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GOSP
GLOBAL QUALITY
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SIAEP



STANDARD OPERATING PROCEDURES

For Export Mangoes Packhouse

Acknowledgements

This document was prepared by Mr Peter Johnson and Mrs Dang Thi Sau. We appreciate the valuable inputs received during the preparation of this document from the following experts and organizations: Mr Le Minh Hung, Mr Nguyen Duy Duc, Mr Nguyen Van Phong, Mr Nguyen Vinh Phuc, Sub-Institute of Agricultural Engineering and Post-Harvest Technology (SIAEP), Agro Processing and Market Development Authority (AGROTRADE), Plant Protection Department (PPD), Department of Crop Production, Vietnam Institute of Agricultural and Post-Harvest Technology (VIAEP), Southern Horticultural Research Institute (SOFRI), Vietnam Fruit & Vegetable Association (VINAFRUIT).

This document was prepared under the framework of the project “Increasing quality and standards compliance capacity of Mango value chain in the Mekong River Delta”, which is jointly implemented by the Ministry of Agriculture and Rural Development (MARD) and the United Nations Industrial Development Organization (UNIDO) and funded by Switzerland, through its State Secretariat of Economic Affairs (SECO).

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Contents

1. General Information	1
2. Scope of SOP Document	1
3. Key Definitions	2
4. Principle Implementation of SOP	3
5. Means of Implementation	3
5.1. Location of Packhouse and Requirements	3
5.2. Layout of the Packhouse	4
5.3. Water Supply	5
5.4. Equipment Requirement	6
6. Content of Implementation	7
6.1. Processes	7
6.1.1. Receivals Inspection	7
6.1.2. Desapping	8
6.1.3. Washing	9
6.1.4. Grading and Sizing	9
6.1.5. Postharvest Disease Treatments	10
6.1.6. Drying	11
6.1.7. Packing	11
6.1.8. Ripening	13
6.1.9. Palletizing	13
6.1.10. Pre-cooling and Cold Storage	14
6.1.11. Loading	14
6.1.12. Records and Documentation	14
6.2. Product Flow and General Procedure	15
6.2.1. Product Flow Diagram	15
6.2.2. Isolation Pathways	16
6.2.3. Implementation of Hazard Based Internal Control System	16
6.2.4. Cleaning Schedules	17
6.2.5. Pest Control Procedure	20
6.2.6. Waste Management Procedure	21
6.2.7. Training Requirements	21
6.3. Quality Assurance	21
6.3.1. Product Specifications	21
6.3.2. Quality Monitoring	22
6.3.3. Internal Audit	23

6.3.4. Documentations and Record Keeping	24
7. Compliance and Record Keeping	24
7.1. Mandatory Legislative Requirements	24
7.1.1. Registrations	24
7.1.2. Regulatory Compliance	25
7.1.3. International Trade	25
7.2. Customer Requirements	26
7.2.1. Traceability	26
7.2.2. Audits (Internal and External)	27
7.3. Occupational Health and Safety	27
7.4. Environmental Management	28
7.5. Training Requirements	28
8. Documentations and Record Keeping	29
8.1. Required Archives Documents of Packhouse	29
8.2. Requirements of Record Keeping	30
9. References	32
10. Appendixes	33
Appendix 1: Standard for mangoes (codex stan 184-1993)	33
Appendix 2: Packhouse Internal Auditing Checklist	40
Appendix 3: Operational plan	51
Appendix 4: SSOP check lists	55
Appendix 5. Forms applied in the export mangoes packhouse	71
Appendix 6. Layout plan of packhouse	83
Appendix 7. Pictures demonstrate activities at export mangoes packhouse	84

Acronyms

CCP	Critical Control Points
EU	European Union
GS1	Global Standard 1
HACCP	Hazard Analysis and Critical Control Points
ISO	International Organization for Standardization
ISPM 15	International Standards For Phytosanitary Measures No. 15
MARD	Ministry of Agriculture and Rural Development
MRL	Maximum Residue Limits
PHC	Packhouse code
PUC	Production Unit Code Number
QA	Quality Assurance
QC	Quality Control
SOPs	Standard Operating Procedures
SSOP	Sanitary Standard Operating Procedures
TCVN	Viet Nam Standards
VHT	Vapor Heat Treatment

1. General Information

The packhouse is a critical component for the export chain where product can be received, sorted and graded to specification, post-harvest treated for disease, packaged and cooled to the requirements of the export market. The packhouse has substantial influence over the end quality of the fruit, with the ability to intercept and remove inferior coming from suppliers and then prepare a handle to standards to minimize quality deterioration farther down the chain. This document applies to mango business and personnel involved in the export mango chain such as growers, cooperatives, collectors, packhouse operators, managers, personnel technicians, traders and exporters.

This document is intended to be read with in conjunction with the following SOP documents:

- SOP No.1: Standard Operating Procedures for exported mangoes field practices
- SOP No.3: Standard Operating Procedures for disease management of exported mangoes
- SOP No.4: Standard Operating Procedures for cool chain management of exported mangoes
- SOP No.5: Standard Operating Procedures for transportation of exported mangoes
- SOP No.6: Standard Operating Procedures for traceability of exported mangoes
- SOP No.7: Manual for mangoes export market requirements.

2. Scope of SOP Document

The scope of this document is to provide the standard operating procedures for packhouse operational management of fresh mangoes so they will meet the requirements for export to a modern retail system.

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

This document can also be used as training reference resources for Agricultural Extension Centers, Vietnam Fruit and Vegetable Association (VINAFRUIT) and for agricultural students in Universities and Colleges.

The export markets do not have their own requirements: Middle East market, Canada, Russia, and Singapore.

Markets requiring irradiation: USA, Australia, and New Zealand.

Markets requiring vapor heat treatment: Japan, Korea, and New Zealand.

3. Key Definitions

Packhouse: The packhouse of fresh mangoes for exporting is the place where mangoes are gathered, sorted, preliminarily processed, postharvest treatment, packed and preserved according to a process in accordance with the phytosanitary requirements of the importing country.

Product specification is the blueprint for describing how the product should appear and comply. Most product specifications can be grouped under four main criteria:

- General appearance (Colour, visual appearance, size sensory, shape and maturity)
- Major defects (Insects, diseases, physical damage, temperature damage and physiological disorders)
- Minor defects (Physical damage, temperature damage, physiological disorders, and blemishes)
- Consignment criteria (Tolerance per consignment, packaging & labelling, shelf life, receival conditions, chemical & containment residues and food safety requirements)

An internal quality assurance program is a process that ensures product leaving the packhouse consistently meets product specifications.

4. Principle Implementation of SOP

Principle 1: Packhouse Infrastructure

For an export packhouse to be able to produce a product that is able to meet the requirements of the modern retail system it needs to have a level of infrastructure accompanied with its operational procedure for this that will enable it to meet the requirements. Whilst also being consistent with the packhouse code award conditions.

Principle 2: Processes

The activities within a packhouse that enable the operation to process product that meets specification and market requirements. Each activity can have an impact on quality and potentially shelf-life of the fruit.

Principle 3: Product Flow

Understanding the movement of product through the packhouse requires capabilities of the identification of critical control points influencing the quality of storage products.

Principle 4: Quality Assurance

The movement of product through the packhouse will enable the identification of critical control points where the processes can influence the ability to maintain quality.

Principle 5: Compliance

Verification of management practices needs meeting requirements of standards, regulation, quality, environment, health and safety.

5. Means of Implementation

5.1. Location of Packhouse and Requirements

An export packhouse must have good access to transportation infrastructure, preferably sealed roadways. The facility requires access to power supply, clean water source, reliable communication, drainage system, a place to collect waste linked to a waste treatment facility to ensure environmental sanitation and must have a fire protection system according to regulations. The building must have a solid structure, enough protection from

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

the sun and rain, the inside of the building must have enough light and good ventilation, the floor must be suitable to ensure hygiene.

The following areas should be avoided as a location:

- Polluted areas such as chemical waste, radioactive sites or industrial zones which emit contaminants such as ethylene and other gaseous compounds.
- Flood-prone areas.
- Areas with high levels of pest infestations such as rodents, birds and insects.
- Where solid or liquid waste generated by the packing facility cannot easily be removed such as crowded urban centers with limited heavy vehicle access.

Packhouse structures intended for the usual preparatory steps for fresh produce packaging, should be within easy reach of markets, sea ports and/or airports. Several growers may use one packing-house as a common service facility, which should be accessible to all of them.

Packhouses for produce destined for high-end or export including phytosanitary markets such as the United States, Australia and Japan must, for example, be packed in a screened area to prevent re-infestation with fruit flies once it has undergone phytosanitary treatment. Such facilities may also have small laboratories equipped with basic instruments for evaluating the quality of produce. Cold rooms may also be provided for pre-cooling and temporary holding to minimize the impact of transport delays.

5.2. Layout of the Packhouse

The export packhouse must have segregation of receipt and dispatch area, product must be able to flow through the facilities in a unidirectional manner with no chances of cross contamination of product.

Other important considerations in the packhouse lay-out are practicalities of maintaining a clean working environment, the ability to exclude vermin, the working environment, working heights and space for the operation of the packing facilities.

5.3. Water Supply

The source of water used in the packhouse must meet the requirements in accordance with current regulations on clean water quality. The regulation applied at this time is the National Technical Regulation on the quality of clean water used for domestic purposes QCVN 01-1:2018/BYT (This regulation needs to be updated according to current regulations).

The packhouse must have an adequate supply of clean water in terms of volume, temperature, and pressure to meet the packhouse's operational and hygienic requirements. Ground or rain water sources will need to be treated to eliminate risk of pathogens, this can be done through filtration and sterilization (Chlorine or Ultraviolet).

Water sources must be periodically tested for quality at laboratories meeting ISO/IEC 17025:2015 standards and quality criteria according to the regulations of the Ministry of Health on water requirements for production and must keep records of these test results.

Water storage facilities should be designed with adequate capacity, made of food grade materials, and cleaned and maintained periodically to prevent contamination. Water can be reused if it does not present a contamination hazard. The reused water must meet the requirements of the Ministry of Health's regulations on clean water quality according to QCVN 01-1:2018/BYT (this regulation needs to be updated according to current regulations).

Water filters are regularly changed or effectively maintained.

Water that does not meet the quality requirements according to the current regulations on clean water quality used only for fire fighting equipment, refrigeration equipment and other similar purposes does not come into contact with the fruit and must have a separate system, determined clearly identified, do not connect or allow reflux into the clean water system. The water pipes and all connectors are made of non-toxic, durable, waterproof, easy to seal and crack-free materials.

5.4. Equipment Requirement

Required equipment can vary greatly depending upon the degree of mechanization of the packhouse.

Basic Requirements

Weighing scales, de-sapping tanks or racks, sorting and grading tables, mango washer, hot water treatment machine, blowers system for air-drying, packing table, cool room(s).

Additional Equipment

Conveyors, carts and forklifts, forced air cool rooms, ripening rooms with ethylene gas generator, mechanical grader.

Technical Equipment

Digital weighing balance, vernier calipers, penetrometer, refractometer, digital thermometers with pulp probes, chlorine test kits, pH meter, temperature data loggers.

Measuring instruments such as scales, thermometers, heat sensors of hot water treatment machines, cold storage temperature sensors, VHT temperature sensors, humidity sensors, etc. must be calibrated periodically and kept records according to the regulations of the importing country.

