



Ministry of Industry, Commerce,
Agriculture & Fisheries (MICAF)



A GUIDE TO GOOD MANUFACTURING PRACTICES (GMPs) IN PACKING ESTABLISHMENTS FRESH AGRICULTURAL PRODUCE



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Approved by: Plant Quarantine/Produce Inspection Branch

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Acknowledgements

Good Manufacturing Practices (GMPs) minimize the risk of contamination by microbial pathogens and other contaminants during the processing of fresh agricultural produce. With the increased emphasis on food safety, these become more crucial for the continued viability of Jamaica's food industry.

As a crucial part of this thrust, the Jamaican GMP manual was produced to provide comprehensive guidelines for exporters and other stakeholders involved in the process.

The Plant Quarantine/Produce Inspection Branch, in association with the Food Safety Committee and the Rural Agricultural Development Authority (RADA) came on board for its formulation and preparation, and along with the Inter-American Institute for Cooperation on Agriculture (IICA) solidified the document. Although persons are not named individually, all were vital to the process.

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Don McGlashan

Director General

Ministry of Industry, Commerce, Agriculture & Fisheries

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Introduction

With globalization, increased trade in agricultural produce has resulted in heightened food safety concerns. Over the past decade, there have been an increasing number of food safety alerts worldwide. Among these were chemical and biological contamination to include: *Listeria*, *Salmonella* and *Campylobacter* spp as well as *Escherichia coli*. These crises have led to multiple counter measures, regulations and monitoring programmes for food safety and quality, from both the public and the private sectors.

Food safety is of great importance to governments as they strive to protect their citizens and seek to trade internationally. Governments are now requiring that food be produced in compliance with requisite food safety standards and be safe for consumers. Developing countries are consequently faced with the challenges of producing food in compliance with these standards in order to continue trading.

The capability of exporters in developing countries to trade internationally depends critically on their ability to meet stringent food safety standards imposed by trading partners. These standards require more than the basic quality standards of the past. Suppliers must now take into consideration food safety issues such as the safe and appropriate use of agrochemicals, worker health and hygiene, sanitation, water quality, waste disposal as well as social and environmental impact along the entire value chain. These requirements can be met by observing Good Manufacturing Practices (GMPs). GMPs are a set of procedures that ensure food is processed in a manner that meets food safety, quality and legal requirements.

By documenting and executing GMPs, Jamaican producers can assure government regulators and trading partners worldwide that the industry is diligent in its commitment to providing safe, high quality food. This document is designed to help exporters examine and improve the practices they apply in the preparation of fresh produce for export and to ensure that they meet the generally accepted standards of GMPs. These GMPs are broadly written and are not intended to be facility specific, but instead, they explain requirements for the fresh produce sector.

GMPs, along with Good Agricultural Practices (GAPs) and Sanitation Standard Operating Procedures (SSOPs), are prerequisites to the development of a food safety plan or risk-based analysis specific to each facility.



Objectives

This document sets out guidelines for GMPs necessary to assist in reducing and controlling hazards (biological, chemical, and physical) associated with fresh agricultural produce, particularly during processing, packaging and transporting.

There are three major hazards that may be introduced into the food supply chain at any time during harvesting, processing, transporting, preparing, storing and/or distributing food. These hazards may be biological, chemical or physical.

Biological hazards

Biological hazards occur when food becomes contaminated by microorganisms found in the air, food, water, soil, transportation, animals and the human body. Some microorganisms may cause a foodborne illness. Microorganisms commonly associated with food-borne illnesses include bacteria, viruses and parasites.

Chemical Hazards

Chemical hazards can occur at any point during harvesting, storage, preparation and distribution. When toxic chemicals used for pest control or for cleaning and sanitizing food contact surfaces and food preparation equipment come into contact with food, the food may be contaminated by those chemicals. Toxic metals such as copper, brass, cadmium, lead and zinc can be a source of chemical contamination.

Physical Hazards

Physical hazards usually result from accidental contamination and /or poor food handling practices. Examples include, splinters, hair, nails, nail polish, pieces of jewellery, metal fragments from worn or chipped utensils and containers, dirt, stones.

The principles outlined are in no way exhaustive and must be regarded as general recommendations.

Scope

The principles in this document apply to the processing (receiving, sorting, washing, treating etc.), packaging and transporting of fresh agricultural produce and are not applicable to manufactured foods.

Glossary

The definitions given below apply to the terms used in this guidance document. Certain terms may have different meanings in other contexts.

Adequate - that which is needed to accomplish the intended purpose, in keeping with good manufacturing and food safety practices.

Bacteria - a group of microorganisms, some of which can cause diseases in humans by producing harmful poisons or toxins.

Biofilm - a thin layer of microorganisms adhering to a surface.

Biological hazards - organisms or substances produced by organisms that pose a threat to human health.

Calibration - comparison of a measurement standard or instrument of known accuracy with another standard or instrument to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the item being compared.

Certificate - a document issued by the competent government authority attesting to the fulfilment of some specific requirement(s).

Control measures - actions and activities that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Cross-contamination - the transfer of harmful pathogens from one food to another by way of a non-food surface, such as a cutting board, countertop, utensils, or a person's hands.

Debris - any physical or extraneous material which affects the wholesomeness of the produce.

Detergent - any agent used for washing food-preparation surfaces and equipment to remove grease, dirt and grime from surfaces. It only removes some surface bacteria and does not kill bacteria.

Disinfectant - any substances that are applied to non-living objects to destroy microorganisms that are living on the objects.

Establishment - refers to plant, premises or facilities that are involved in the processing of food.

Finished product - a product that has undergone all stages of production, including packaging in its final container and labelled.

Flow diagram - a schematic systematic presentation of the sequence and interaction of steps in a process; A flow diagram usually takes the form of a flowchart, where all steps in a process and their inputs and outputs (including by-products and waste) are shown as boxes connected by unidirectional arrows. Flow diagrams may be referred to as 'process maps'.

Food - any substance that humans and animals eat or drink in order to maintain life and growth.

Food-borne illness - a general term often used to describe any disease or illness caused by eating contaminated food or drink.

Food-contact surfaces - surfaces of equipment and utensils which normally come in contact with food, or those surfaces from which food may drain, drip, or splash back on to surfaces normally in contact with food.

Food contamination - refers to the presence in food of harmful microorganisms, chemicals or any object which can cause consumer illness.

Food safety - the scientific discipline describing handling, preparation and storage of food in ways that prevent contamination.

Food safety plan - a document which identifies hazards prescribes and outlines the management of the corrective measures to mitigate food- safety concerns.

Garbage - all refuse other than industrial waste and effluents. It refers to easily decomposable and putrefying organic (animal and vegetable) waste from preparation, handling and storage.

Good practice - a practice or set of practices designed to ensure that food products, services, etc., are executed according to prescribed food safety standards. Examples of 'good practices' include good manufacturing, good veterinary practice, and good hygienic practice.

Germicide - any antiseptic or other agent used to destroy germs (Microorganisms).

Hazards - a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

Lot - is a number of units of a single commodity, identifiable by its homogeneity of composition, origin etc., forming part of a consignment.

Microorganism - a very small living organism that can only be seen under a microscope and includes bacteria, viruses and some fungi.

Produce - refers to farm products, particularly fruits, vegetables, tubers and condiments.

Pathogen - any disease-causing organism.

Personal hygiene - a set of practices performed by persons to maintain health and cleanliness.

Pests - unwanted creatures in food premises which may be the sources or carriers of food-borne illnesses.

Preventative measures - controls aimed at deterring or mitigating undesirable events from taking place.

Process flow - a method of visually documenting the stages involved in performing a certain procedure.

Physical hazard - any extraneous object or foreign matter in a food item which may cause illness or injury to a person consuming the product.

Recall - to remove or withdraw food product from the market because it may cause health problems or possible death.

Sampling - collection of a number of units that comprises representative sample(s) from a designated lot or batch of product.

Sanitizer - a two-in-one product that acts as a detergent and a disinfectant.

Shall - is used to state mandatory requirements.

Should - is used to state recommended or advisory procedures or identify recommended equipment.

Sanitation standard operating procedures (SSOP)- address the pre-operational and operational sanitation procedures to prevent direct product contamination or adulteration.

Standard operating procedures – A description of specific activities to be carried out in a specific operation to define the work that should be done, explain how it should be done, who should do it, and under what circumstances. In addition, it explains what authority and what responsibility has been allocated, which supplies and materials should be used, and which documents and records must be used to carry out the work.

Traceability - the ability to identify and trace the history, distribution, location, and application of products, parts, and materials.

1 THE ENVIRONMENT – BUILDING AND FACILITIES

1.1 Establishment: Design and Facilities

Operations should have a plant schematic (a plan, blueprint or layout of the facility) on file. This is an important reference document for operators, customers and government regulators. In addition to a simple plant schematic, processors shall create a drawing that demonstrates the “process flow”. The process flow schematic should briefly describe the most relevant features of each processing step.

