve as breeding places of insects.
3. *Use clean and disease-free planting materials*. This is ~~as~~ the first line of defense against pathogen. Follow the recommended distance of planting. Overcrowding enhance the development of pathogen, especially fungi.
4. *Plant trap plants*. Banana, *gabi* and other alternate host plants of aphids can be planted along the borders of the farm to divert pests from the major crop. This activity should be accompanied by weekly indexing and immediate removal of diseased plant. Remove or rogue the infected plants at the early stage of the disease, even when only one leaf shows symptoms of infection. For aphid monitoring, inspect the base of the stalk and unfurl the youngest leaf of the suckers to guide in making decision whether to use insecticidal spray or allow the naturally occurring biological agents to regulate the population.
5. *Intercrop*. Plant appropriate short season crops during the first one and one half year of establishment of abaca to control the growth of weeds, diversifies available habitat, and disrupts the reproduction of pests. This practice also provides additional source of income to farmers.
6. *Practice sanitation in the farms*. Remove unnecessary dried leaves because they are fire hazards in the plantation. They also favor the growth of fungi, bacteria and insects. They impede the growth of suckers due to the limited penetration of sunlight. Cut leaves can be mulched to preserve moisture in the soil and keep down the growth of weeds. Disinfect tools used in cutting and eradication of diseased plants to avoid spread of mechanically transmitted viral diseases such as abaca mosaic and abaca bract mosaic

B. Farmers training and information campaign on IPM

Their benefits are:

1. Provide information on abaca insect pests and disease cycle, symptoms, and control measures.
2. Provide information and introduce beneficial insects naturally found in the abaca farm.
3. Advocate regular disease indexing and monitoring of the insect pests. Conduct training on the proper handling of chemicals, formulation, methods of application and proper disposal of emptied containers. Provide protective gears and create awareness on prohibited practices while in spray operation.

C. Regulatory control

Observe Abaca Zonification Law RA 1176 of 1954, prohibiting the planting of corn within 500 meters to declared abaca planting areas. Abaca planting materials should not be transported from declared diseased to disease-free areas.

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Annex J
(informative)

Recommended abaca stripping knives

Table J – Normal grades of hand- and spindle-stripped abaca fiber with respect to stripping knife used

Grade		Description	Knife used
Name	Alphanumeric grade	Stripping / cleaning	
Mid current	EF	Excellent	0 serration
	S-EF		
Streaky two	S2		
	S-S2		
Streaky three	S3		
	S-S3		
Current	I	Good	24 serrations per inch
	S-I		
Soft seconds	G		
	S-G		
Soft brown	H		
	S-H		
Seconds	JK	Fair	17 serrations per inch
	S-JK		
Medium brown	M1		
	S-M1		

NOTE

For residual grades, where fiber is short, tangled, low colored, improperly stripped, is produced using stripping knives of any serration.

**Regular denting of stripping knifes is necessary to maintain the number of serrations

Annex K
(informative)

Supplementary information for the different methods of fiber extraction

A. Manual/hand stripping

When a non-serrated knife (0.25 mm rounded tip) is used, a force (blade pressure) ranging 6 kg to 8 kg (about 70 N) is required per centimeter width of tuxy. However, using serrated stripping knives, a blade pressure of not less than four (4) kg is required per centimeter width of tuxy. When the manual method is employed a stripper can produce 10 kg of dried S2 fiber a day

B. Spindle stripping

A non-serrated blade of 0.5 mm (rounded tip) is used in extracting abaca fiber using spindle stripping machine. Stripping requires blade pressure ranging from 7 kg to 10 kg per centimeter width of tuxy and a pulling speed of the tuxy ranging 180 m/s to 340 m/s or spindle angular speed of 300 rotations per minute (RPM) to 600 RPM.

C. Decortication

Decorticating machine is composed of a drum with several blades attachment set about two (2) cm apart and distributed around its drum periphery. The blades should have the right corner edges and in close distance with the feeding plate which is placed tangentially below the drum. The decorticating drum rotates at peripheral speed ranging 1,200 m/min to 2,600 m/min. A regular decorticating machine can produce 80 kg of dried fiber in a day of operation. The fiber produced using decorticating machine contains parenchymatous materials.

Annex L
(informative)

The farmer should keep farm record to facilitate recalls and product safety investigations. The following should be recorded:

- soil analysis
- weather condition during harvesting of produce (when applicable)
- types, varieties/clones and sources of planting materials
- types and usage of agricultural inputs (pesticides, fertilizer, growth regulators, etc.)
- suppliers of agricultural inputs
- lot number of agricultural inputs
- production site with lot codes
- water management practices
- water source and quality
- processing including the date, method and final volume of product
- pest control (dosage, schedule, frequency, and cleaning schedules of equipment, etc.)
- raw material used, start and end date of treatment in case of farm producing its own inputs.

Department of Agriculture

Bureau of Agriculture and Fisheries Standards

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