Equipment for Maintenance

Routine inspections are carried out on a regular basis on all production machinery by the quality supervisor to ensure that its maintenance schedules, cleanliness and operational safety are up to date. Records of maintenance, safety issues, inspections along with corrective actions need to be kept.

The necessary tools and equipment for the room/area to test finished samples include: quality check table of suitable size, clean, well-lit, with tools such as precision balances, magnifiers (10X), sample containers for unspecified defects, copies of packaged product specifications, and product inspection record forms.

6. Content of Implementation

6.1. Processes

Packhouse process is the specific steps for handling mangoes for the target market. The process includes a number of steps, including receivals, de-sapping, cleaning, diseases treatment, sorting and grading, ripening (if necessary), packaging, pre-cooling, and cold storage. If excess fruit cannot be treated and packaged immediately or transport is delayed, holding capacity in the packhouse is necessary.

6.1.1. Receivals Inspection

On receiving product into the packhouse, it is the responsibility of the appointed quality supervisor to collect, assess and record samples, verify documentation and report to the packhouse manager when necessary.

Traceability and Compliance

Verify consignment either directly from programmed orchard with an allocated producer unit code and registration of packhouse facility or indirectly from an intermediary supplier with registration of packhouse or from an orchard certified GlobalGAP., organic (if any).

Check consignment if it is clearly identified with suitably labeled/marked to allow identification of information on name of orchard, location, production unit code number, variety and date of harvesting.

Each consignment is accompanied with a declaration of agro-chemical treatments applied (product applied/date).

Quality Inspection

A random sample of each consignment is assessed with a representative of 2% of the fruit.

Each fruit is inspected for maturity, softness, external appearance, contamination and the presence of pests and disease. A cut test is recommended for fruit that is suspected immature, the internal colour of the fruit can be matched against maturity standards.

Crates are inspected for cleanliness and signs of rough handling.

Pulp temperature can also be recorded at this point by inserting a temperature probe into the sampled crates of fruit.

QC at the receiving stage needs to fill in all the details of the input material source in the material receipt file, including the date and time of receipt, the identification number of the carrier (license plate), the variety and volume of the received mangoes, and grower/harvest information. Receipt records need to fill in all information about ripeness and fruit quality.

6.1.2. Desapping

The preferred method is that the desapping process happens in the field at harvest as this will give the best quality results. However, this is not always possible and therefore will need to be undertaken in the packhouse, carried out in the processing area by trained workers.

Method 1: Desapping onto Racks

Hold the fruit upside down while cutting the stalk of fruit at the first knuckle 0.5 to 1.0 cm with a pair of clean sharp secateurs allowing the spurt sap to come out without touching the skin of the fruit.

Inverting freshly de-stemmed fruit on plastic or steel mesh racks, allowing the latex to drip for about 30 minutes. Racks must have a wide mesh and the fruit needs to be placed so that the stem is the space between the rack and the sap can flow unimpeded. Do not invert fruit on burlap sacks as this may lead to coagulation of latex at the base of the fruit. Racks and equipment used for this process must be cleaned regularly to prevent cross contamination.

Method 2: Lime Desapping

A stainless steel water holding tank is preferable. The water in the tank is added with food grade lime to make a 0.5% solution, alternatively desapping powders can also be used. This will neutralize the acid in the sap.

The stem is then either broken by holding the mango upside down pulling the stem towards the body while moving the mango away from the body. After the initial spurt sap the fruit is placed in the solution plastic crates can be used to hold the fruits during dipping. Note that the amount of sap

treatment solution must be enough to ensure that the mango is submerged during the processing time. Fruit should only be held in the solution for a minimum of 90 seconds and a maximum of 120 seconds before removing. The solution in the tank needs to be replaced when a noticeable oil layer builds up on the surface.

6.1.3. Washing

Mangoes often come into the packhouse covered in residue or sap and require a level of cleaning, in modern packing lines this is conducted over mechanized smooth rotating brush units while subjected to overhead water sprays. If such equipment is not available it is recommended only to manually wash the fruit if it has visible residue on the skin that needs removing, this can be done with clean damp soft cloths. Do not use detergents in any washing process to avoid lenticel spotting on the skin of the fruit.

6.1.4. Grading and Sizing

These activities are determined by available types of equipment. With a fully mechanical operation the grading and sizing are done just before packing. With a manual operation this can be done at either the beginning of the operation or even at the packing stations.

Correct sizing is important as this will facilitate ease of packing and assure carton weights are within specification and the final pack is uniform. Sizing can be done either mechanically or manually and is generally based on weights and related to the counts in the cartons. The tolerance levels between the weights will vary.

Grading is measured by national standard or by a customer specific standard. Around the world, many mango classification standards are based on the Mango Codex Standard 184-1993.

For accurate grading a table is necessary ideally on a conveyor, grading can be done manually by using conveyors to move products where the fruit can rotate, workers will be standing along either side of the conveyor to grade. Grading area needs good lighting with shatter proof covers.

To follow specific standard, graders need to be trained to the specific standards that are being applied. Mangoes are graded into 3 classes, including extra class, class 1, class 2 as per the quality parameter specified and the tolerance described in product specifications.

Fruit that is graded out of specifications is segregated into plastic crates are removed at the end each working shift from the packing area and are distinctly labeled for disposal.

6.1.5. Postharvest Disease Treatments

Intervention with a postharvest treatment for disease is a critical component for successful exporting of mangoes. Treatments will suppress the development of diseases and the level of suppression will depend on several factors such as the level of inoculum, disease profile, temperature of the water and duration of treatment.

Hot Water Treatment (HWT): HWT is to control postharvest diseases. There are two distinct systems for applying HWT in a packhouse.

Batch System: The fruit is immersed in a hot water bath at 52°C for 2-5 minutes. Ensure that the water is circulating with a pump so that there is an even water temperature, monitor the water temperature constantly, make sure the fruit is fully submerged for the duration of the treatment. Do not exceed treatment time or temperature. Do not treat fruit harvested in wet weather. Strain off the fruit before packing.

Continuous Flow System: The fruit is exposed to a continuous hot water spray at 52°C for 2 - 5 minutes. Generally, this is incorporated into a mechanized packing line. Monitor the water temperature constantly to ensure a spray that the fruit is rotating and a dip that is forced under the water for the duration of the treatment. Do not exceed treatment time or temperature. Do not treat fruit harvested in wet weather. Allow fruit to dry before packing.

Efficacy can be greatly enhanced by the addition of postharvest fungicides. These options are currently being trialed in Vietnam for registration purposes. Check products permitted status in Vietnam before

using. Ensure the chemical is permitted by the importing country. Follow manufacturer's label for dosage, top up requirements, mixing and safety procedures. Treatments should be recorded; batches should be identifiable throughout storage and subsequent distribution up to and including point of export. Post-treatment withholding periods should be complied with. Dispose of waste chemical solutions in accordance with local environmental and safety regulations.

6.1.6. Drying

After the hot water treatment, the fruit should be cooled down and dried before packing by placing it in a plastic container in a cold room. Humidity conditions will determine how fast the fruit dries. The process can be enhanced by using fans to move air across the surface of the fruit.

6.1.7. Packing

Mangoes are manually packaged in carton boxes. As required by some markets, each mango can be wrapped in a foam net before being packed into cartons. Carton box with a lid is preferred for airfreight and a single piece open top carton box is suitable for sea freight. The dimensions of the cartons may vary depending upon customers' requirements.

(Refer To SOP 4 - Cool Chain Management for Export and SOP 5 - Transportation for Export Mangoes for information on carton designs).

Once the export carton sample has been selected, a packing template for this type of carton must be created.

The packed carton must meet the specified minimum weight, allowances need to be made for weight loss so packs should add an average of 5%.

Fruit Size

This will need to be calculated using the following formula

$$\text{Average size} = \frac{\text{Carton weight}}{\text{Count}}$$

Then the tolerance level will be 50% the difference between the average of the next count.

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

For example 5 kg carton using counts 8,9 and 10

$5/8 = 625\text{g}$ $5/9 = 555\text{g}$ $5/10 = 500$.

Count	Average size (g)	Tolerance (g)
8	625	660-591
9	555	590-528
10	500	527-473

Table 1: An example of a 5 kg carton fruit weight distribution.

Fruit Placement

Fruit must be of uniform size, packed in the same direction and position, preferably stem end facing downwards. The use of white expandable polystyrene, netted sleeves is common in some export packhouses, these are not mandatory and some markets such as the EU do not want their use at all. They will often make uniform packing and meeting the minimum carton weight more difficult, it is important to check with the importing country before using these sleeves.

Check each market destination that sealing the carton may be required by some importing countries.

Labelling

Carton labelling in most countries is a legal requirement. Labelling needs to comply with Decree No. 111/2021/ND-CP on goods labels or labelling according to the regulations of the importing country.

Each product carton or tray must have the following information visible externally:

- Product
- Country of origin
- Exporter's address
- Weight
- Date packed
- Traceability to Orchard or block (Production Unit Code Number, Packhouse Code and Lot Number)

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- Treatment Facility Code (TFC): for irradiated or heat treated (VHT) products (if applicable)

Traceability data should be recorded and labels applied using the GS1 International Traceability Standard, as set out in TCVN 12827:2019

(Refer to SOP 6 - Standard Operating Procedures for traceability of exported mangoes)

6.1.8. Ripening

Some markets, particularly those where airfreight is being used, may require the packhouse to partially start the ripening process. It is very important to communicate with the customer about their requirements, especially what stage of ripening they want to receive the fruit.

This is conducted in a suitable temperature-controlled room where ethylene is introduced either via gas injections or catalytic ethylene generator. Ripening room temperature needs maintaining between 18 to 22°C. Treat with an ethylene concentration at 100 ppm for 24 hours to activate the ripening process, CO₂ needs to be maintained below 1% this can be achieved by venting the rooms 10 to 15 minutes every 6-8 hours.

It is necessary to locate ripening rooms away from storage areas containing produce that could be damaged by exposure to ethylene. Pure ethylene gas is potentially explosive and extreme caution and appropriate safety measures must be in place for its use.

6.1.9. Palletizing

Most modern markets will require the cartons to be palletized for ease of movement, for selecting the type of pallet Refer to SOP 5 Transportation for export mangoes

Wooden pallets must be compliant with the International Standards for Phytosanitary Measures (ISPM) 15 – for wood packaging material.

When stacking cartons onto pallets, be sure that the first layer of cartons is placed completely within the outside edges of the pallet. If the cartons overhang the pallet, carton failure is likely to occur. Subsequent

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

layers must be stacked according to carton manufacturer's specification, this will vary between carton designs.

Palletized cartons should be strapped with (preferably) 19 mm poly strap, including card-board or plastic corner boards to increase rigidity of the pallet.

Pallet height is determined by carton strength or the maximum height limits in the containers.

Completed pallets should be transferred to a refrigerated area as soon as possible.

6.1.10. Pre-cooling and Cold Storage

After packing the fruit requires cooling unless it is to be sent for VHT treatment. For pre-cooling operations and cool chain management.

(Refer to SOP No.4 - Standard Operating Procedures for cool chain management of exported mangoes.)