Depending on the environment and the operations, the facilities should be so located, designed and constructed to ensure that:

- facilities are separated physically (e.g. spatially or solid wall) from any other activities and in conformity with national standards (e.g. Town and Country Planning Act)
- the design and layout permit appropriate loading, off-loading, maintenance, cleaning, disinfections and minimize airborne contamination
- building is constructed to facilitate adequate ventilation (see Appendix II)
- building is of suitable size, design and construction to permit unobstructed placement of equipment, orderly storage of material, sanitation operation and maintenance
- building surfaces and materials such as floors, walls and ceilings should be constructed of smooth, easily cleanable surfaces and should be suitable, durable and easily maintained
- there is a unidirectional flow of operations to prevent cross-contamination (*see Figure 1.1*)

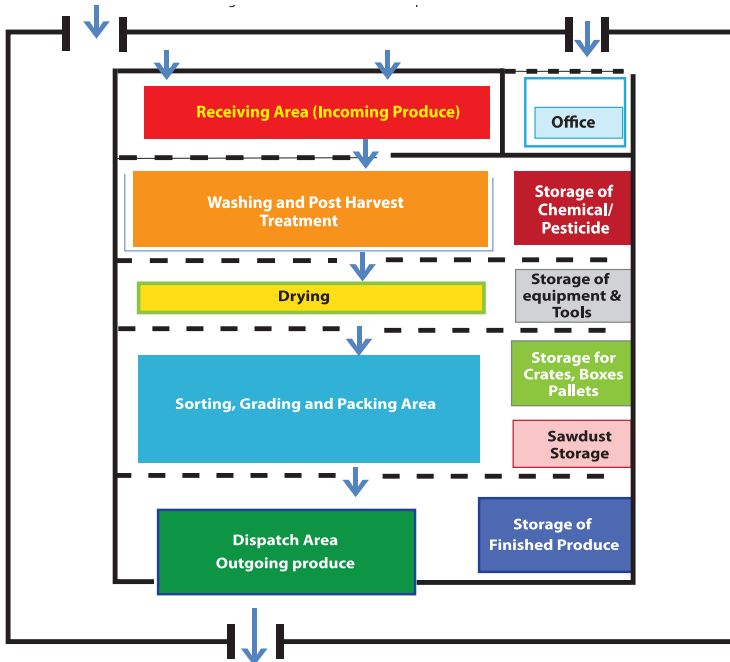


Figure 1.1: Unidirectional flow of operations

1.2 Packaging Facility

1.2.1 External

The following shall be implemented to minimize the potential for contamination associated with the surroundings:

1. Maintain grounds in order to reduce the potential for contamination. Grounds must be free of garbage and debris. There should also be adequate grading and/or drainage to avoid pooling of water. Vegetation must be managed to prevent pest harbourage.
2. Where there are other activities not of similar nature nearby, preventative measures shall be taken to minimize the cross-contamination of foods stored or processed on the facility by biological, chemical or physical hazard.
3. Waste facilities must be well maintained and designed to prevent contamination of the product or packaging material.

Waste containers must be properly covered, secured, clearly identified and emptied in a timely manner.

4. Roads, yards and parking lots must be maintained so they do not pose a risk of contamination to any produce on site.
5. Equipment stored on the grounds must not provide sources of contamination and or pest harbourage.
6. Store, convey and dispose of garbage and processing waste to minimize odour and the potential for attracting pests (flies etc.) and to protect against contamination of foods, food-contact surfaces, water supplies and ground surfaces. An established schedule for garbage disposal must be in place and recorded.
7. Measures must be in place to adequately secure facilities.

1.2.2 Internal

The internal design and layout of the packaging facilities must permit good sanitation practices, including protection against cross-contamination during processing or handling operations. The following shall be implemented to minimize the potential for contamination associated with the establishment.

1. Ceilings and overhead fixtures should be constructed and finished to minimize the build-up of dirt and the shedding of particles.
2. Ensure that all lighting fixtures and electrical outlets in processing facility and warehouse areas are shielded.
3. Provide adequate lighting in all processing and support areas, including hand-washing areas, dressing and locker rooms, restrooms, and all areas where produce are examined, processed or stored.
4. Walls and partitions should have smooth surfaces up to a height appropriate to the operations.
5. All openings, including windows, doors etc., should be easy to clean, constructed to minimize the build-up of dirt and, where necessary, be fitted with removable and cleanable insect-proof screens. Doors should have smooth, non-absorbent surfaces that can be easily cleaned and disinfected.

6. Facility must be rodent-proof.
7. Floors should be of concrete or other impervious material and constructed to allow adequate drainage and cleaning. Where floor meets wall it should be curved.
8. The use of glass and non-food-grade plastic material is prohibited in the post-harvest facility.
9. Provide adequate space and layout to facilitate production and prevent accidental cross- contamination of produce.
(see Figure 1.1)
10. Ensure that drip or condensation from fixtures, ducts and pipes does not contaminate food, food-contact surfaces, or food-packaging materials.
11. Working surfaces must be made of smooth, non-absorbent material, inert to the food, to detergent and disinfectant under normal operation procedures. Working surfaces that come in direct contact with food should be in sound condition (not stripping, flaking etc.), durable and easy to clean.
12. Only food-grade paint must be used on machineries, walls and ceilings. Corrosion should be prevented.
13. Material used for food-contact surfaces should be food grade, non-absorbent, easy to clean and able to withstand repeated cleaning.
14. All equipment and utensils should be checked regularly to ensure proper functioning; secure any loose parts.
15. Avoid oil leaks and overlubrication of machinery to avoid food contamination. Use only food-grade oil and lubricants on machinery.
16. A comprehensive machinery and equipment-cleaning and maintenance programme should be in place.
17. Locate and operate fans and other air-blowing equipment in a manner that minimizes the potential for contaminating foods, packaging materials, and contact surfaces.
18. Running potable water under sufficient pressure shall be provided in all areas where required for the processing of food, for the cleaning of equipment, utensils, and food-

packaging materials, or for employee sanitary facilities.

19. Appropriate systems for potable water (hot and cold) storage and use, should be available whenever necessary to ensure the safety and suitability of food.

1.3 Pest Control

All animals, including mammals (such as rodents), birds, reptiles, and insects, are potential sources of contamination in processing environments because they harbor, or could be vectors for a variety of pathogenic agents, such as *Salmonella spp* and *E. coli*. Each facility must establish a pest control programme to reduce the risk of contamination by rodents, insects, birds and any other pests. Pest control programmes should be administered by a certified pest control operator and records should be kept.

The following should be implemented to minimize the potential for contamination within the packing facility and the surrounding grounds:

1. An effective pest control programme should include regular and frequent monitoring of affected and treated areas to accurately assess the programme's effectiveness. A staff member should be trained to implement the programme and work with outside pest control contractors as needed. Detailed pest control logs describing treatments, applicator and the results should be maintained.
2. Pest control programmes should be administered by a certified pest control operator.
3. No animals shall be allowed in any area of a food facility.



Figure 1.2: “No Pets or Animals allowed”

4. Grounds surrounding the packing facility should be cleared of all waste, litter, and improperly stored garbage. Keep all weeds cut low to discourage the breeding, harbouring, and feeding of pests, such as rodents and reptiles. Remove items, including unused and inoperative equipment, to eliminate areas that harbour pests.
5. Clean and sanitize daily to remove remnants that attract pests in and around the packing facility.
6. Maintain adequate surface drainage to reduce breeding places for pests.
7. Water treatment and disposal systems should be operated in a manner so that they do not become sources of contamination or pest attractants. Extra precaution should be taken if facility is adjacent to an unkempt area.
8. Exclude pests by blocking areas, such as holes in walls, doors, flooring and vents that allow entrance into the facility. Screens, wind curtains and traps may be used.
9. Pest control procedures and logs shall describe the location of any outdoor bait stations and glue boards. Bait stations are not permitted inside the plant. Trap or bait station locations should be documented and include a schematic map. They shall be inspected frequently to detect activity and a record maintained. Traps shall be cleaned and maintained regularly. Dead pests should be removed immediately and disposed of to prevent any potential contamination or infestation. Ensure that the baits used inside of the bait stations are food safe.
10. Records must be maintained of all pesticides used at the facility along with safety data sheets and recommendations. A record should be maintained of all pesticide applications, including trade name, active ingredient, and concentration, date of application and name of applicator. All pesticide applicators must be trained and certified.
 - All pesticides shall be used in accordance with manufacturer's label recommendations and local regulations.

- After pesticide application, all food-contact surfaces should be cleaned and properly sanitized.

1.3.1 Pesticide and Container Disposal

Disposal of unused post-harvest pesticides should be done in accordance with recommendation on manufacturer's label and local regulations and/or guidelines. It is recommended that a charcoal pit be constructed for disposal of post-harvest fungicides (*see Figure 1.3*) Pesticide containers should be disposed of according to the Pesticide Control Authority (PCA) recommendations.

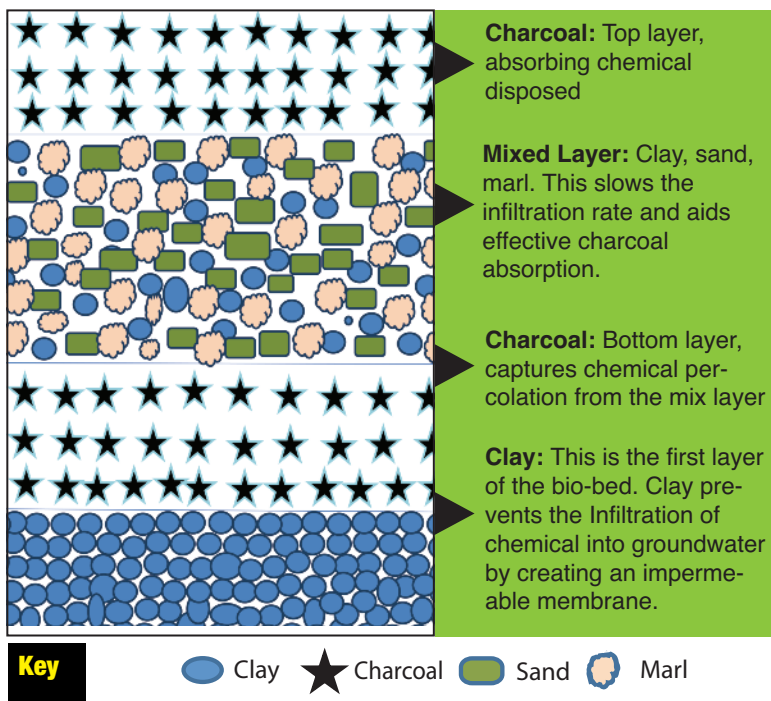


Figure 1.3: Charcoal pit

The disposal system can be as simple as a 45-gallon plastic drum retrofitted with an outlet at the bottom (*see Figure 1.4*) containing alternate layers of organic material (such as dried banana leaves or grass, compacted) and charcoal. The disposal system should be located close to where the chemical is to be used.

The following is strictly prohibited:

- Dumping unused pesticide material into a septic system or drainage ditch
- Burning of empty or partially empty pesticide containers
- Burying of empty unrinsed or partially empty pesticide containers

Recommendations

- Mix pesticide according to manufacturer's recommendation
- Dispose of unused portion of pesticide according to manufacturer's guidelines
- Triple-rinse empty pesticide containers. Contact the relevant authorities (Pesticide Control Authority) for the disposal of pesticide containers



Figure 1.4: Waste pesticides disposal drum

1.4 Sanitary facilities and controls

1.4.1 Water

Water can be a carrier of many harmful microorganisms, such as coliforms, *Salmonella spp.*, *Vibrio cholerae* and *Shigella spp.* Even small amounts of contamination with some of these organisms can result in food-borne illness. Therefore, water used in food processing must meet national potable water standards.