6.1.11. Loading

Ensure the fruit has been precooled. Before loading into refrigerated trucks, inspect the trucks for cleanliness and record the air temperature. Trucks must be precooled before loading. Loading cooled products on trucks as quickly as possible to minimize fruit heating, pallets should be removed from the cool room at once at loading time. The same applies if the product is manually loaded onto a refrigerated truck.

Ensure that the proper temperature is maintained throughout the trip, pre-cool the produce and the truck before loading.

6.1.12. Records and Documentation

Developing a form for recording key operations within the packhouse. These will include, receivals assessment (which includes a maturity assessment), Packed product monitoring (which includes tray weight monitoring), Chemical records (including application rates, top ups, batch number and MSDS sheets), and if filling a sea container, a container loading plan.

Recording all handling activities in packhouse and records keeping with periodic internal verification.

6.2. Product Flow and General Procedure

6.2.1. Product Flow Diagram

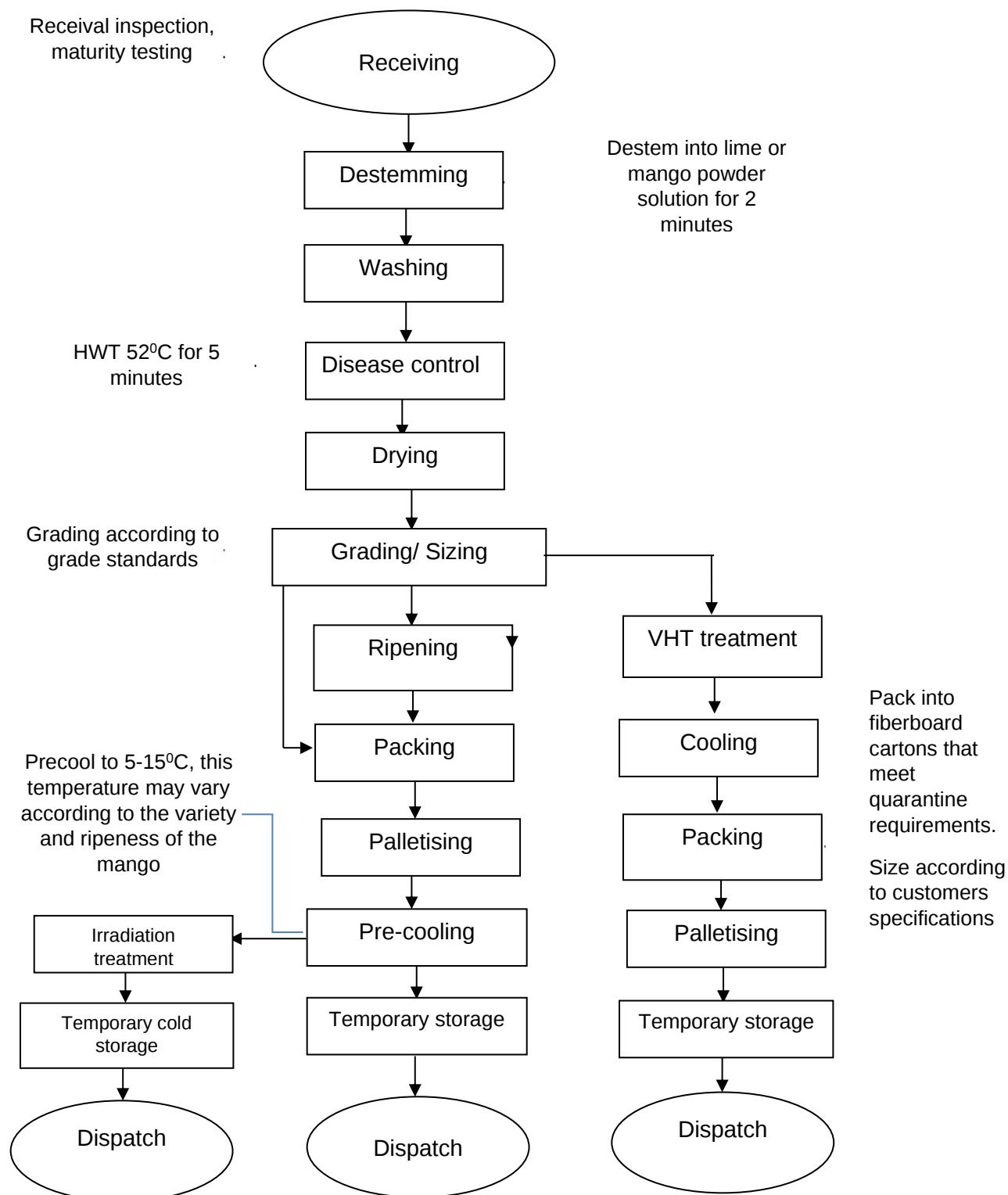


Figure 1: Process flow for mangoes destined for export markets

6.2.2. Isolation Pathways

To ensure the integrity of goods being prepared at the packhouse:

- Measures in place to minimise the risk of infestation or contamination. For example, effective hygiene, waste removal and pest control measures, security measures for goods being prepared for export such as physical barriers and isolation by distance.
- Measures to keep export goods which have acquired a phytosanitary status separate from goods which haven't. For example, physical barriers (packaging, separate storage areas), isolation by distance and effective traceability systems.
- Measures in place to minimise the risk of substitution (switching of goods) For example, effective traceability systems and secure packaging/labelling of goods.
- For goods which have reached a phytosanitary status they must meet the phytosanitary security requirements.

6.2.3. Implementation of Hazard Based Internal Control System

An export packhouse for supplying the modern retail market needs to operate under “Hazard Analysis Critical Control Point (HACCP)” principles. This enables hazards to be identified and controlled before they threaten the safety of food and consumers.

There are 7 principles of HACCP:

- Identify the hazards: Look at each step in your operation and identify what can go wrong.
- Determine the critical control points (CCPs): Identify the points in your operation that ensure control of the hazards.
- Establish critical limit(s): Set limits to enable you to identify when a CCP is out of control.
- Establish a system to monitor control of the CCP: When CCPs and critical limits have been identified it is important to have a way to monitor and record what is happening at each CCP.

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control: When monitoring indicates that a CCP is not under control, corrective action must be taken.
- Establish procedures for verification to confirm the HACCP system is working effectively: Review and correct the system periodically and whenever you make changes to your operation.
- Establish documentation concerning all procedures and records appropriate to these principles and their application: For the successful implementation of HACCP based procedures, appropriate documentation and records must be kept and be readily available.

6.2.4. Cleaning Schedules

Facility Cleaning and Sanitation

Packhouse sanitation needs to cover the interior and exterior of the facility, and equipment installed. A staff member should be assigned to manage the packhouse sanitation.

A written cleaning schedule needs to be developed this will contain:

- A list of specific areas and equipment that must be cleaned and sanitized,
- The frequency required for cleaning,
- The specific details of the cleaning process,
- Personnel involved and supervisor conducting verification.

Receiving and Dispatch Areas, and Storerooms - Visible soil, dust, debris and unnecessary items should be removed from these areas continuously. A regular cleaning schedule should be followed including an 'as-needed' basis.

Cold Rooms and Cooling Units must be cleaned and sanitized regularly. Evaporator and condenser coils are especially prone to accumulating dust due to tight spaces within. Frost also accumulates on evaporator coils and encourages dust accumulation. Floor areas should be kept dry. Ammonium compounds at 200 ppm can be used to sanitize walls and other refrigerated compartments. (Price 1992).

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

Floors should always be maintained in a dry condition. Dust and debris must be removed preferably with vacuum cleaners, brooms can be used but care is needed to avoid excessive dust. A cleanser can then use detergent, rinse and spray disinfectant after the product has been treated.

Drains must not be cleaned with high-pressure water jets to avoid contamination. Blocked drains can be unblocked with the use of a chemical drain opener. Alternatively, a pipe cleaning tool can be used.

Overhead Pipes, Structural Supports, Ducts, and Fans – Exposed pipes and ducts should be cleaned to remove accumulated foreign matter.

Waste and Garbage Areas need regular cleaning and sanitizing on schedule. Waste materials should not be allowed to accumulate. Containers used in these areas should also be cleaned regularly and should not be used for other materials. Alcohol at 70%, 200ppm chlorine solution or ammonium compounds at 200ppm can be used for sanitization.

Toilets/wash Basins are cleaned and disinfected daily with detergent.

Specific Equipment: Standard Operating Procedures for cleaning and sanitation must be developed for each specific item of equipment.

SOPs identify the following:

- What – identifies the task;
- Why – describes the purpose of the task;
- When – frequency of the task;
- Who – identifies the person responsible for the task and
- How – lists and describes the steps for completing the task.

(Source Rap 2012)

Personal Hygiene

Every person working at the pack house facility has to maintain a high degree of personal cleanliness. Staffs are potentially the greatest source of contamination as they are in physical contact with the fruit. All staffs working in the packing area must undergo periodic health checks at least once a year, and must ensure that they do not contract infectious diseases when participating in production.

Hand Washing

Correct hand washing is an essential part of a hygiene program.

Hand-washing stations must have non-perfumed, neutral or medicinal soap preferably liquid soap in a dispenser and hot air dryers. Hand washing stations should have signage including pictorial images of correct hand washing practices. Hands should always be washed during the following times: (1) before starting each shift, (2) after using the restroom, after a rest break, or prior to returning to the work area, (3) after contact with dirt.

Clothing

Appropriate clothing must be worn during operations, this needs to be cleaned and changed regularly. A hairnet or cap should be used in the packing area. Where protective clothing is being used and becomes contaminated it should be changed. This includes gloves that are reusable and need to be cleaned and stored properly. Jewelry and makeup should not be permitted.

Food

The consumption of foods should only be in designated areas. Smoking must be prohibited within the packing facility.

Personal Habits

Staff should refrain from habits that can result in food contamination such as smoking, spitting, chewing. Staff that have infections, injuries or illness should not handle produce whilst still symptomatic.

Develop cleaning instructions and forms to monitor cleaning activities at the packhouse.

Records of cleaning activities in all areas of the packhouse and sanitary equipment should be recorded and maintained in the packhouse.

Sanitation records should include:

- Dates
- List of areas and equipment that have been cleaned and sanitized
- Staff accountability: each task completed should be signed off

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- Verification of the completed task
- Description of any deviation from SSOP, and the reason for the deviation

6.2.5. Pest Control Procedure

Pests that are commonly found in a packing facility include insects, rodents, reptiles and birds. Pets such as cats and dogs, while not normally considered pests, can be a significant source of contamination and must be excluded from the packhouse. Maintaining effective control of pests is necessary to prevent disease and contamination.

- Areas surrounding the packing facility should be maintained in a hygienic condition, and rubbish should be stored in closed bins.
- Grassy and weedy areas need to be trimmed on a regular basis.
- Unused bins, containers and equipment should not be allowed to accumulate inside the facility.
- Scheduled inspections should be conducted in all areas for evidence of pest activity.
- Produce and equipment should be kept 50 centimeters away from walls to allow ease of inspection.
- Screened windows and ventilation holes should be installed, and holes in walls, floors and doors must be blocked. Traps or bait used for the eradication of pests must be placed in locations that will not contaminate produce or packaging materials. Traps should be inspected and cleaned on a regular basis.
- Use of rodent bait within the packing facility should not be allowed. If unavoidable, all materials should be removed before application of the bait.

Development the procedure for pest management and form to monitoring pests in the packhouse include:

- Number, location and type of bait and traps; chemicals used for rodents, birds, insects.
- Date and place of setting traps and bait.

- Frequency of baiting and trapping.

6.2.6. Waste Management Procedure

Developing a waste removal schedule includes:

- Keeping frequency and methods of waste removal.
- Keeping waste storage areas clean and far away from the processing area.
- Cleaning waste receptacles.

6.2.7. Training Requirements

- Food safety training – HACCP principles and CCP identification.
- Sanitation training – covers the importance of proper sanitation, cleaning efficacy, how to use cleaning chemicals and how to implement SOPs.
- Worker safety issues – use of personal protective equipment, Hazard identification, accident prevention and procedures,
- Chemical handling chemicals and sanitizers, chemical mixing, baiting.
- Pest control: Pest management principles and practices.

6.3. Quality Assurance

An internal quality assurance program is a self-imposed process that ensures the product leaving the packhouse constantly meets the product specifications.

It is unlikely staff accepting responsibility for quality without management commitment to quality. Feedback should be encouraged by consulting staff on quality matters.

6.3.1. Product Specifications

Product specification is the blueprint for describing how the product should appear and comply. Most product specifications can be grouped under four main criteria.

General Appearance (Colour, visual appearance, size sensory, shape and maturity)

Major Defects (Insects, diseases, physical damage, temperature damage and physiological disorders)

Minor Defects (Physical damage, temperature damage, physiological disorders, and blemishes)

Consignment Criteria (Tolerance per consignment, packaging & labelling, shelf life, receival conditions, chemical & containment residues and food safety requirements)

It is important to communicate with exporters and importers as most import customers will already have defined product specifications for mangoes. These however may need to be reviewed and refined to reflect local varieties and conditions in Vietnam.

6.3.2. Quality Monitoring

The purpose of quality monitoring is to ensure that product marketed under packhouse brand meets the quality and packing standards defined in the product specifications. Monitoring staffs check the packed product to ensure that it meets the quality and packing standards. By monitoring regularly, problems are identified and can be fixed before packing has proceeded too far.

Sampling

- A random selection (without bias) is required to be taken.
- Select products packed by different packers.
- Select products from the range of sizes packed.
- The first sample is taken within 15 minutes of the start or restart of packing.
- Samples are then taken at a frequency of at least 2% of the packed product.

Examination Technique

- Check if the label details meet the specifications and that all information is correct and legible.
- Weigh the carton.

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- Check if the number of fruits in the carton corresponds with the label.
- Check the fruit's presentation. The fruit must be uniform in size, packed firmly together and below the top of the carton inner. Stickers must be present on each fruit.
- Each fruit is removed and individually examined to ensure that it meets the quality standards.
- For fruit “out of grade”, identify the defect.

Product Quality Record

- Record the brand, time, estimated number of cartons packed since last sample, count, net fruit weight and presentation.
- Each carton sampled is recorded in a separate column on the packed product inspection record sheet.
- The number of fruits out of grade are recorded alongside the appropriate defect name.
- The total number of fruits out of grade is summed for each defect category (quarantine, major, minor, cumulative) and marked on the quality summary chart for major and cumulative defects.
- Actions taken or observations made are recorded in the comments section and/or in a separate diary.
- The packed product inspection record sheet must be retained and filed by the monitoring staff.

6.3.3. Internal Audit

An internal audit is a more formal verification process to ensure packed product meets product specifications. A designated quality control personnel should be assigned to the task. Namely:

- Sample a number of pallets and/or select trays/ from the second layer from the top of the pallet.
- Check that the tray is labeled correctly.
- Assess each tray according to the relevant Product Specifications. For instance, you may have sampled products

from different grades or different sizes, be sure to assess the product to the correct specification.

- Count and weigh produce for each fault detected.
- Add up total count or weight for all trays/cartons/bags sampled for each fault and compare with the tolerances.
- Count and record total number of major and minor defects according to tolerances.
- Take photographs of product inspected, particularity of any problems or out of specification product.

6.3.4. Documentations and Record Keeping

The quality controller must maintain an up-to-date copy of the packhouse quality manual.

The quality manual contains the following documents:

- Product specifications
- Packer quality plan.
- Procedures for packer accreditation and auditing.
- Procedures for critical production processes and monitoring activities specified in the packer quality plan.
- Examples of forms used for monitoring records and product identification and traceability.
- Procedures/documents for training staff.

Records of internal auditing such as the results of internal auditing activities and corrective action.

7. Compliance and Record Keeping

7.1. Mandatory Legislative Requirements

7.1.1. Registrations

Packhouse Unit Code will require:

- Registration of production unit code with packing facility code.
- Registration of the packing facility code with the Provincial Plant Protection Sub-Department.

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

Some importing countries will require independent packhouse registration and refer to PPD for further advice.

- Export registration and quarantine treatment at facilities approved by the importing country.

Once registered a certification can be issued for:

- Certification of production unit code
- Certification of packhouse code
- Certification of Treatment facility/Phytosanitary certificate/the treatment facility must be approved and certified by authority of import country

7.1.2. Regulatory Compliance

- Export Permits.
- Phytosanitary requirements as provided by PPD.
- Chemical Residue: Products not exceeding maximum residue limits on permitted chemicals and not using banned or unregistered chemicals.
- Packaging Pallets.
- Carton Labelling.
- Quality Requirements: Some EU markets, for example, enforce regulatory quality standards on produce.

7.1.3. International Trade

If the packhouse undertakes direct export then they need to be aware of some of the international conditions for trade. This will differ between countries and businesses.

Commercial Process

- Establish a contract,
- Receive orders,
- Advise on delivery, request payment, packing,
- Provide evidence of certifications and accreditation.

Transport Procedures

- Establish a transport contract,

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- Receive, ship and deliver goods,
- Provide waybills or Bill of Laden, good receipts, status reports, etc.

Regulatory Procedures

- Obtain export license,
- Provide custom declarations,
- Issue Export Certificate and Phytosanitary or Plant Health Certificate,
- Provide cargo declaration,
- Apply trade security procedures,
- Clear goods for export.

Financial Procedures

Provide credit rating, evidence of insurance issue, invoice for release of the goods on arrival.

7.2. Customer Requirements

Many customers will require HACCP, GMP, BRC certification, in order to gain access to their market, usually a GlobalGAP. VietGAP standard may not be verified and recognized by the importing countries.

Other requirements may be Business Social Compliance Initiative, Fairtrade and MRL. Some supermarkets impose their own MRL's on produce that differs from the legal requirement (lower or none at all).

7.2.1. Traceability

The packhouse must have a documented system for containing the following:

A documented traceability program is in place and includes:

- How the packhouse tracks movement of goods from an accredited block to receipt and through storage and loadout.
- How the packhouse tracks movement of product to the next receiving establishment for inspection and/or treatment in accordance with the Guideline: Maintenance of phytosanitary security for horticulture exports guideline

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- Can demonstrate that all receipt and loadout records are in possession.

Traceability Standard, as set out in TCVN 12827:2019 and SOP No. 6

7.2.2. Audits (Internal and External)

Audits and reviews serve to verify that good management practices activities are effective.

Internal audits need to be carried out by quality control staff to help identify gaps within the business that can be remediated to meet the product specifications. This will help the management with identifying and prioritizing risks. Internal audits should be carried out on a regular basis during packhouse operations.

External audits are usually carried out annually and are mandatory for compliance programs independent examiners (auditors external to the company) conduct on-site inspections, interview personnel and check records.

7.3. Occupational Health and Safety

People working in packhouses are exposed to risk of injury associated with a range of hazards such as:

- Mechanical hazards of the machinery, the means of transportation, hand-tools and associated with manual handling in the packing sheds.
- Biological hazards: molds, saps and infectious diseases e.g. leptospirosis, legionella.
- Chemicals: insecticides, fungicides and herbicides.
- Dusts, solar radiation: working outdoors in heat and sunlight.
- Electricity
- Noise causing hearing loss and tinnitus.
- Stress and fatigue.

A risk assessment required for packhouses involves 6 steps:

- Step 1: Hazard identification. This is the process of examining each work area and work task for the purpose of identifying all the hazards which are “inherent in the job”, etc.
- Step 2: Risk identification.
- Step 3: Risk assessment.
- Step 4: Risk control, etc.
- Step 5: Documenting the process, etc.
- Step 6: Monitoring and reviewing.

7.4. Environmental Management

Environmental management plans describe how an action might impact on the natural environment in which it occurs and set out clear commitments from the business taking the action on how those impacts will be avoided, minimized and managed so that they are environmentally acceptable. The plan must comply with applicable local environmental regulations.

The plan must include management of chemical, biological, non-biological waste and wastewater. This will include emergency procedures, spills and incident management.

The plan must be documented, and relevant staff trained in its application. This is the responsibility of the packhouse manager.

7.5. Training Requirements

Packhouses need to develop the structured and onsite training programs. The training content should be included:

- Food safety and hygiene training: key staffs need to know the principles of HACCP and define CCP or knowledge of the food safety management system according to ISO 22000/FSSC 22000.
- Training about packhouse procedures, maturity standards, desapping practices, HWT and chemical management, load cooling, and internal audit practices.
- Packing staff need training in understanding, identifying and applying grade standards, packing procedures, labelling, palletizing.

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- Sanitation training - covers the importance of proper sanitation, cleaning efficacy, how to use cleaning chemicals and how to implement SOPs.
- Worker safety issues - use of personal protective equipment, hazard identification, accident prevention and procedures.
- Chemical handling - chemicals and sanitizers, chemical mixing, baiting.
- Pest control - Pest management principles and practices.

Only qualified individuals should conduct staff training. The content of the training should be guided by programs of the packhouse and must be approved by the quality control officer and packhouse manager.

Packhouses must have a documented system to ensure that staff receiving, inspecting, storing or moving export horticulture commodities are trained. The training should cover the protocol/work plan requirements applicable to their role. Packhouse must have a training program in place and includes:

- Training material covered
- Frequency of training

8. Documentations and Record Keeping

Documentation and record keeping is an essential requirement in export packhouse operation.

8.1. Required Archives Documents of Packhouse

- Batch Record Forms
- Protocols
- Product specifications
- Standard Operating Procedures (SOPs)
- Operational plan of the packhouse
- Work Instructions (WIs)
- Checklists
- Forms/Log sheets

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- Training Assessments
- Regulations for critical production steps and monitoring activities are specified in the packhouse's operational plan
- Chemical document (including application rates, top ups, MSDS sheets)
- Records forms are used for product identification, monitoring, and traceability
 - Material receipt form
 - Packaged product monitoring form (including carton weight tracking)
 - Form for monitoring chemical use (including chemical type, batch number, concentration used, time of use, etc.)
- Procedures, guidelines, and forms for internal audits and corrective actions
- Mandatory Legislative requirements document
- Customer requirements document
- Occupational Health and Safety document
- Environmental management document
- Electronic and hard copy Quality records (e.g. non-conformance, corrective and preventative actions, internal inspection, change control, training records etc.)
- Certificate of Analyses (CoA) or Certificate of Compliance (CoC)
- Traceability
- Validation documentation

8.2. Requirements of Record Keeping

Quality monitoring records at all stages of operation of the packhouse with periodic internal verification.

A record of sanitation activities for all areas of the packing facility and equipment in the packhouse.