All water should be tested at least once a year for microbes, pesticide residue and heavy metals.

The following practices when assessing water quality and in applying controls to minimize microbial food safety hazards shall be followed.

1. All water used for processing or contact surfaces or used in the facility for employee services must be potable and meet local regulations for drinking water.
2. If self-chlorination of water is done, the concentration of residual chlorine must be monitored daily.
3. There must be no cross-connections between potable and non-potable water supplies. A plumbing diagram should be on file to verify this.
4. All hoses, taps, and piping systems must be designed to prevent back-flow or siphonage of standing water and/or have backflow prevention devices installed. A map of any back-flow devices that are installed in the water lines must be available. Piping shall not have any 'dead ends'.
5. For municipal sources, a certificate of analysis must be obtained and must form a part of your records.
6. If water is from a non-municipal source, the operator must ensure that the water meets national water standards for potable water. This should be done via a testing programme with an accredited third-party laboratory.
7. Equipment designed to harvest water and maintain quality (chlorine injectors, filtration systems, and back-flow prevention devices), must be routinely inspected to ensure efficient operation. A map detailing the location of the equipment should be available.
8. For pre-cleaning/sanitization of produce, water has to be changed frequently in accordance with an established schedule.

9. The water supply (hot and cold) must be adequate for peak usage, and for clean-up requirements.
10. The sewage-disposal system must be in accordance with the national standards and approved by the relevant agencies such National Environment and Planning Agency (NEPA) and National Water Commission (NWC).

1.4.2 Toilets

1. Each processing facility must provide employees with adequate, readily accessible toilet facilities.
2. National health standards (Ministry of Health) require a ratio of one toilet to 25 persons. (Please note: other certification programs may require lower ratios).
3. Signs must be posted showing where restrooms are located. Signs must also be posted in restrooms instructing users to wash their hands after using the toilet.

(see figure 1.6)

4. Toilet facilities must not have doors that open into operation areas, except where alternative means have been taken to protect against contamination, such as double doors or positive airflow systems. Toilet facilities must have self-closing doors.



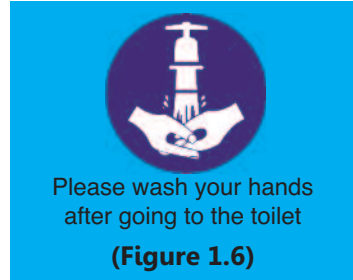
Figure 1.5: Signage for restrooms

5. Toilet facilities must be kept clean, neat and in good repair. Basins, toilets, urinals, walls, and floors shall be frequently cleaned and sanitized (at least once daily). A bathroom cleaning schedule should be maintained and visibly displayed.
6. There must be adequate waste disposal. Disposal bins must be covered and 'hands-free' operated.
7. Toilet facilities must be adequately supplied with toilet paper, soap, hand sanitizer and paper towels or air-dryers

for drying hands. Multiple-use towels must not be used. Toilet facilities must be checked daily and restocked as necessary to ensure adequate supplies.

1.5 Worker health and hygiene

The responsibility for reducing or avoiding contamination while handling food falls heavily on the handlers. Healthy people are more productive than those who are ill and are less likely to contaminate food and fellow workers. Ultimately, it is the people who work with food that are the key to the assurance of food safety. Employees can transfer pathogens to food along the entire food chain (farm to fork). This can be avoided through adequate personal hygiene and proper handling of the food.



The objective of the personal hygiene principles is to reduce or eliminate the risk of contamination by persons who are in contact with food.

Employee training in good food-handling practices, covering the key areas of sanitation and worker hygiene, is critical to producing safe food. It is important to ensure that all personnel, including those indirectly involved in processing operations, such as equipment operators, buyers pest-control operators and visitors, comply with established hygienic practices. Personnel responsible for ensuring the sanitation of the facility should be trained.

The following steps should be taken to minimize potential contamination associated with employees and visitors to your facility:

1. Employees must be properly attired:
 - Must wear suitable protective clothing that includes no shorts, sleeveless shirts or vests. Hair must be covered and properly secured.
 - Outer garments must be clean to protect against contamination of produce or packaging materials.

- Garments should have no shedding fibers.
 - Footwear must be appropriate and in good repair, no open-toed shoes are allowed.
 - A plastic apron is recommended when handling water or dirt.
 - Workers should not wear their coveralls or aprons in areas other than the operation area.
 - Clothes and personal effects must be kept in appropriate areas exclusively for that purpose (dressing room).
 - Food of any kind must not be kept in the dressing room/locker to avoid attracting pests.
 - Procedures for the washing of protective clothing should be established and monitored.
2. All employees in the packing facility must have a valid Food Handlers Permit from the Ministry of Health.
 3. All employees must wash hands with soap and potable water before work, after using restrooms, upon returning to their workstation from break or lunch, or at any other time when their hands may have become soiled. (**see figure 1.8**) Hand sanitizers are to be used after washing but they are not to be used as a substitute for hand washing.
 4. Hair should be properly secured and protected by a hair net or cap. It is recommended that food handlers be well groomed; that is, no beards, moustaches, or sideburns. If they do, however, these should be fully covered.
 5. No food, candy, chewing gum or lozenges should be allowed in the operation areas.
 6. Personal items such as pens, pencils and cell phones must be stored in lockers or other designated locations outside the operation areas.

7. All jewellery must be removed when entering the packing facility (plain wedding bands are frequently exempted from this requirement provided that they are covered by a glove). No hairpins or other objects that could fall into food may be worn in the operation areas. Fingernail polish and false fingernails must not be allowed. Nails should be short and clean to avoid the presence of pathogenic microorganism underneath them and to prevent puncturing/damage to produce.
8. If employees wear gloves they must be of an impermeable material. Gloves must be cleaned and/or sanitized at the beginning of work, after returning to workstation, or at any other time when the gloves become soiled. Damaged gloves should be discarded and replaced.
9. No employee infected with or showing symptoms of any infectious or communicable disease or having open sores, boils, and infected wounds or any other affliction that may spread disease should be in contact with food or packaging materials. A supervisor must monitor for these conditions. Cuts and wounds must be covered by suitable waterproof dressings to eliminate the risk of contaminating food.
10. Visitors to packing facility should wear protective clothing and adhere to the same personal hygiene provisions as employees. A visitors' log must be kept.
11. The use of glass items of any kind should be avoided in the operation areas.
12. Prior to the use of the restroom workers should remove hair cover/net, gloves and apron. After the use of the restroom, standard hand washing and sanitizing procedures must be followed before fitting back protective gear or resuming handling produce.
13. Smoking is not permitted in the facility and 'no smoking' signs must be posted at strategic locations in the packing facility (**see Figure 1.7**). Spitting, chewing, eating, sneezing or coughing in proximity to food is unacceptable because it increases the risk of contamination. An area outside of the packing facility may be designated for smoking.

14. Personnel working in cleaning and washing areas or other 'dirty' areas of the facility should not enter other areas before changing into appropriate attire to prevent cross-contamination with extraneous matter or pathogens. Forklifts and other equipment used in the 'dirty' areas should not move into processed product areas due to the risk of contaminating finished product.



Figure 1.7: No - smoking sign should be posted at strategic locations

1.6 Hand washing

The easiest and most effective food safety practice that every facility can implement is hand washing. Workers should be well trained in proper hand washing techniques no matter how simple or basic the procedure appears to be.

1.6.1 Proper hand-washing techniques

- Thorough washing of hands before commencing work and after using the toilet is very important. Employees must wash their hands before working in the packaging facility. Proper hand-washing before and after the workday, using the bathroom, and eating, drinking, or smoking is a simple seven-step process:
 1. Wet hands with potable water
 2. Apply antibacterial liquid soap from dispenser (no bar soap)
 3. Scrub hands and fingernails (for 20 seconds)
 4. Rinse off soap thoroughly with potable water
 5. Dry hands with disposable paper hand towel or with hands-free dryer
 6. Discard used towels in trash bin
 7. Apply hand sanitizer

GUIDELINES



Figure 1.8: Proper hand-washing steps

- Each food facility must provide an adequate and convenient hand-washing station furnished with potable running water, antibacterial soap, hand sanitizer, sanitary disposable paper towels or hand dryers. Handwashing stations must be checked daily and restocked as necessary to ensure adequate supplies.
- Restroom fixtures, such as water control valves, should be of a type designed to minimize recontamination. Hands-free or sensing systems are preferred.
- Easily understood signs must be posted directing employees to wash and sanitize their hands before they begin work, before returning to work from a break, and any time their hands may have become soiled or contaminated. These signs should be posted in restrooms, in the processing rooms, and anywhere employees may handle food or materials and surfaces involved in the production process.

- Provide and maintain waste receptacles in ways that protect against food contamination.



Figure 1.9: Hand-wash station

1.7 Chemicals

Improper use of chemicals can pose a risk to employees and food safety. Implementation of the following recommendations regarding chemical handling and employee training is critical to minimizing issues associated with chemical use.

Those employees designated to handle hazardous materials must be trained in proper handling. These employees should sign the training record sheet after they have been properly trained (date, name of trainer/facilitator, duration of training and the topic should be recorded). Records of chemicals, its use, training and authorization must be kept.

1. All chemicals must be properly packaged and labeled.
2. Chemicals must be stored in a secured and enclosed area away from operational areas so as not to contaminate food, food-contact surfaces or food-packaging materials.

If smaller packages are prepared for ease of use, these must be properly labeled stating the name of the chemical, the amount and direction for use. **Chemicals must never be repackaged in food containers or drink bottles.**



Figure 1.10: Chemical storage sign

3. Procedures and controls should be established for the securing, checkout and return of chemicals to avoid unauthorized use.
4. Post-harvest facilities should maintain a chemical inventory and safety data sheets.
5. Chemical control procedures should be developed that outline:
 - a. the listing of all chemicals used in the facility;
 - b. the usage, handling, storage and labeling of chemicals;
 - c. the distribution and management of chemicals;
 - d. the maintenance of Safety Data Sheets;
 - e. the disposal of empty chemical containers or waste chemicals.
6. Cleaning and sanitizing agents shall meet appropriate regulations, and documentation shall be obtained from suppliers verifying this.

7. Only approved chemicals shall be used on food and food contact surfaces and for cleaning and sanitizing
8. Disposal of empty containers or waste must conform to local regulations for the particular chemical. No empty containers must ever be stored in areas that would present the possibility of potential contamination to food, food packages, or water sources. Manufacturers' recommendations for use of chemicals used in or around food-contact areas must be adhered to.
9. Empty chemical containers must never be reused for any purpose.
10. Records must be kept detailing chemical usage, including date of application, location, dosage rate, purpose, etc.

2 OPERATIONAL MANAGEMENT

2.1 Receiving Fresh Produce

The operators shall receive the fresh produce according to their established Standard Operating Procedure, for the specific commodity. Supplier verification procedures must be employed when receiving produce, such as the farmer's receipt, dealer's licence, inspection of transportation, invoice, etc.

2.2 Supplier Verification

The safety of a commodity for export depends not only on what is controlled within the packing house but also depends on the source from which goods are received.

It is important for operators to have effective supplier verification and supply chain management processes. Exporters should ensure that goods are bought from farmers and suppliers (middlemen) who employ Good Agricultural Practices.

The General Requirements include:

- A. Documentation of procedures for receiving produce
- B. Records of produce received for packing
- C. Supplier verification activities to ensure that appropriate controls are conducted and documented.

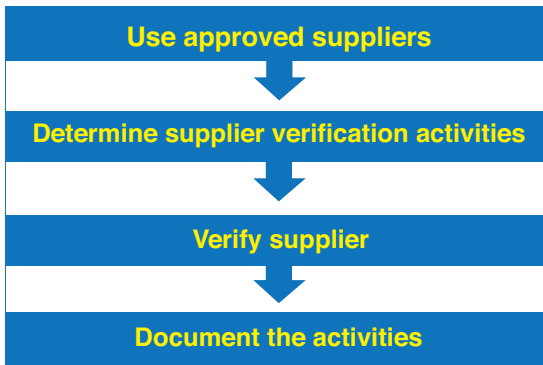


Figure 2.1: Supplier Verification Process

2.3 Produce Cleaning and Treatment

Fresh produce should be processed (cleaned, treated, etc.) to prevent contamination from microorganisms and other substances. Cleaning/treatment methods to be employed will vary according to the commodity being processed.

2.3.1 Proper cleaning and sanitizing procedures for fresh produce

Cleaning and sanitizing are done to remove the biological, chemical and physical hazards that are associated with fresh produce. The sanitizing procedures for individual commodities vary according to commodity class – for example, vegetables, ground provisions, fruits, herbs, spices and condiments. The general cleaning procedure should include the following steps:

- Pre-clean by removing soil and debris by dry-cleaning for example brushing
- Wash with potable water to remove surface dirt
- Sanitize with approved food sanitizing agent (usually chemical disinfectant). Follow SSOP. Always clean and sanitize containers before and after use.
- All containers must be in good repairs
- Do not use containers intended for fresh produce for any other purpose.
- Use separate containers in each step of the process to prevent cross-contamination. Label or colour-code containers

2.4 Cooling

Cooling procedures may be applied to extend the shelf life of fresh produce and to maintain quality of fruits and vegetables. Cooling also helps to inhibit the growth of pathogens in fresh produce. In the cooling process, excessive heat is removed from the product by a cooling medium, in most cases by air, water or ice.

Regardless of the cooling method, care must be taken to ensure that the cooling medium does not contaminate or damage the produce. Two of the main hazards associated with cooling procedures are:

- Biological – water- and ice-cooling methods may present a higher risk of contamination. Water and ice must be of potable, microbial-free quality and stored under sanitary conditions.
- Chemical - contamination of produce by refrigerants, cooling and sanitizing agents should be avoided

2.5 Packing

To minimize contamination and maintain quality of produce, packing should be done as soon as possible after processing.

- Produce should be packed in clean and new containers
- Packaging design and material should provide adequate protection for products to minimize contamination, prevent damage and accommodate proper labelling.



Figure 2.2: Yams packed with packing material (coir)

2.5.1 *Packing Surfaces*

Design and maintain packing surfaces and equipment to minimize produce damage and contamination; no wooden or painted surfaces should be used. The design should also facilitate cleaning and sanitizing.

2.5.2 *Packaging containers and materials*

Packaging containers may include crates, cartons, bags, palletised containers and bulk bins.

- Packaging material (such as sawdust and paper) should be non-toxic and not pose a threat to the safety and suitability of produce under specified storage.
- Printed media **MUST NOT** be used as a form of packaging material.
- Areas designated for storage of waste must be at least 4.5 m (15ft.) away from the packing facility and placed so as to minimize the contamination of food.
- Waste containers inside the packing facility must be clearly labelled, conveniently placed and tightly covered when not in use (**see figure 3.1**).
- Remove all waste products frequently include waste collection procedures in daily cleaning activities; It is recommended that organic and inorganic waste should be separated for recycling purposes.

2.6 Labels

Labels must accurately state the content and quantity of food in the package exclusive of wrappers or packaging material. Refer to the Bureau of Standards Jamaica (BSJ) for minimum labelling standards.

The minimum information required on labels is:

- The name of the produce
- Net contents (weight)
- Name and address of the exporter of the produce
- Country of origin
- Lot identification and packer's code

Labels placed directly on product should be food-grade quality

YELLOW YAM

Company Name: XYZ EXPORT LTD

**Company Address: 1 Pimento Way
Jones Drive
St. Elizabeth**

Country of Origin: Jamaica

Net Weight: 35lbs / 15.91kg

Lot ID: 2015BR0319K



Figure 2.3: Sample label used on packages for export

2.7 Storage

Adequate facilities should be provided for the storage of produce, packing material and chemicals.

2.7.1 Storage of fresh produce

- Store fresh produce in a clean location using an organized system. Storage facilities should have temperature and humidity control devices where necessary.
- Adjust and regulate temperature and humidity according to a commodity's specific requirements.

Table 2.1: Recommended storage temperatures for some fresh produce

COMMODITY	AMBIENT STORAGE (°C)	COLD STORAGE (°C)
Avocado	15-20	12-13
Breadfruit	17-22	16
Citrus	19-21	1-5
Dasheen	18-20	9-12
Ginger	25-30	12-14
Hot Pepper	11-12	7-10
Mangoes (Julie, East Indian, etc.)	18-25	12-14
Pumpkin	15-20	12-13
Soursop	17-22	12-16
Yams (Yellow, Lucea, Negro, etc.)	21-24	15

2.7.2 Storage of packaging material

- Storage area must be kept clean, dry and free of trash, pests and animals;
- Storage area should be separated from areas with hazardous material, e.g. chemicals;
- Store containers and packing material off the floor to prevent contamination and allow enough space in-between containers and wall of at least 60cm (2 ft.) for air circulation and ease of access for cleaning and inspections.
- Materials used for packaging, such as sawdust, wood shavings, and paper sleeves should be properly stored and kept in covered containers.
- Storage area should be properly secured to avoid possible contamination and unauthorised access.

3 WASTE MANAGEMENT, CLEANING AND SANITATION

3.1 Waste Management

Waste products, (processing waste) including trash, cuttings, leaves, and pods generated from the processing of fresh produce, can be a source of contamination. Decomposing waste can serve to spread microorganisms around the facility and generate offensive odours, thereby attracting pests that may be vectors of pathogenic organisms. The following GMPs should be observed for the daily management of waste in a packing facility.

3.2 Proper Handling of Waste

A designated area must be identified for internal and external temporary storage of waste. All staff must be trained to ensure that waste is properly handled and collection procedures correctly followed.



Figure 3.1: Sample waste disposal bins that should be used in the packing facility

3.2.1 External

- Areas designated for storage of waste must be at least 4.5m (15ft.) away from the packing facility and placed so as to minimize the contamination of food.
- This area should be designed to facilitate easy cleaning and removal of the waste to prevent accumulation of residues, pest harbourage and bad odours.
- A schedule of frequent waste disposal must be established and records kept.

- Waste container must be clearly labelled and covered at all times.

3.2.2 Internal

- Waste containers inside the packing facility must be clearly labelled, conveniently placed and tightly covered when not in use (*see figure 3.1*).
- Remove all waste products frequently and include waste collection procedures in daily cleaning activities;
- It is recommended that organic and inorganic waste should be separated for recycling purposes.

3.3 Cleaning and Sanitation

To reduce the risk of produce contamination, all food-contact surfaces must be properly cleaned and sanitized before and after use and records kept.

3.4 Cleaning Methods

The packing facility should be cleaned daily to minimize and or prevent contamination of food. Areas that are in direct contact with food are particularly important. Cleaning can be carried out by separate or combined use of physical methods, such as heat, scrubbing, turbulent flow, vacuum cleaning or other methods that avoid the use of water, and chemical methods using detergents; alkalis or acids.

Cleaning procedure should involve where appropriate:

- Removing gross debris from surfaces
- Applying a detergent solution to loosen soil and bacterial film and hold them in solution and suspension
- Rinsing with potable water to remove loosened soil and residues of detergents.



Figure 3.2: Cleaning equipment

- Dry cleaning or other appropriate methods for removing and collecting residues and debris. Where necessary disinfect with subsequent rinsing unless manufacturers' instructions indicate on a scientific basis that rinsing is not required.

Cleaning tools can be a major source of biological hazard when not handled properly. Always wash and sanitize all cleaning tools after use and replace them regularly to avoid growth of microbes.

- This area should be designed to facilitate easy cleaning and removal of the waste to prevent accumulation of residues, pest harbourage and bad odours.
- A schedule of frequent waste disposal should be established and records kept.

3.5 Sanitizing

To reduce microorganisms, all food-contact surfaces should be treated with sanitizing agents. Sanitizing is not a substitute for proper cleaning; therefore, all food-contact surfaces must be cleaned prior to sanitizing to remove dirt, dust, food residues and biofilm. The presence of these reduces the effectiveness of sanitizing agents.