Sanitation records should include:

- Dates

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

- List of areas and equipment that have been cleaned and sanitized
- Staff accountability: each task completed should be signed off
- Verification of the completed task
- Description of any deviation from SSOP, and the reason for the deviation
- Records should also show the frequency that cleaning tools are cleaned and sanitized

Pest management records.

Pest management programs should be fully documented as follows:

- Number, location and type of bait and traps; chemicals used for rodents, birds, insects
- Date and place of setting traps and bait
- Frequency of baiting and trapping

Records of water quality testing results.

Chemical records (including application rates, batch number, etc.)

Records of maintenance and calibration equipment, measuring instruments.

Training records include:

- details of the training undertaken
- completed date the training
- name of the trained individual, etc.

Certificate of Analyses (CoA) or Certificate of Compliance (CoC).

Records of identification and traceability.

Records of internal verification.

Records of internal audit including results of internal audits and corrective and preventative actions.

The records in the packhouse can be either in hard copy or electronic form to facilitate quick retrieval and the same are clearly indicated in master control of records. The facility will give access for inspection by an authorized person at any time of visit.

The packhouse will maintain production and process records for a period of three years. Calibration and internal auditing records are maintained for at least three years. Records of trade contracts with the exporters and letter of agreement with the contracted growers/producers are maintained up to the end of each fruiting season.

Writing Instruction and Procedure Documents

Instructions and procedures serve as a preplanned guide on how to complete tasks safely, efficiently and effectively. They need to be easily understood and relevant. These are usually developed from previous experiences and incorporated into a set of best practices. These are live documents and must be actively developed and updated.

- Explains the purpose of the task.
- Describes important steps separately and in sequence.
- Designates persons of authority for the particular task and defines their responsibilities.
- Gives guidance in case of problems encountered during performance of the task, and
- identifies points where decisions must be made.
- It is supported by visual aids (photos, flowcharts, drawings) for clarity.

Source RAP (2012)

9. References

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10. Appendixes

Appendix 1: Standard for mangoes (codex stan 184-1993)

1. Definition of Produce

This standard applies to commercial varieties of mangoes grown from *Mangifera indica* L. of the Anacardiaceae family, to be supplied fresh to the consumer, after preparation and packaging. Mangoes for industrial processing are excluded.

2. Provisions Concerning Quality

2.1. Minimum Requirements

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

In all classes, subject to the special provisions for each class and the tolerances allowed, the mangoes must be:

- whole
- sound, produce affected by rotting or deterioration such as to make it unfit for consumption is excluded;
- clean, practically free of any visible foreign matter;
- free of black necrotic stains or trails;
- free of marked bruising;
- practically free of damage caused by pests;
- free of damage caused by low temperature;
- free of abnormal external moisture, excluding condensation following removal from cold storage;
- free of any foreign smell and/or taste;
- sufficiently developed and display satisfactory ripeness.

When a peduncle is present, it should be no longer than 1.0 cm.

The development and condition of the mangoes must be such as to enable them:

- to ensure a continuation of the maturation process until they reach the appropriate degree of maturity corresponding to the varietal characteristics,
- to withstand transport and handling, and
- to arrive in satisfactory condition at the place of destination.

In relation to the evolution of maturing, the colour may vary according to variety.

2.2. Classification

Mangoes are classified in three classes defined below:

2.2.1. “Extra” Class

Mangoes in this class must be of superior quality. They must be characteristic of the variety. They must be free of defects, with the exception of very slight superficial defects, provided these do not affect the general

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

appearance of the product, the quality, the keeping quality and presentation in the package.

2.2.2. Class I

Mangoes in this class must be of good quality. They must be characteristic of the variety. The following slight defects, however, may be allowed, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package:

- Slight defects in shape.
- Slight skin defects due to rubbing or sunburn, suberized stains due to resin exudation (elongated trails included) and healed bruises not exceeding 3, 4, 5 cm² for size groups of A, B, C respectively.

2.2.3. Class II

This class includes mangoes which do not qualify for inclusion in the higher classes, but satisfy the minimum requirements specified in Section 2.1 above. The following defects may be allowed, provided the mangoes retain their essential characteristics as regards the quality, the keeping quality and presentation:

- Defects in shape;
- Skin defects due to rubbing or sunburn, suberized stains due to resin exudation (elongated trails included) and healed bruises not exceeding 5, 6, 7 cm² for size groups of A, B, C respectively.

In Classes I and II, scattered suberized rusty lenticels, as well as yellowing of green varieties due to exposure to direct sunlight, not exceeding 40 per cent of the surface and not showing any signs of necrosis are allowed.

3. Provisions Concerning Sizing

Size is determined by the weight of the fruit, in accordance with the following table:

Size Code	Weight (in grams)
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SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

A	200-350
B	351-550
C	551-800

The maximum permissible difference between fruit in the same package belonging to one of the above mentioned size groups shall be 75, 100 and 125 g respectively. The minimum weight of mangoes must not be less than 200 g.

4. Provisions Concerning Tolerances

Tolerances in respect of quality and size shall be allowed in each package for produce not satisfying the requirements of the class indicated.

4.1. Quality Tolerances

4.1.1. “Extra” Class

Five per cent by number or weight of mangoes not satisfying the requirements of the class, but meeting those of Class I or, exceptionally, coming within the tolerances of that class.

4.1.2. Class I

Ten per cent by number or weight of mangoes not satisfying the requirements of the class, but meeting those of Class II or, exceptionally, coming within the tolerances of that class.

4.1.3. Class II

Ten per cent by number or weight of mangoes satisfying neither the requirements of the class nor the minimum requirements, with the exception of produce affected by rotting, marked bruising or any other deterioration rendering in unfit for consumption.

4.2. Size Tolerances

For all classes, 10 per cent by number or weight of mangoes in each package are permitted to be outside (above or below) the group size range by 50 per cent of the maximum permissible difference for the group. In the smallest size range, mangoes must not be less than 180 g and for those in the largest size range a maximum of 925 g applies, as follows:

Size Code	Normal Size Range (gr)	Permissible Size Range (gr) ($\leq$ 10% of fruit/package exceeding the normal size range)	Max. Permissible Difference between fruit in each package
A	200 – 350	180 – 425	112.5
B	351 – 550	251 – 650	150
C	551 – 800	426 – 925	187.5

5. Provisions Concerning Presentation

5.1. Uniformity

The contents of each package must be uniform and contain only mangoes of the same origin, variety, quality and size. The visible part of the contents of the package must be representative of the entire contents.

5.2. Packaging

Mangoes must be packed in such a way as to protect the produce properly. The materials used inside the package must be new,¹ clean, and of a quality such as to avoid causing any external or internal damage to the produce. The use of materials, particularly of paper or stamps bearing trade specifications is allowed, provided the printing or labelling has been done with non-toxic ink or glue.

Mangoes shall be packed in each container in compliance with the Recommended International Code of Practice for Packaging and Transport of Tropical Fresh Fruit and Vegetables (CAC/RCP 44-1995).

Description of Containers

The containers shall meet the quality, hygiene, ventilation and resistance characteristics to ensure suitable handling, shipping and preserving of the mangoes. Packages (or lot for produce presented in bulk) must be free of all foreign matter and smell.

6. Marking or Labelling

¹ For the purposes of this Standard, this includes recycled material of food-grade quality.

6.1. Consumer Packages

In addition to the requirements of the Codex General Standard for the Labelling of Pre-packaged Foods (Codex stan 1-1985, Rev. 2-1999), the following specific provisions apply:

Nature of Produce

If the produce is not visible from the outside, each package shall be labelled as to the name of the produce and may be labelled as to the name of the variety.

6.2. Non-retail Containers

Each package must bear the following particulars, in letters grouped on the same side, legibly and indelibly marked, and visible from the outside, or in the documents accompanying the shipment. For produce transported in bulk these particulars must appear on a document accompanying the goods.

6.2.1. Identification

Name and address of Exporter, Packer and/or Dispatcher.
Identification code (optional).²

6.2.2. Nature of Produce

Name of produce if the contents are not visible from the outside. Name of variety and/or commercial type (optional).

6.2.3. Origin of Produce

Country of origin and, optionally, district where grown or national, regional or local place name.

6.2.4. Commercial Identification

- Class
- Size (size code or weight range in grams);
- Number of units (optional);
- Net weight (optional).

7. Contaminants

² The national legislation of a number of countries requires the explicit declaration of the name and address. However, in the case where a code mark is used, the reference “packer and/or dispatcher (or equivalent abbreviations)” has to be indicated in close connection with the code mark.

7.1. Heavy Metals

Mangoes shall comply with those maximum levels for heavy metals established by the Codex Alimentarius Commission for this commodity.

7.2. Pesticide Residues

Mangoes shall comply with those maximum residue limits established by the Codex Alimentarius Commission for this commodity.

8. Hygiene

It is recommended that the produce covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of the Recommended International Code of Practice - General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 3-1997), and other relevant Codex texts such as Codes of Hygienic Practice and Codes of Practice.

The produce should comply with any microbiological criteria established in accordance with the Principles for the Establishment and Application of Microbiological Criteria for Foods (CAC/GL 21-1997).

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

Appendix 2: Packhouse Internal Auditing Checklist

Packhouse internal auditing checklist

Audit date:

Auditor's name:

No.	Checks	Yes	No	Comments/Detail information
I.	Pack house exterior information			
1	Is the packhouse closed off to the outside environment?			
2	Is the approach road to the pack house made of asphalt road or concrete road?			
3	Is there any obnoxious smell inside pack house and outside packhouse?			
4	Arrangement of disposal waste material.			
5	Whether the external walls are properly plastered and free from			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

	crevices, cracks, holes, dampness, cobwebs etc.			
II	Packhouse interior information			
1	Is the building and layout of the packhouse designed to prevent cross-contamination?			
2	Is the packhouse having unidirectional flow of process from material holding/preliminary inspection area to docking/loading area?			
3	Is the incoming material holding/preliminary inspection area segregated from the main processing hall?			
4	Whether entry is restricted and all the entry-exist points are			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

	provided with plastic curtains/ fly proofing and self-closing?			
5	Condition of walls, insulation, ceilings (the partitions, walls, floors must have a smooth surface, without crevices and potholes and easy to clean, absence of cob-webs and must allow water to flow out).			
6	Type of flooring (cemented, tiled, marble, epoxy coated etc.). Floor level/slope in the pack house.			
7	Whether adequate protected (shatter proof etc.) lighting arrangements are provided in the working area?			
8	Whether sufficient signboards indicating do not spit/do not smoke, eatable prohibited etc.,			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

	are prominently displayed in the premises?			
9	The drainage system is in good condition and in the form of surface with covered or underground pipe.			
10	Whether equipment in the material area/holding/preliminary inspection area/ main processing hall area are adequate and properly maintained?			
11	Are all chemicals properly labeled and have batch numbers, best before date etc.?			
12	Whether wash and change room for workers provided and provision for water, soap, towels, foot operation taps etc.			
13	Wash room: Male... / female:...			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

	Change room: For male.../for female...			
14	Availability of first aid box.			
15	Are the doors of toilet rooms open outwards the packhouse processing area or not? If not, this needs to be modified.			
III	Pest control checklist			
1	Pest, insect, rodent control measures (in house/out sourced (with name of agency)).			
2	Are storage facilities kept free from pests including signs of pests. E.g. droppings?			
3	Are there rodent controls put in place and are they regularly maintained?			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

4	Whether insects, fly traps are installed at the pack house. Indicate location and numbers			
5	Are there any locations in the packhouse that could encourage birds to roost or nest?			
6	Are there any bird controls put in place?			
7	Arrangement for prevention of contamination from outside net proofing to avoid dust/flyes/pest etc.			
8	Exhaust fan provided with proper netting or shutter.			
IV	Water supply			
1	Is drinking quality water used during processing and cleaning fruit contact surfaces?			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

2	Is the water source for postharvest treatment of fruits checked periodically by a laboratory that meets ISO/IEC 17025:2015 standards?			
3	If tanks are used for storing water, are they sealed and designed in such a way to prevent animals and pests from entering?			
V	Power supply			
1	The packhouse have sufficient electricity supply			
2	Packhouse has fire prevention system according to regulations.			
VI	General storages			
1	When garbage and waste are stored, is it covered?			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

2	Separate storage arrangement for fungicides, chemicals, post-harvest biological control agents.			
3	Separate arrangement for storage of packaging material, pallets.			
4	Separate storage arrangement of rejections and ripened and rotten fruits.			
5	Is sanitation equipment cleaned and sanitized regularly and stored correctly and kept separate from other equipment?			
6	Are cold storage and pre-cooling facilities regularly cleaned, sanitised and properly maintained?			
VII	Document records			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

1	The packaging procedure describes all the detailed about receiving, sorting, handling and packaging of products.			
2	Keeping records of all activities at the packhouse to ensure the traceability of the product's origin.			
3	Profile of production origin: quantity, production unit code, commodity information or export unit.			
4	Pest control records: regularly record inspection time, list of detected pests, number of individuals detected, distribution location, use of chemicals and set rate and prey.			
5	Monitoring records of packing facility hygiene: record the entire			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

	time, area, inspector, chemicals used.			
6	Other related records: personnel records, internal training records, protective environment records, fire prevention and fighting records.			
VIII	Personnel Profile			
1	Persons directly involved in classification, preliminary processing and packaging of fruits for export must be in good health.			
2	Persons directly involved in the classification, preliminary processing and packaging of fruits for export must have knowledge of the packaging process being applied at the packhouse.			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

3	Technical staff must have a clear understanding of the packaging procedures being applied at the packhouse, capable of identifying harmful organisms.			
IX	Other requirements			
1	Chemicals used in the process of preliminary processing, preservation and packaging must be on the list of permitted use and use for the right purposes according to the regulations of Vietnam and the importing country.			
2	Packaging, packing materials must be clean. The size and information on the packaging meet the phytosanitary requirements of the importing country.			

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

Appendix 3: Operational plan

Requirements for Operating Procedures, Monitoring Procedures, Records, Product Identification and Traceability

Process	Operating Procedure	Monitoring Procedure	Records	Product ID & Traceability	Responsibility
Receival	Ensure that receivals from different blocks or growers are segregated.	Check fruit regularly for immaturity and excessive amounts of sap on the skin. Regularly check the cleanliness of picking containers.	Receival record	Maintain a record to link despatch of packed product with block code and shed receival date.	Packhouse manager
Desapping	Methods for desapping must be documented. Ensure that the risk of skin browning is minimized.	Regularly check that the procedure for desapping is being followed correctly	-	-	Packhouse manager
Washing	Ensure that wash water is not recirculated and brushes and rollers are kept clean.	Check the cleanliness of brushes and rollers twice a day.	-	-	Packhouse manager

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

HWT, Fungicide / insecticide treatment	Method of treatment must be documented (water temperature, duration chemical, rate, application (if any), etc.)	Regularly check that the treatment is prepared correctly and application is effective.	Post-harvest chemical record	Chemical application recorded for each consignment	Packhouse manager
Drying	The fruit is drained by letting it drain naturally in a plastic basket for a few minutes in a cool room or by using a fan to blow air over the surface of the fruit.	Check for drainage on the surface of the fruit.	-	-	Packhouse manager
Grading	Fruit must be graded to the quality standards described in the product specifications.	Packed product must be inspected as described in the procedure for packed product monitoring Quality of ripe fruit must be checked as described in the	Packed product inspection record Ripening check record	Defect levels recorded on packed product inspection record Ripe fruit quality recorded on ripening check record.	Packhouse manager

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

		procedure for ripening check			
Sizing	Fruit must be sized as described in the product specifications	Packed product must be monitored as described in the standard procedure	Packed product inspection record	-	Packhouse manager
Packing	Fruit must be packed as described in the product specifications. Do not pack wet fruit.	Packed products must be monitored as described in the standard procedure	Packed product inspection record	Grower and packer code, pallet number marked on each carton.	Packhouse manager
Palletising	Pallets must be stacked as described in the product specification or to order	Regularly check that pallets are stacked correctly and the contents reconcile with pallet card	-	Packer code, grower code, date, time, number of cartons (brand x size) recorded on pallet card	Packhouse manager
Precooling	Methods for precooling fruit must be documented. Cool fruit to transport	Check the fruit temperature of every consignment before dispatch.	Record fruit temperature on dispatch advice.	Fruit temperature recorded on dispatch advice.	Packhouse manager / transporter

SOP 2 – Standard Operating Procedures for Export Mangoes Packhouse

	temperatures as described in product specifications and hold until ready for dispatch.				
Despatch	Ensure that pallets are loaded correctly.	Check that all relevant documentation is completed.	-	Consignment number, grower code, packer code, pallet number, carton numbers (brand x size), date, transporter recorded on dispatch advice.	Packhouse manager
Equipment cleaning	Methods for cleaning equipment must be documented. All equipment must be cleaned at least daily.	Check cleanliness of equipment at least once each day. Ensure that sap does not build up on equipment.	-	-	Packhouse manager

Appendix 4: SSOP check lists

SSOP 01. SAFE WATER

1. Purpose: To prevent and minimize the chance of the water becoming a source of contamination to products by ensuring that all water which comes in contact with fruits must be a potable water.

2. Scope: Ensure that the water supplied for production at the packhouse meets the requirements according to the national technical regulations on clean water quality (QCVN 01-1:2018/BYT).

3. Procedures

- Water used to wash fruits and clean contact surfaces or for equipment and factory cleaning must be quality water according to QCVN 01-1:2018 /BYT of the Ministry of Health (This standard must be updated according to current regulations). Water samples should be submitted for quality analysis twice per year at an accredited laboratory to ensure that the water source meets the requirements of this standard and that records are maintained.
- Where it is necessary to store water, storage facilities are adequately designed, made of food grade material, cleaned periodically and maintained to prevent contamination.
- The recycled water used must be free of hazardous pollution factors and the recycled water must have the same standards as clean water according to current regulations of the Ministry of Health.
- Where water filters are used, they are regularly changed or effectively maintained.
- Non potable water (for use in, for example, firefighting and refrigeration equipment and other similar purposes where it will not come in direct contact with fruit) shall have a separate system.
- Non-potable water systems are identified and shall not connect with, or allow reflux into, potable water systems.

SOP 2 - Standard Operating Procedures for Export Mangoes - Packing House

- The water pipes and all connectors are made of non-toxic, corrodible, impervious materials, free from cracks, and should be sealed.

4. Monitoring

The sensory criteria of water such as colour, taste, odour and clarity are daily checked before starting production by QC/employee.

5. Corrective action

If a water quality problem is discovered, packhouse management will stop production, determine and solve the problem to ensure safety before restarting production.

6. Verification and Record keeping

- Periodically water samples are sent to a standard laboratory for testing for safety criteria according to regulations of the Ministry of Health.
- All records and test results related to safety of water are kept in SSOP files for three years.

Date implemented: _____ **by:** _____

Date reviewed: _____ **by:** _____

Date revised: _____ **by:** _____

SSOP 02. PREVENTION OF CROSS CONTAMINATION

1. Purpose: To prevent unintentional contamination of fruits.

2. Scope: This procedure applies to all employees who are responsible for receiving, handling, packing fruit at the packhouse.

3. Procedures

- Train related employees on using the procedures in this SSOP.
- Wash hands properly. Refer to the SSOP Personal hygiene.
- Employees have diseases or are suspected of carrying pathogens such as flu, diarrhea, vomiting etc. that can cause cross-contamination to the product are not allowed to enter the production area or to handle the fruit.
- Avoid touching fruit at the packaging stage with bare hands.
- Separate different types of raw materials.
- Separate unwashed fruits from washed fruits and other ready-to-pack fruits.
- Use only dry, cleaned, and sanitized equipment and utensils. Refer to SSOP Cleaning and Sanitizing Fruit Contact Surfaces for proper cleaning and sanitizing procedure.
- Touch only those surfaces of equipment and utensils that will not come in direct contact with fruits.
- Store chemicals in a separate location. Refer to SSOP safety chemicals.
- Fruits and utensils are kept on the clean pallets.
- Crates for washed fruits must be distinguished from crates for unwashed fruits.

4. Monitoring

During operation, All handling processes are continually monitored to ensure that fruits are not cross contaminated and the monitoring activities and any corrective action taken on the checklist of prevention of cross contamination are recorded by QC

5. Corrective action

- Retrain any employee found not following the procedures in this SSOP.

SOP 2 - Standard Operating Procedures for Export Mangoes - Packing House

- Separate fruits found improperly handling and rehandling these fruits before packing.

6. Verification and record keeping

- Production manager will verify that employees have taken the required procedure by observing employees during the shift and reviewing the checklist records.
- Keep the checklist on file for three years.

Date implemented: _____ **by:** _____

Date reviewed: _____ **by:** _____

Date revised: _____ **by:** _____

SSOP 03. CLEANING AND SANITIZING FRUIT CONTACT SURFACES

1. Purpose: To prevent and minimize the chance of fruit contact surfaces become a source of contamination by ensuring that all contact surfaces are properly cleaned and sanitized.

2. Scope: This procedure applies to all employees involved in cleaning and sanitizing fruit contact surfaces.

3. Procedures

- Train related employees on using the procedures in this SSOP.
- Follow manufacturer's instructions regarding the use and maintenance of equipment.
- Use approved chemicals sanitizers at recommended concentrations and contact times.
- Wash, rinse and sanitize the contact surfaces of sinks, tables, utensils, thermometers, carts and equipment with approved sanitizer at appropriate concentration with frequency:
 - Before each use.
 - After each production shift.
 - Any time contamination occurs or is suspected.
- Clean, wash and sanitize fruit contact surfaces such as sinks, tables, conveyor, utensils, thermometers, carts and equipment by using the following procedure:
 - Remove all debris left on the surface.
 - Wash the surface with a detergent solution.
 - Rinse the surface with clean water.
 - Sanitize surfaces by using approved chemicals, sanitizers at recommended concentrations and contact times for effective sanitisation.
 - Place wet items in a manner to allow air drying.

4. Monitoring

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- Cleanliness of contact surfaces of the equipment and utensils are inspected regularly by QC.
- The sanitizer concentration is tested by using the appropriate test kit for the chemical.
- When using hot water to sanitize, use a calibrated thermometer to measure the water temperature.
- QC may use swab analysis to verify the surface has been effectively cleaned and sanitised monthly.