When selecting a sanitizer for food-contact surfaces, the following considerations should be borne in mind:

- Type of surface being sanitized
- Sanitizing equipment available
- Effectiveness of sanitizing agent against certain pathogens
- Effectiveness under practical conditions
- Sanitizers must be food safe

3.5.1 *Type of Sanitizing*

- (a) **Thermal:** This can be done by dry heat but most often involves the use of hot water or steam. The exposure to heat should be for a specific time and temperature.
- (b) **Chemical:** Chemical sanitizers are a group of compounds that are used to destroy or substantially reduce the number of undesirable microorganisms. Chlorine-based sanitizers are the most commonly used sanitizers in food applications.

3.6 Handling and Use of Sanitizing Agents

- Storage of sanitizers must be separate from fresh produce and packing material;
- Employees should be trained in safe handling and use of sanitizers.
- Carefully follow specific manufacturer's handling and usage instructions for each product.
- Employees should wear protective gear, such as goggles and gloves, while handling and working with sanitizers.
- Handling and disposal of sanitizers should be in accordance with national standards; refer to the PCA.

4 EMPLOYEE TRAINING

Workers engaged in food operations who come directly or indirectly into contact with food should be trained and/or instructed in food hygiene to a level appropriate to the operations they are to perform. Employee training in good handling practices, covering the key areas of sanitation and workers' hygiene, is critical to achieving the goals of the food safety programme. Establishing a written training programme for employees that addresses general sanitation and good hygiene practices will help reduce the risk of all forms of contamination. All training programmes must be documented, routinely evaluated and updated to ensure that all the requirements for food safety are met.



All training must be documented and filed. All trainees / personnel that attend the training must sign the register provided which must also be filed. Persons employed in critical areas such as the handling of post-harvest chemicals must have basic numeracy and literacy skills.

Some of the areas of training should include:

- Sanitation and waste management
- Standard Operating Procedures (SOPs)
- Post-harvest handling
- Record Keeping
- Occupational health and safety
- Workers' Health and Hygiene

5 TRANSPORTATION

Proper transport of fresh produce helps reduce the potential for microbial contamination and spoilage of produce due to poor transporting practices. It is essential to create active awareness among the personnel involved in produce transportation. Produce must be adequately protected during transport. The types of conveyances or containers required depend on the nature of the food and the conditions under which it is transported. Necessary measures should be taken to protect food from potential sources of contamination and damage.

Operators and food handlers involved in the transport of fresh produce are encouraged to pay close attention to product transportation at each level in the system. This includes proper packaging for transporting the produce from the field to packing and cooling facilities, and on to distribution.

5.1 Guidelines for Transport of Fresh Produce

- Use only containers or vehicles designed and designated for transport of produce.
- Inspect containers and vehicles for cleanliness before loading, and insist on cleaning if necessary.
- Vehicles and containers should be dry except for refrigerated units.
- Enclosed transport units are highly recommended to avoid pest access and contamination.
- Avoid using containers previously used to transport commodities such as meat, eggs, fish manure or live animals. If these containers are used they must be properly cleaned and sanitized.
- Vehicles and containers should be cleaned and sanitized after each load.
- Maintain proper temperature during transportation to ensure produce quality and food safety.
- Ensure that produce is loaded carefully in order to minimize damage.

- Ensure that transporters maintain integrity of the lot identification and trace-back system in use.
- Make sure that all personnel involved in the transportation process practise proper hygiene and are properly attired.
- Records of transportation process/log must be kept.

5.2 Considerations for refrigerated transportation

- Temperature recorders should be placed in all refrigerated fresh-produce vehicles and containers.
- Refrigeration and humidity control units should be checked for proper functioning before each trip.
- Make sure temperature and humidity are set according to specific commodity requirements.
- Minimize time between removal from cooling storage and loading into refrigerated container.
- Allow for adequate air circulation within the transportation unit by proper stacking.
- Prevent produce contamination by condensation water from refrigeration units;
- Maintain temperature and humidity control during transport and record all data.
- Provide frequent training in temperature control to personnel involved in transportation.



Figure 5.1: Refrigerated truck used for transporting fresh produce

6 TRACE BACK AND PRODUCT RECALL

Trace-back is the ability to track foods back to their source (growers, middlemen, exporter, etc.). A system to identify the source of foods alone cannot prevent food safety problems or the occurrence of a food safety recall. However, the ability to identify the source of a product through trace-back is an important component of good agricultural and manufacturing practices and may prevent the reoccurrence of food safety problems. Information gained from trace-back investigation may also be useful in identifying and eliminating a hazardous pathway. An effective trace-back system identifies the source of a contaminated lot to a specific region, packing facility or farm, rather than an entire inventory or commodity group. It also builds confidence among regulators, customers and consumers that the food manufacturing industry is in control of all phases of production and distribution.

A comprehensive trace-back system must have a process of handling complaints, investigations and product recalls.

6.1 Complaints

A complaint is one of the main triggers for activating a trace-back system. It is any written, electronic, or oral communication that alleges deficiencies related to the identity, quality, and safety of a product. An effective complaint-handling system is an extremely important part of any quality control system. Exporters should understand that any complaint received on a product should be evaluated and, if necessary, thoroughly investigated and analyzed, and corrective action taken. The results of this evaluation should lead to a conclusion regarding whether the complaint was valid, the cause of the complaint, and any action necessary to prevent further occurrences. Complaints must not be ignored.

Written procedures must be established to handle complaints. This should be provided to employees to facilitate communication, maintain consistency, and reduce quality problems. These procedures should detail receiving, reviewing and evaluating. This should be done by a previously designated member of staff.

Complaints must be:

- documented, reviewed, evaluated, and filed
- handled by a formally designated unit or individual
- investigated if necessary.
- recorded whether or not an investigation is done.
- filed and retained for a period of time no less than two years from the date of release for commercial distribution.

Also, responsibility must be assigned for deciding when or not to investigate.

The investigation record should include:

- (1) the name of the produce
- (2) the date the complaint was received
- (3) any produce identification(s) and traceback number(s) used
- (4) the name, address, and phone number of the complainant
- (5) the nature and details of the complaint
- (6) the dates and results of the investigation
- (7) any corrective action taken; and
- (8) any reply to the complainant.

6.2 Instituting effective trace-back systems

Operators should examine current procedures and develop additional ones if necessary, to track produce from the farm to the consumer.

An effective trace-back system should include:

- documentation of the source of a product
- a mechanism that can trace the product from the farm to the consumer.
- farm identification and date of harvest
- production, quality, and warehouse records such as packaging dates
- the customer(s) information
- shipment dates
- any other supply chain elements not noted above.

6.3 Positive lot identification

A key element of a trace-back programme is positive lot identification. Adequate lot coding and distribution records are critical. Lack of a coding system and accurate records could lead to a total product recall with notification to all customers. For this reason, every load of produce that comes into your facility should be assigned a unique lot number for control purposes. This number should link back to the lot number assigned by the grower for that lot. Your lot number identifies the product to everyone who will be associated with it and is a major component should a recall be necessary. It should remain with the lot through all processing steps, grading, chemical and microbiological testing, storage and shipping. Be consistent in your lot numbering to maintain accuracy and eliminate confusion.

In addition to identifying the production dates in the lot number, the code must also include lot numbers that can be traced to a grower and production line. This code should be listed on the shipping invoice and maintained in facility records. Computer records of lots sent with shipments will make recall simpler and product tracing significantly faster.

6.4 Product recall

A recall is the procedure(s) conducted by responsible handlers to remove or correct a product that regulatory authorities consider, or may consider to be in violation of their food laws. The ability to remove products from the marketplace quickly and effectively is very important. It takes on added importance, since we have entered an era in which terrorists could use the food supply as a mechanism to disrupt commerce and cause public panic.

6.4.1 Prompting a recall

There are many situations that can result in a product recall. Some are emergency situations, others are not. Following is a list of potential causes of product recall.

- **Allergens** – A product or component containing an unlabeled ingredient that may cause an allergic reaction in humans.

- **Bacterial contamination** – Contamination by spoilage organisms or harmful bacteria (*E coli*, *Salmonella*, *Listeria*, etc).
- **Chemical contamination** – The presence of unapproved pesticides and/or residues of these items in amounts greater than the established residue tolerance levels; naturally occurring chemical contaminants such as Aflatoxins.
- **Communicable diseases** – Human illnesses that can be transmitted through foods.
- **Processor-generated information** – Food safety problems discovered through food processors' internal record review and examination processes.
- **Foreign materials** – Presence of materials such as glass, plastic or metal.
- Illnesses identified by food safety regulators.
- In-house sabotage.
- Misbranding – violations of labeling laws.
- Real or fraudulent customer or consumer claims.
- Tampering and tampering threats.
- Undeclared ingredients.

6.4.2 Recall classifications

A **Class I** recall means there is a reasonable probability that the use of the contaminated product will cause serious adverse health consequences or death.

Examples of Class I recalls are:

- Salmonella contamination
- Undeclared allergens.

A **Class II** recall means the use of a contaminated product may cause temporary or medically reversible adverse health consequences.

Examples of **Class II** recalls are:

- the presence of spoilage organisms
- the presence of unapproved additives or ingredients
- mislabeling, such as incorrect weight declaration or non-organic almonds being labeled as organic.
- food produced under unsanitary conditions.

A **Class III** recall is for products that violate national regulations, but are unlikely to cause adverse health consequences.

7 INSPECTION AND CERTIFICATION

The basic goal of inspection and certification is to ensure that the facility, services and products meet National and International specific requirements for food safety.

7.1 Farm Certification

Farm certification is the implementation and adherence to Good Agricultural Practices (GAPs) approved by the competent authority. GAPs are pre-requisites for Good Manufacturing Practices (GMP).

GMPs are more effective when growers have implemented GAPs and other on-farm food quality and safety programmes. Growers who utilize safe and effective agricultural practices will minimize the potential for food contamination in the field and ultimately at the packing facility. Operators of packing facilities should verify GAP programmes and farm food safety plans through written documentation and on-site inspections.

The following should be done:

- Suppliers or farms must be assessed to determine GAP compliance.
- Maintain record of GAP compliance.
- Conduct on-site inspections to verify that growers are utilizing GAPs (designate a person or hire a third party).
- Have each grower or middleman sign an agreement. This agreement should outline any requirements or exclusions for the food the grower will deliver to the packing house.