5. Corrective action

- Retrain any employee found not following the procedures in this SSOP
- Rewash, rinse and sanitize dirty contact surfaces; sanitize contact surfaces if it is discovered that the surfaces were not properly sanitized; and isolate/discard fruit that comes in contact with the improperly sanitized surfaces.

6. Verification and record keeping

- Production manager will verify that employees have taken the required procedure and tested the sanitizer concentration by observing employees during the shift and reviewing the contact surfaces cleaning and sanitizing checklist form.
- Keep the checklist and testing results on file for at least three years.

Date implemented: _____ **by:** _____

Date reviewed: _____ **by:** _____

Date revised: _____ **by:** _____

SSOP 04. PERSONAL HYGIENE

- 1. Purpose:** Establish policy on personal hygiene and hygiene practices for all employees. Require employees to ensure personal hygiene requirements when participating in production to prevent contamination of fruits by employees.
- 2. Scope:** This procedure applies to all employees who handle fruits at the packhouse as well as visiting customers.

3. Procedures

3.1. Regulations on general hygiene

- The employees must be trained and complied with this SSOP.
- Follow the Employee Health Policy. Employees report health condition with manager before working time.

3.2. Regulation on personal hygiene and product safety protection

- Employees must wear protective clothes in accordance with regulations before starting work. Uniforms must always be clean and hygienic.
- Hands must always be clean and hygienic and washed in the morning, after lunch or after using the toilet, after contact with waste or dirty area, after sneezing, spitting or running nose.
- Fingernails must be kept short and clean,
- Avoid wearing artificial fingernails and fingernail polish.
- Do not wear any jewellery on fingers or wristbands.
- Do not wear long or hanging earrings at work.
- All cuts, open wounds, burns or sores must be completely covered with sterile wipes and waterproof dressings. When hands are bandaged, single-use disposable gloves must be worn. Inform management of the condition.
- Do not eat, drink or smoke in the processing area.
- Wear suitable and effective hair cover/net while in the processing area.
- If the protective clothes are dirty while working, workers must change into new clothes.

3.3. Regulation on protective clothes.

SOP 2 - Standard Operating Procedures for Export Mangoes - Packing House

No.	Processing area	Blouse	Protective clothes	Hair cover	Face mask	Apron	Gloves	Heat resistant gloves	Rubber boots	Plastic Slippers
1	Receiving		x	x	x					x
2	Sorting/ de-sapping		x	x	x	x	x			x
3	Washing/ Heat treatment area		x	x	x	x		x	x	
4	Packing area		x	x	x	x	x			x
5	Storage area		x	x	x		x			x
6	QA/QC	x		x	x		x			x
7	Visitor	x		x	x					x

4. Monitoring

- The designated staff will inspect employees when they report to work to be sure that each employee is following this SSOP.
- QC will monitor that all employees are adhering to the personal hygiene policy during all hours of operation and complete the Personal hygiene checklist daily.

5. Corrective action

- Retrain any employee found not following the procedures in this SSOP.
- Isolate the affected fruits.

6. Verification and record keeping

The production manager will verify that employees are following this SSOP by visually observing the employees during all hours of operation, then review the record, and signature before keeping this record for at least three years.

Date implemented: _____ **by:** _____

Date reviewed: _____ **by:** _____

Date revised: _____ **by:** _____

SSOP 05. SAFETY CHEMICAL

1. Purpose: Guidelines describe safe handling for various chemical hazard classes and some commonly-used chemicals.

2. Scope: This procedure applies to purchase, storage, usage and disposal of chemical at packhouse.

3. Procedures

a. Purchase

- Only use chemicals from approved suppliers.
- Any chemicals used in the packhouse must be authorised for post-harvest for use and applied according to the label. Do not use chemicals of unknown origin and composition or not allowed by the designate market.
- Chemicals are properly labelled.
- Chemicals are checked for the supplier, label, manufacturer and shelf-life before unloading.

b. Storage chemicals and usage

- Chemical storage areas should be separated from production, handling, storage products areas or other materials.
- All chemicals must be stored in clean and secure area with access restricted to workers. The storage area should have been sound structural, ventilated and constructed to protect chemicals from direct sunlight and weather exposure.
- Chemicals are stored in original containers according to directions on the container label. If a chemical is transferred to another container for storage purposes, the new container must be a clean chemical container approved for the relevant product and a copy of the chemical label needs to be transferred to the new container.
- Unusable chemicals and empty chemical containers must be collected and disposed by registered collection agencies or be disposed at approved areas.
- Cleaning and sanitation chemicals as well as pest control chemicals must be approved for the purpose for which they are used. They should be stored

SOP 2 - Standard Operating Procedures for Export Mangoes - Packing House

and applied so as to minimise the risk of contaminating produce, vehicles, equipment, containers or packaging materials.

- A secure, vented area should be used for storing products and equipment used for cleaning and pest control. All chemicals used for cleaning and pest control must be approved by the National regulator and used in accordance with the manufacturer's instructions.
- Only use the chemicals that are approved for use on the produce in the destination market. They should be applied exactly according to label directions or permits to ensure MRLs are not breached.
- Any chemicals used must be documented.

c. Training

- Workers authorised to use chemicals have to be trained and supervised appropriately.
- Workers involved in the supervision of the use of chemicals have to complete a recognised chemical user's course or equivalent.
- All personnel have to read and fully adhere to the SSOP when handling the chemical.

4. Monitoring

- Production management is responsible for organizing and monitoring the implementation of this procedure.
- QC is responsible for following up daily chemical import and export.
- QC monitors daily chemical use and records it.

5. Corrective action

- Retrain any employee found not following the procedures in this SSOP.
- Isolate/discard the affected fruits.

6.Verification and record keeping.

The production manager will verify that employees are following this SSOP by visually observing the employees during all hours of operation, then review the record, and signature before keeping this record for at least three years.

Date implemented: _____ **by:** _____

Date reviewed: _____ **by:** _____

Date revised: _____ **by:** _____

SSOP 06. PEST CONTROL

1. Purpose

Destroy and prevent the entry and presence of harmful animals and insects such as mice, flies, mosquitoes, birds, ants, cockroaches, spiders, lizards, etc. in the packhouse area, avoid infection or cause unsafe food hygiene.

2. Scope of application

Guidelines for controlling rats and harmful insects are carried out on the entire factory area of the export mango packer. Specifically:

- Office area, corridor, flower garden, and packhouse campus.
- Material gathering area, grading, preliminary area, packing area, finished product warehouse, and raw material warehouse.

3. Regulations

- All doors to the outside of the packing area have plastic curtains to prevent insects from entering the workshop.
- The sewer systems outside the packhouse area have screens to prevent harmful animals from entering.
- At the doors to the packing area, insecticidal lights must be arranged, operating continuously throughout the time of fruit packing.
- Around the packhouse area, a mouse trap system must be arranged according to the diagram.
- The pest control program is reviewed annually to ensure that it is functioning properly to minimize food safety hazards and pests in mango packing areas.
- Rat traps or insect sticky traps must be designed and positioned properly to prevent the entry of harmful organisms as well as avoid cross-contamination of materials, products or equipment.
- Regularly check for signs of pest activity in handling and packing areas to determine the type of pest and their activity level.
- If signs of pests are detected, take measures to eliminate their presence such as using bait less traps in the packhouse or hiring an outside expert to handle them.

SOP 2 - Standard Operating Procedures for Export Mangoes - Packing House

- Monitoring of pest activities including daily trap inspection and inspection of pest activities in and around the packhouse.
- Record all pest control and monitoring activities.

4. Monitoring

- Workers are responsible for complying with the Pest Control SSOP and for reporting any food safety hazards associated with harmful animals to supervisors/QCs.
- QC will analyze trends in pest activity, as well as inspect to identify potential food safety hazards related to pest activity and take action to prevent zoonotic contamination pests in the product during postharvest handling.

5. Corrective actions

- Elimination measures must be put in place immediately after evidence of pest infestation is reported.
- The cause of infestation should be identified and corrective actions taken to prevent a recurrent problem.
- The affected fruit is isolated or discarded.

6. Verification and record keeping

- The program, records, pest activity trends and frequency of service, as well as inspections are reviewed monthly to make sure that all documentation is in order. This is done by the production manager.
- The information of all products currently being in use has to be updated.
- Chemical safety instruction sheets, product labels for handling pests at packhouses, diagrams of pest traps and pest control activities at packhouses are documented.
- All records must be kept at least three years.

Date implemented: _____ **by:** _____

Date reviewed: _____ **by:** _____

Date revised: _____ **by:** _____

SSOP 07. PERSONAL HEALTH

SOP 2 - Standard Operating Procedures for Export Mangoes - Packing House

1. Purpose: Ensure all staff working in the mangoes packhouse as well as all visitors are healthy and free from infectious diseases that pose a risk of contamination of the produce and production areas.

2. Scope: This procedure applies to all employees working at packhouse as well as visitors.

3. Procedures:

- All employees before starting to work at the company have to report their medical certificates issued by a competent health agency to ensure that they are fully healthy to perform their work.
- Every year, the packhouse manager will organise periodical health checks for all employees. If anyone is not healthy enough to work, they have to go for treatment or transfer to another job.
- All employees are responsible for providing correct information about their previous health status and must undergo a medical examination before being hired.
- Persons suspected of having a disease, e.g. diarrhea, vomiting, skin diseases, flu, open wounds, etc. or carrying a pathogen that can be transmitted through the product are not allowed neither contact with the product nor to enter the production area.
- Employees are responsible for immediately reporting to management if they have infectious diseases.
- During the working time, if workers suffer from bleeding wounds, they must stop production and treat the wound properly before returning to production. If the injuries are serious, they must be taken to the hospital for treatment.
- Unhealthy workers must be completely cured and must undergo a health check before returning to work.
- For visitors, before entering the production area, the packing will be checked and declared health status. Only guests who do not have infectious diseases, and comply with the hygiene and labour protection regulations of the packhouse, are allowed to visit the production area.

4. Monitoring

SOP 2 - Standard Operating Procedures for Export Mangoes - Packing House

- QC will check and monitor the health status of workers before and during the production process.
- QC or assigned staff will check and monitor the health status and ensure safety and hygiene of guests while visiting at the packhouse.

5. Corrective action

- Retrain any employee found not following the procedures in this SSOP.
- Employees who have health problems must stop working to leave for treatment before he/she can return to work.
- The affected fruit is isolated and rehandled.

6.Verification and record keeping

- Production manager verify that employees follow this SSOP by visually observing the employees during all hours of operation then review the records.
- Keeping records includes:
 - o Worker health monitoring sheet.
 - o Visitor's health declaration form.
 - o Employee health records.
- These records are kept in file for at least three years.

Date implemented: _____ **by:** _____

Date reviewed: _____ **by:** _____

Date revised: _____ **by:** _____

SSOP 08. WASTE DISPOSAL MANAGEMENT

1. Purpose: The purpose of this procedure is to ensure proper management, handling, temporary storage and disposal of waste, garbage from the packhouse to prevent contamination of product and environment.

2. Scope: This procedure ensures that waste materials are identified, collected, removed and discarded periodically to get rid of contamination to the environment and product.

3. Procedures

- All waste receptacles should be leak-tight with tight-fitting lids or covers and be made of impervious material which can be easily cleaned and sanitised.
- The waste is collected and removed from the processing areas periodically or at the end of the operation or when the container is full.
- Lids of dumpsters are closed at all-time unless adding or removing materials.
- Waste storage area is far away from processing area and is designed to prevent access to waste by pests.
- Indoor waste receptacles must be empty, cleaned and sanitised daily.
- Around outdoor waste storage areas are swept up regularly.
- The waste is to be picked up regularly and disposed of at approved disposal facilities.
- Hazardous materials are not allowed to be put in the trash receptacle.
- Non-hazardous liquid waste must be disposed of in the sanitary sewer.
- Containers made of recyclable products cardboard, plastics and paper, etc. are requested to be used to minimise waste.
- All applicable employees should be trained for proper management, handling and storage of waste, trash or garbage.

4. Corrective action

- Retrain any employee found not following the procedures in this SSOP.
- All trash receptacles and waste storage areas have to be handled, washed and sanitised properly. If not, they have to be done again.

5. Verification and record keeping

- The QC will verify that employees have properly managed and handled waste and sanitised waste areas or not then will complete the waste disposal checklist daily.
- All of the waste disposal checklist, the contract, receipts or invoices from disposal facilities are recorded.
- All records are kept for at least three years.

Date implemented: _____ **by:** _____

Date reviewed: _____ **by:** _____

Date revised: _____ **by:** _____

Appendix 5. Forms applied in the export mangoes packhouse

RAW MATERIAL RECEPTION RECORD SHEET

Date/ Time of reception: Name of supplier: Supplier code:

Variable	Product 1			Product 2			Product 3			Product 4			Product 5		
Common name															
Species and variety code															
Grade breakdown (kg)															
Grade 1															
Grade 2															
Grade 3															
Rejected															
Total quantity received (kg)															
Temperature (3 readings)															
Operator Batch Code No.															

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Plant health conditions					
Observations (supplier batch codes, cleanliness/packaging conditions/foreign matter, physical damage, etc.)					

QC of reception

Production Management
(Signature and name)

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DE-SAPPING RECORD SHEET

Date/time of treatment	Batch Code	Batch No.	Type and concentration of detergent (%)	Frequency of water change	Treatment time (minutes)	Latex cleanliness of mango after treatment	Name/ signature of QC

Verification Date:.....

Production Management

(Signature and name)

WASHING RECORD SHEET

Date/time of treatment	Batch Code	Batch No.	Type and Concentration of detergent (%)	Frequency of water exchange	Cleanliness of washing water	Washing time (minutes)	Cleanliness of fruit after washing	Name/ signature of QC

Verification Date:.....

Production Management

(Signature and name)

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HOT WATER TREATMENT RECORD SHEET

Date of treatment	Batch Code	Batch No.	Water temperature (°C)	Start treatment time	Ending treatment time	No. of crates treatment	Quantity of fruit treatment	Hydro Cooling time (minutes)	Core fruit temperature after cooling	Fruit visual quality after treatment	Name/ signature of QC

Verification Date:.....

Production Management

(Signature and name)

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FINISHED PRODUCT INSPECTION SHEET

Product name:	
Date of manufacture:	
Batch Code:	

Criteria	Inspection results compare with product specifications	Evaluate		Name/ signature of QC
		Yes	No	
Carton box/ carton label				
Packing				
Fruit label				
Quantity and weight of fruit				
Percentage of defects				
Total number of fruits				

Verification Date:.....

Production Management

(Signature and name)

MONITOR THE RESULTS OF RAT EXTERMINATION AT THE PACKHOUSE SHEET

Trap day	Inspection day	Trap location	Trap tool	Bait used	Result	Person in charge	Name/ signature of QC

Verification Date:.....

Packhouse Manager

(Signature and name)

MONITORING INSECTICIDAL AT PACKHOUSE SHEET

Date of treatment	Date of next treatment	Time of treatment	Spraying location	Chemicals used	Result	Person in charge	Name/ signature of QC

Verification Date:.....

Packhouse Manager

(Signature and name)

VISITOR HEALTH INSPECTION SHEET

To ensure the traceability of food hygiene and safety issues for the packhouse's products. Please fill in all the information about your health in the form below and change into work wear as prescribed before entering the production area. Thank you very much for your cooperation.

Date:..... **Visitor's name:** **Organization:**

Your health status: Are you suffering from the following symptoms related to the disease?

- | | | | | |
|------------------|-----|--------------------------|----|--------------------------|
| 1. Tuberculosis | Yes | ☐ | No | ☐ |
| 2. Dysentery | Yes | ☐ | No | ☐ |
| 3. Typhoid | Yes | ☐ | No | ☐ |
| 4. Skin diseases | Yes | ☐ | No | ☐ |
| 5. Cough | Yes | ☐ | No | ☐ |
| 6. Flu | Yes | ☐ | No | ☐ |
| 7. Open wound | Yes | ☐ | No | ☐ |
| 8. Eye disease | Yes | ☐ | No | ☐ |
| 9. Diarrhea | Yes | ☐ | No | ☐ |
| 10. Covid-19 | Yes | ☐ | No | ☐ |

Visitor (Signature and name)	Production Management (Signature and name)
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PACKHOUSE HYGIENE INSPECTION CHECKLIST

Supervision date:	Supervisor's name:
-------------------	--------------------

No	Category	Criteria	Yes	No	Corrective action required	By Who	By When	Re-examination on status (Ok/Not Ok)
1	Doors	Doors are cleaned weekly.						
2	Windows	Window frames are cleaned weekly.						
3	Wall surfaces	Wall surfaces are cleaned weekly.						
4	Floor	Floor areas are swept, cleaned and disinfected with detergents at the end of each working shift.						
5	Ceiling	Clean vents, clean ceilings, remove cobwebs, dust, and dirt monthly.						
6	Packing lines	Packing lines/production surfaces and equipment are cleaned with an approved detergent, rinsed and disinfected with sanitizer such as 200 ppm chlorine solution at the end of each working shift.						

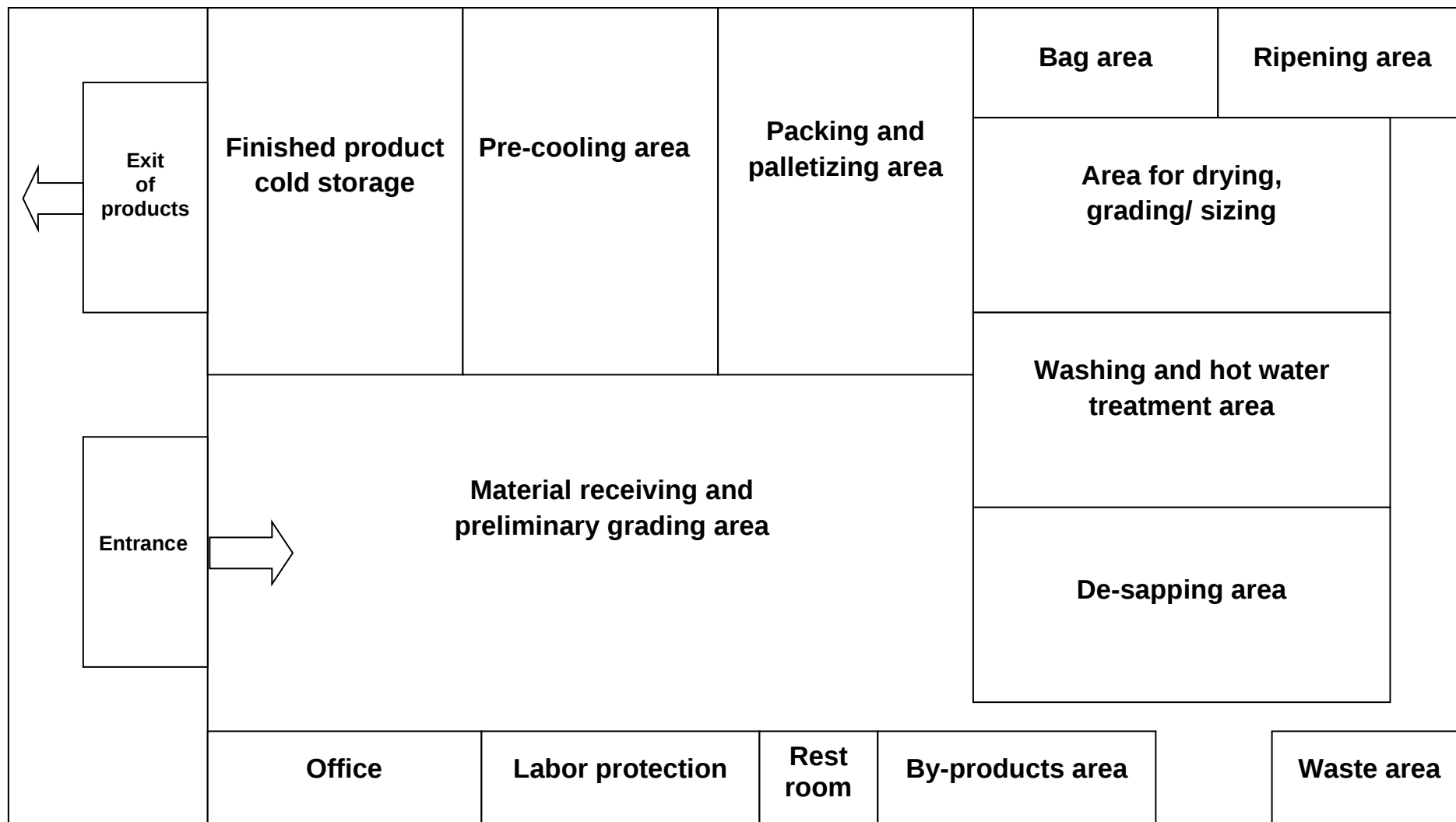
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7	Equipment	Surfaces of de-sapping equipment and processing line (conveyor, washing line, hot water dip equipment, drying equipment, sorting, grading line, and packaging line) are cleaned and sanitized with approved detergents at the end of each working shift.						
8	Desapping racks	Desapping racks are cleaned, with an approved detergent, rinsed and disinfected sanitizer such as 200 ppm chlorine solution thoroughly at the end of each working shift.						
9	Scissors	Long nosed scissors used for cutting the stalk of the fruits are cleaned with an approved detergent, rinsed and disinfected with alcohol at the end of each working shift.						
10	Grading tables	Solid surfaces of inspection/sorting/grading tables are cleaned and disinfected by alcohol 70% or 200 ppm chlorine solution or quaternary ammonium compounds (Lysol) at the end of each working shift.						

SOP 2 - Standard Operating Procedures for Export Mangoes - Packing House

11	Pre-cooling chamber	Floors of pre-cooling chambers are cleaned and disinfected at the end of each emptying and before loading fresh process load.						
12	Cold storage chamber	Floors of cold storage chambers are cleaned and disinfected at the end of each emptying and before loading fresh process load.						
13	Drainage ditch	Drainage ditches are cleaned at the end of each working shift.						
14	Waste bins	Fruit waste, packing materials and rubbish are collected from various areas and moved to closed disposable waste bins and removed daily.						

Appendix 6. Layout plan of packhouse



Appendix 7. Pictures demonstrate activities at export mangoes packhouse

(Source: UNIDO Project)



De-sapping at the farm



De-sapping at the packing house

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Mango washing machine



Hot water treatment by continuous hot water injection system

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Mango packing sample



Mangoes are palletized and stored in cold storage



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