7.2 Inspection and Certification

All packing facilities for export of agricultural produce must be certified by the Plant Quarantine/Produce Inspection Branch of the Ministry of Industry, Commerce, Agriculture and Fisheries. Fresh Produce Exporters are certified after their facility is inspected and the requisite licences are obtained according to the Agricultural Produce Act of 1926 and its regulations.

Section 3.- (1) of this act states: “Every person carrying on the trade or business of buying or selling, or of buying or exporting agricultural produce shall be required to take out a licence under this act for each premises in which he intends to carry on such trade or business.”

Section 3.- (2), a person may apply for a traveller’s licence if that person;

- (a) Carries on the trade or business of buying and selling, or of buying and exporting, agricultural produce; and
- (b) Desires to buy any agricultural produce at any place other than on the premises for which that person holds a licence to buy or export agricultural produce.

The guidelines for establishing and operating a packing house for exports and becoming a licensed certified exporter are outlined in **Appendices I and II**.

Inspection of finished produce must be done by inspectors from the Plant Quarantine/Produce Inspection Branch. In order to receive certification by Plant Quarantine, the final product, presented for inspection, must comply with established ministry standards and the requirements of the importing country.

7.3 Appointments for Export Inspections and Certifications

All Exporters are required to make an appointment for all inspections at least twenty-four (24) hours prior to inspection date.

The following information must be provided:

- Size of shipment quantity
- Name of the commodity to be inspected
- Destination of shipment
- Flight information e.g. Departure time

7.4 Appointment for Fumigation

Appointments for fumigation must be made at least seventy-two (72) hours and confirmed at least twenty-four (24) hours prior to fumigation. Exporters should indicate:

- Date and time of delivery of goods to the Export Complex
- The name of the commodity/commodities
- Number of boxes to be fumigated
- Shipment information e.g. Departure date and time

Appointments must be communicated to the Export Complex Office via telephone or email during regular office hours:

- 8.30 a.m. to 5.00 p.m. Mondays to Thursdays
- 8.30 a.m. to 4.00 p.m. Fridays

8 SECURITY OF FOOD

Food products have been identified as subjects to risk of tampering, criminal or terrorist actions. All operators are responsible for the protection of all produce processed and stored in their facilities. The preventative measures listed below are relevant to all sectors of the produce supply chain, including farms, transportation, processing, packing and warehouse facilities.

8.1 Managing the Security of Food

- **Security procedures** – Assign responsibility for security to qualified people. Encourage all employees to be on the alert and immediately report any signs of product tampering or other unusual activities.
- **Investigation of suspicious activity** – When suspicious activity is observed or reported, management should immediately initiate an investigation of the incident. Should criminal activity be suspected, alert local law enforcement.
- **Supervision** – Provide an appropriate level of supervision for all employees at all times. Conduct routine security checks with focus on product or equipment tampering.
- **Mail/packages** – Secure incoming mail and packages. Be alert to any signs of tampering.

8.2 Physical Facility

- **Physical security** – Use fencing or other barriers to control access to facility. Keep gates and doors locked whenever possible. Use security patrols or video surveillance where appropriate. Provide adequate lighting of facility perimeter
- **Visitor control** – Restrict access to the facility, especially processing, packaging and storage areas. Screen incoming and outgoing vehicles for suspicious or inappropriate activity or cargo. A visitors' log must be maintained.
- **Storage and use of hazardous chemicals** – Isolate and secure all hazardous chemicals. Limit access to hazardous storage materials and storage areas. Account for all hazardous materials and investigate losses or irregularities.

8.3 Employees

- **Pre-hiring screening** – Screen employees and conduct criminal background checks for all employees, including seasonal, temporary and contract employees.
- **Daily work assignments** – Know who is working when and where.
- **Identification** – Establish a system of positive identification, such as photo ID badges. Collect ID badges when an employee's service is terminated either voluntarily or involuntarily.
- **Restricted access** – Control and restrict access to production areas, allowing only personnel necessary to perform a job or function.
- **Personal items** – Restrict all personal items from the operational area. All personal items should be stored in the designated areas.
- **Training** – Train all employees in the security of food at the time of employment and periodically thereafter.
- **Unusual behaviour** – Watch for any employee behaviour that is out of the ordinary and take appropriate action.

8.4 Computer systems and records

- Restrict access to computer systems and records. Protect with password or other methods. Back up computer data and use a system that traces critical computer transactions.

8.5 Raw material and packaging

- Use only known and reputable suppliers.
- Inspect incoming materials for signs of tampering.

8.6 Operations

- **Water security** – Test for portability regularly, secure wells, storage and handling facilities.

8.7 Finished Products

- **Store in secured areas**
 - Track movement of product
 - Lock and/or seal vehicles used to transport products.

9 RECORD KEEPING

Records play a very important role in conforming to good manufacturing practices.

Records must be kept for all stages of the operations. This is needed for traceability, inspection of processes by regulators or customers, auditing purposes and to:

- make sure we know exactly what we did and when we did it
- be able to correct mistakes if they happen
- be able to prevent mistakes from occurring in the future

9.1 Critical Records

There are some records which are mandatory to the operation of any fresh produce facility. These include:

9.2 Produce book

All exporters of fresh agricultural produce must maintain a produce book according to the Agricultural Produce Act of 1926, Section 11, which states:

“Every licensed produce dealer must keep a book wherein he shall record in the English language at the time of purchase of any agricultural produce the date of such purchase, the description of such produce, the weight, number, grade or quantity of such produce, the price paid for same, the name and address of the person from whom he or anyone on his behalf actually received such produce, the name and address of the owner of such produce, the place where and the person by whom such produce was grown or produced”.

This book must be available for inspection upon request by a Plant Quarantine /Produce Inspector.

9.3 Food Safety Plan

Every fresh produce facility must have a food safety plan which identifies, manages, and prescribes corrective measures to mitigate food safety concerns.

Among the records to be included in the food safety plan are:

1. Map of the facility and layout of the operational area
2. Worker health, hygiene, and facility sanitation
 - a) Basic food safety, employee health and hygiene training content and roster
 - b) General employee policies for appropriate and expected food safety measures for the facility
 - c) Records of all employee health incidences
 - d) Employee non-compliance form
 - e) Brochure for food safety procedures for facility workers and visitors
 - f) Facility supervisors' daily checklist for the packaging facility, for example, sanitation, packaging, chemical-usage checklist
 - g) Visitors' log
 - h) Servicing and cleaning logs for sanitation facilities
3. Internal inspections and auditing
 - a) Outcomes of inspections and audits done
 - b) Corrective measures
4. Water management
 - (a) Water monitoring sampling log
 - (b) Water testing and treatment
5. Chemical usage
 - a) Post-harvest chemical treatment records
 - b) Pest control treatment records
 - c) Copies of licences of pest-control operators
 - d) Inventory of chemicals
6. Packaging and transportation records
7. Procedures for emergency response to spills and leaks
8. Trace back
 - a) Trace-back programme
 - b) Mock recall and dates conducted
9. Training records to include files for all employees with valid food handler's permit should be maintained.

10. All facilities should have a quality-assurance plan that outlines the grades and standards of all the produce accepted for processing,
11. Written schedules and procedures for cleaning and maintaining the equipment must be kept
12. Standard Operating Procedures for processing different produce i.e process flow.

9.4 Record-Keeping Tips

1. Always use a non-water-soluble pen for writing all your records if they are not electronically produced.
2. Clearly record the date.
3. Write legibly.
4. There is a correct method for making corrections to a record – strike through the incorrect entry then write and sign the correction.
 - a. No erasers
 - b. No correction fluid (white-out)
 - c. No post-it notes.
5. Enter enough details so the information can be understood in the future.
6. There must be a proper recording system in place

10 EVALUATION

The evaluation of GMPs is a systematic activity with the objective of checking or assessing the implementation and maintenance of principles and practices. Evaluation must be periodically done to continuously improve and update operations against set standards. The main method of evaluation is auditing.

10.1 Auditing

An audit is the organized collection of information necessary to verify the efficiency of a GMP system. It is based on previously established rules and guidelines and should be conducted by trained internal or external auditors. In order to assure independence, impartiality and credibility, auditors should not be directly involved with GMP implementation or maintenance. Aspects of auditing include review of records, observation, examination and verification.

The GMP evaluation should be performed periodically or when modifications are made to the process, the product, packaging materials or in other factors that may affect the final product. Evaluation is also indicated when audits yield poor results, when frequent deviations are recorded, when new information about hazards arises, or when evident problems exist in GMP implementation.

10.2 Audit Types

Internal audit: Performed under the authority of the audited facility. Auditors should be totally independent from the areas they will audit.

External official audit: Performed under the responsibility of local official governmental authorities or from importing countries or from public-health authorities.

10.3 Scheduling of Internal and Official Audits

Audits should be programmed when at least one of these conditions exists:

- Significant changes are made to the GMP
- Suspicion arises as to the safety of a product due to a failure in the implementation of safety requirements
- Corrective measures need to be verified.
- Standard audit schedule

10.4 Steps of the Audit

The audit consists of the following steps:

- The initial step
- The audit itself
- The written report

REFERENCES

1. CFSAN 1998: Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables. Guidance for Industry. Centre for Food Safety and Applied Nutrition (CFSAN), US Department of Health and Human Services, Food and Drug Administration, October 1998.
2. Code of Hygiene Practice for Fresh Fruits and Vegetables (2003) AC/RCP 53-2003
3. Food and Drug Administration (2010), Code of Federal Regulations-21 CFR Part 108, Part 110, Part 113, Part 114.
4. Food and Drug Administration-21 CFR 110.80(a)(2)-(4) (Raw materials)
5. Food and Drug Administration (21 CFR 10.115; 65FR 56468; September 19, 2000)
6. FAO 2004: Improving the quality and safety of fresh fruits and vegetables: A practical approach. Manual for Trainers. Food Quality and Standards Service. Food and Nutrition Division. FAO Rome, 2004.
7. Food Storage and Prevention of Infestation Act (1973)
8. Pan American Health Organization (PAHO) 2001: Good Manufacturing Practice (GMP) and Hazard Analysis and Critical Control Points (HACCP), Buenos Aires, Argentina.
9. University of California 2004: Key Points of Control and Management of Microbial Food Safety for Growers, Packers and Handlers of Fresh Consumed Horticultural Products. Prepared by Trevor V. Suslow, Dept. of Vegetables Crops, University of California
10. University of Maryland 2002: Improving the Safety and Quality of Fresh Fruits and Vegetables: A Training Manual for Trainers, University of Maryland, Symons Hall, College Park, MD 20742.

APPENDIX I: STEPS TO ACQUIRING A DEALER'S AND TRAVELLER'S LICENCE

Under the Agricultural Produce Act of 1926 Section 3.(1), "Every person carrying on the trade or business of buying or selling, or of buying or exporting agricultural produce shall be required to take out a licence under this act for each premises on which he intends to carry on such trade or business."

According to Section 3 (2), a person may apply for a traveller's licence if that person;

- (a) carries on the trade or business of buying and selling, or of buying and exporting agricultural produce; and
- (b) desires to buy any agricultural produce at any place other than on the premises for which that person holds a licence to buy or export agricultural produce.

Step 1

Section 4 (4) *Acquire a certificate signed by the chief officer of the Constabulary or Justice of the parish in which the application is made that the applicant is able to read and write the English language and to keep the books required to be kept by a licenced dealer/traveler.*

Step 2

Obtain a Tax Payer Registration Number (TRN)

Step 3

Section 4 (1) *Take the certificate signed by chief officer of constabulary or justice of the parish with the requisite fees to the Collector of Taxes. (i.e. dealers licences \$250 and travellers licences \$500).*

Steps 4

Obtaining an agricultural produce certificate

- I. Obtain packing house requirements from one of the Plant Quarantine/Produce Inspection Branch offices or online at www.micaf.gov.jm (Plant Health Services) for new exporters

If using the facility of a licensed and certified exporter, obtain a letter from the exporter giving approval for the use of his facility.

- (a) This arrangement will be for a period not exceeding one year.
- (b) A letter written on the company's stationery and signed by the licensed certified exporter, or one other person designated by the licensed certified exporter, should accompany each shipment, verifying that the produce was packed at the approved premises and also indicating the quantity of each item included in that shipment.
- (c) Notify the Plant Quarantine/Produce Inspection Branch when packing on behalf of another person has ceased.
- (d) Take note that shipments will not be certified unless condition #2 is met each time a shipment is presented for inspection and certification.

II. Make an appointment with the Plant Quarantine/Produce Inspection Branch for inspection or re-inspection of packaging facility by calling 924-8906 or 924-8736 in Kingston, 940-4146 or 979-2586 in Montego Bay. The following information should be provided:

- a. Name and address of the potential exporter
- b. Location of packing house
- c. Name, address, telephone number(s) and email of contact person
- d. Tax Payer Registration Number (TRN)

III. Pay the requisite fees for inspection/re-inspection of the facility at the Plant Quarantine/Produce Inspection offices.

IV. If the facility is approved, you will be issued a letter to Jamaica Trade and Invest (JTI) and a Packing House Certificate

V. **Section 9 Duration of licence** *“Subject to the provisions of Section 7 of the Agricultural Produce Act 1926, every licence which shall be granted under this act shall commence on the 1st day of April in each year and shall, unless previously forfeited, expire on the 31st day of March in the immediately succeeding year”.*

VI. **Section (10) Notice board to be affixed to premises:** *“Every licensed produce dealer shall affix a notice board on some conspicuous place at the entrance of the premises specified in the licence”*

A board whereon shall be legibly painted in white letters and figures not less than three inches in height:

- (a) His name in full
- (b) The number and the class of his licence, and
- (c) The words Licensed to deal in Agricultural Produce, and
- (d) The year in which the licence is issued, and

Such board shall not be exhibited after the expiration of the licence.

NB: Licences are valid for one year

VII. **Section 11 Produce book to be kept** *“every licensed produce dealer shall keep a book wherein he shall:-*

- *Record in the English language at the time of purchase of any agricultural produce:*
 - *The date of such purchase*
 - *The description of such produce*
 - *The weight, number, grade according to the number of hands or quantity of such produce*
 - *The price paid for the same*
 - *The name and address of the person from whom he or anyone on his behalf actually received such produce*
 - *The name and address of the owner of such produce, and*
- *Such book shall be open at all reasonable hours to inspection by any:*
 - *Justice of the peace, or*
 - *Constable, or*
 - *Person authorized under any enactment for the time being in force relating to praedial larceny, or*
 - *Inspector, who may take possession of such book for purposes of evidence or record*

VIII. **Section 14 [1]** *“No person shall carry, on any water highway or public road, any agricultural produce unless such produce*

is accompanied by a produce receipt, unless the person who carries such produce is for purposes other than trade or business”.

IX. Section 15 [1] *Every person who is required to issue a receipt under Section 14 [2] may apply for a receipt book mentioned in subsection [2] at any office of the Jamaica Agricultural Society situated in:-*

[b] if the person is a licensed produce dealer, the parish in which he carries on business or in which his licence is issued.

12. Section 17 [1] *every carrier shall apply for and obtain a carrier’s licence*

For further information contact:

Chief Plant Quarantine/Produce Inspector

Telephone: 876-977-0637/977-6401 (PQ/PI Head Office)
876-924-8906/924-8736 (Export Complex – Kingston)
876-940-4146/979-2586 (Export Complex –
Montego Bay)

Fax: 876-977-6992 (PQ/PI Head Office)
876-924-8907 (Export Complex – Kingston)
876-940-1038 (Export Complex – Montego Bay)

Email: ppq@micaf.gov.jm
ppqkgn@yahoo.com
pqmobay@micaf.gov.jm

APPENDIX II: EXPORT PACKAGING FACILITY GUIDELINES

STRUCTURAL REQUIREMENTS

Packing house must be strong enough to withstand the elements of nature. The structural frame of the packing house must be established using material that will facilitate proper washing, disinfecting and other means of sanitation.

SPACE

- Minimum operational floor space requirement is 92.9M² (1,000sq.ft.)
- A portion of the 92.9M² should be used for storage – sawdust or coir dust storage, chemicals, boxes etc. However, an independent storage facility may be established outside the packing-house structure.

This 92.9M² area does not include space for office, sanitary convenience, storeroom, lunch room etc.

BUILDING STRUCTURE

- Must be a separate building from dwelling house in accordance with the public health standards.
- Must be of sound structure, established for fresh produce processing; the structure could be established using the following model:
 - *Constructed using concrete or suitable material (board not recommended for the main structure such as sides and floors). See figure 1.*



Figure 1: Model packing house built using concrete

- The layout should be designed to allow for loading, off-loading, packing and dispatch of produce.

FLOOR

- Concrete flooring for safe and easy movement of people and produce.
- Floor must be steel, floated to allow free flow of water and washing after packing.
- Floor must be sloped towards drain.

It is recommended that where the floor meets the wall it should be curved with no right angles (semicircle/curves to prevent water settling and allow for easy cleaning).



Figure 2: Smooth steel, floated floor surface

WALL SURFACE

- Wall surface must be smooth and painted with light-colour food-grade paint (fungus resistant).
- Wall surface must be an easy-to-clean surface and not prone to growth of mold.

VENTILATION

Building should be constructed to facilitate adequate ventilation while providing protection.

- At least one-third of wall space should facilitate proper air flow.



Figure 3: Windows one-third of the wall space will facilitate air flow

ROOFING

- Building must have adequate protection from the elements of nature.
- Roofing types: concrete slab, aluminium or galvanized zinc sheeting, or any other suitable roofing material- roofing tiles, shakes, and shingles.
 - Material for roofing must be clean and undamaged.
 - Translucent sheets could be used to enhance lighting inside packing house. However, this must only be done if ventilation is excellent. Translucent sheets may result in temperature build-up in the packing house.
 - Roof eaves should hang at least one metre all around
 - Roof must be constructed to prevent water settling
 - Packing house that is built with slab roof may require additional ventilation.

Figure 4: Types of roofs



Roof tiles



Slab roof



Zinc roof

LIGHTING AND ELECTRICITY

- Building should have electricity and adequate lighting to facilitate washing, sorting and packing. (Lighting should be a minimum 540 lux)
- Choice of lights inside the packing house should be yellow lights; yellow lights act as a repellent for insects.
- White lights could be used away from the packing house to pull insects away from operation areas.
- Bulbs are to be covered in order to prevent contamination of produce due to glass from broken bulbs.

Figure 5: Lighting



Uncovered light



Covered light

LIGHTING AND ELECTRICITY

SCREENS (PROTECTION)

- Openings should be screened to protect against entry of insects, birds, rodents and other vermin or anything likely to contaminate the produce.
- Screen specification: insect-proof screen.

Figure 6: Examples of insect-proof screens



Window screen



Door screen

Road

- Through-road access to the property; road should be relatively smooth and able to accommodate small to large trucks and cars.

Doors

- All screen doors leading to the operational area in the facility must be self-closing
- Must be flushed at the top and floor
- Wooden doors painted with fungus-resistance oil paint
- Easily cleaned, smooth, non-absorbent surfaces

DRAINS AND CHEMICAL

Drains

- Drainage must be designed to handle run-off as well as water used in processing operations, without posing threat to the environment.
- Drains and wastage conveyance outlets: open-drain system to facilitate cleaning, and inclined to allow flow of waste from the packing house (must be designed to prevent the entry of rodents).



Figure 7: Open drains with suitable cover to prevent entry of rodents

CHARCOAL PIT

A charcoal pit should be constructed for the disposal of unused chemical mixture. The minimum pit dimension should be 90cm (3ft.) wide and 120cm (4ft.) deep. The pit should be layered, first with a layer of clay, then charcoal, then a mixture of sand, marl and clay (1:2:1:1 ratio) and topped with charcoal.



Figure 8: Open drains with suitable cover to prevent entry of rodents

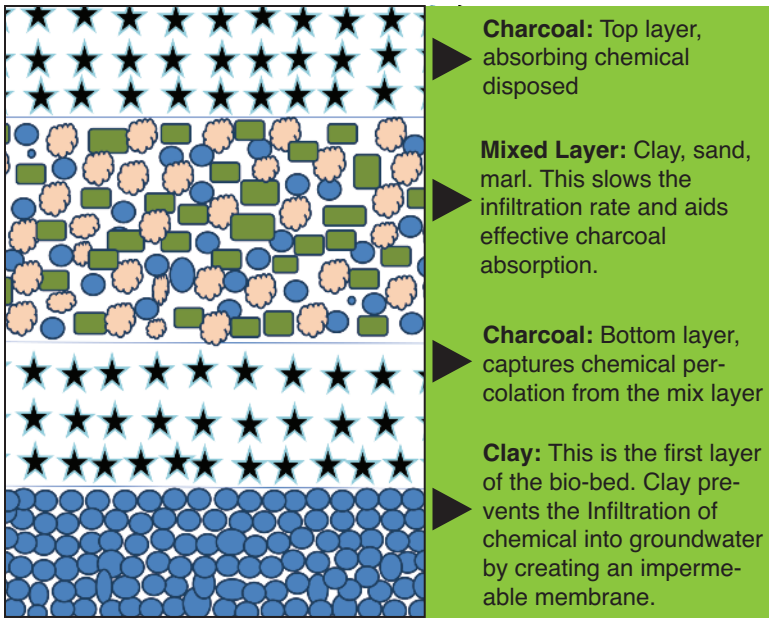


Figure 9: Cross-sectional layout of a charcoal pit



The composition of the charcoal pit should be in the ratio 1:1:2:1 that is, one part clay, one part charcoal, two parts mixed layer, and one part charcoal on top.

OPERATION AREA

Space layout/flow

- Offloading
- Checking and selection
- Washing /cleaning
- Post-harvest treatment
- Drying
- Grading and sorting
- Packing
- Holding (finished product)

- Layout should be designed to allow free movement of produce and personnel throughout the packing house.
- Allow separate space for offloading, checking, and recording, washing, holding, treatments, packing and dispatch areas.
- Allot adequate space for equipment, chemicals, storage of packing supplies.
- Chemicals should be stored in a separate, secured, restricted, ventilated area.

Figure 1: Unidirectional flow of operations

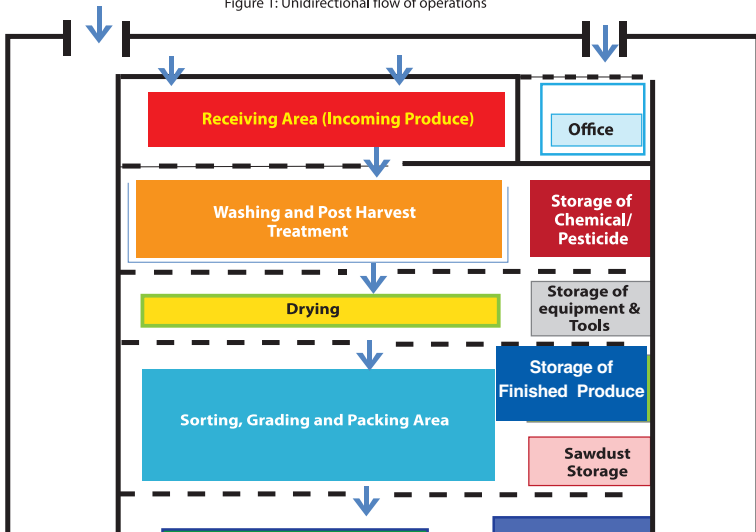


Figure 10: Unidirectional flow operations

EQUIPMENT, TOOLS & MATERIALS

Some tools, equipment and materials necessary for an effective operational flow in a processing and packaging facility.

Washing facilities

- Wash tank: Stainless steel, plastic (plastic must be food-grade finish) or concrete (smooth, impervious, non-absorbent, and cleanable).
- Elevated at a minimum of 75 cm (2.5 ft.)

Figure 11: Wash tanks



Concrete washtank



Food-grade plastic washtank

Dip tank (plastic or concrete)

Treatment/dip tank [for post-harvest treatments]: high-density polythene supported on stands about 75cm high; concrete, smooth, impervious, non-absorbent, and cleanable)cm high; concrete, smooth, impervious, non-absorbent, and cleanable)



Figure 12: Dip tank made from food-grade plastic and supported on a metal stand

Stools and chairs: Seating for workers must be suitable and provide the necessary support and comfort for the users.

Tables or drying racks

- Drying racks or tables made of plastic-covered wire mesh or diamond-shaped wire mesh are suitable. Dimension: 120cm x 240cm (4ft. x 8ft.)
- Sorting and grading table made from stainless steel or food-grade plastic. If constructed with board, the surface must be covered with a food grade plastic.
- Table and drying racks should be approximately 75cm (2.5ft.) high.

Trays, bins: Produce bins, containers or trays should be preferably made of high-density polythene.

Knives: Knives must be stainless steel, well sharpened for cutting fresh produce.

Pallets: Plastic or treated wooden pallets are recommended to be used inside the packing house.

Produce wash brushes: Brushes must be available for washing ground produce.

Cleaning equipment and supplies: These must be available – broom, mop, shovel, dust mask etc.

Scales

- Scales for weighing incoming fresh produce
- Scales for weighing finished commodity and
- Separate scale for weighing chemicals
- Scales should be calibrated and have metric units (kg)

Water: Potable running water (municipal or have proof of treatment)

Roller conveyors

Optional but recommended to facilitate better management, supported on stands, are ideal for the movement of bins or trays throughout the various stages of the operation.

CHEMICALS/PESTICIDE REQUIREMENTS

Pesticides should be stored under dry, cool conditions and be securely locked away. Pesticides must be stored separate from produce and packaging materials. Storage must be in accordance with Pesticide Control Authority regulations.

The appropriate chemicals should be used for the intended market. See Post-Harvest Treatment guidelines.

Requirements for chemical/pesticide use in post-harvest operation

Gloves

- Rubber gloves. Must be sturdy
- 30cm (12 ins.) in length (from the base of the hand reaching to the elbow)

Mask and goggles (respirators)

- Use appropriate safety gear. *DO NOT USE DUST MASK*

Rubber boots and/or hard boots

- Must be worn within operational area

Measuring cylinders/cups

- Must be used to measure liquid chemicals correctly, e.g. Mertect

Scale (digital for small measurement)

- Small unit scale to measure powder-based fungicide, e.g. Botran

Spoon (teaspoon/tablespoon)

- Must be available and used to assist in measuring chemicals

Record books/sheet

- Proper record system must be in place and available for viewing upon request
- Records should be made of each post-harvest application
- Each application should be in compliance with the post-harvest fungicidal guidelines

For recommendations on approved pesticides for selected importing countries from Rural Agricultural Development Authority (RADA) and Pesticides Control Authority (PCA) see Appendix III – Recommended post harvest chemical.

STORAGE

The operational flow chart that outlines the one-way-flow system will help to design designated areas for storing finish produce and material in a manner that will help to prevent cross-contamination.

Chemicals

- There should be a suitable storage area for detergent, soap, bleach, etc.
- Chemicals should be stored under dry, cool conditions and kept securely. Store chemicals separately from produce and packaging materials.

Stationery and shipment supplies: There should be suitable storage for boxes, tape, staples.

Finished product

- Designated storage area for finished product (finished products must not be stored in close proximity to untreated produce; cross-contamination must be avoided at all times).
- A chill room is considered the most suitable areas to store finished produce.

Packaging materials

- Proper storage for pallets
- Proper storage area for sawdust, coir fibre or dust.
- If sawdust is stored on the outside, a proper structure with a suitable roof that would prevent contamination from external factors (rain, dust, pathogens) should be constructed to facilitate covering and locking. This structure should be elevated at least 2 ft. from the ground.



Figure13: Uncovered sawdust bin

PERSONNEL REQUIREMENTS

Packaging materials

- Aprons, hair cover, hard boots should be worn at all times within the operational area in keeping with food safety standards.

Protective gloves must be worn by personnel handling food.

Personnel facilities:

Bathroom - Located away from operational area (must be properly maintained). Ratio of personnel to bathroom must be in accordance with public-health standards.

Hand wash station and Eye Wash Area - Provide adequate hand-washing facility with soap, hand sanitizer, disposable towels, and/or hand dryer.



Hand wash station



Hand wash sink with sign

Running water - Potable running water (municipal or proof of treatment for other sources)

Lunch room - Specific area for eating and relaxing located away from operational area

Changing room - Located away from the operational area with appropriate lockers for workers

Sickbay - Must be in place

First-aid kit

- Must be provided. All workers should know where the First-aid kit is located.
- Must have basic items (such as disinfectant, bandages, painkillers, activated charcoal (treatment for poisoning), smelling salts, rubbing alcohol).

Office

- Must be in place and accessible to staff
- Telephone, documentation processing, record storage etc.
- Provide records for review upon request e.g. the produce book
- Provide information on traceability programme, e.g. chemical usage

SANITATION

All packing houses must maintain proper operational hygiene in compliance with local and international standards.

Grounds

- Proper outdoor sanitation should be maintained. Shrubs, bushes and grass should be pruned.
- Animals are not allowed in the packing house or in the surroundings. There should be no rearing of goats, cows, pigs or other animals on the same compound.
- If dogs are used for security purposes, they must be secured during working hours in proper kennels.
- Covered bins, containers, garbage-disposal skips must be in place and conveniently located.

SIGNAGE

There should be adequate signage throughout the facility, for example: *No Smoking, Please Wash Hands, Chemical Room, and No Eating*

APPENDIX III: LIST OF RECOMMENDED POST-HARVEST CHEMICALS

Recommended Post-Harvest Chemical for Yam (*Dioscorea spp*)

United States of America

Fungicide	BOTRAN 75WP (a.i. <i>dicloran</i>)		
Volume of tank used for post-harvest treatment	Mild 200ppm	Medium 400ppm	Strong 600ppm
1 gallon (4.55L)	1.2 Grams (g)	2.4 grams (g)	3.6 grams (g)

USA standards for Botran (Dicloran) Tolerance is **10ppm or 10mg/l**.
Thus, the proposed measurement fall in line
with the tolerance level.

EU Markets

Fungicide	Mertec (a.i. <i>thiabendazole</i>)		
Volume of tank used for post-harvest treatment	Mild 200ppm	Medium 400ppm	Strong 600ppm
1 gallon (4.55L)	4.0 (ml)	8.0 (ml)	12.0 (ml)

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