



# **Spice and Herbs Processing Level-II**

Based on May 2019, Version 2 Occupational  
standards

**Module Title: - Preparing Modified Spice and  
Herbs Storage**

LG Code: IND SHP2 M05 LO (1-5) LG (13-17)

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## LG #13

## LO #1- Prepare to work in bulk material storage area

### Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Interpreting work to be undertaken
- Identifying OHS hazards, assessing risk and implementing suitable controls
- Selecting, using and maintaining suitable personal protective equipment
- Selecting, checking and maintaining suitable tools and equipment
- Identifying environmental implications in storage area

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Interpret work to be undertaken
- Identify OHS hazards, assess risk and implement suitable controls
- Select, use and maintain suitable personal protective equipment
- Select, check and maintain suitable tools and equipment
- Identify environmental implications in storage area

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

## Information Sheet 1- Interpreting work to be undertaken

### 1.1. Introduction

Spices and aromatic herbs (SAH) constitute an important group of plants of the biodiversity. Different parts of these plants:- the root, the leaves, the fruit, the flora bud, the peel, the seed, the flowers, the stems and the rhizomes use as raw materials for spice and herbs agro-processing.



**Figure 1.1.** Bulk raw materials of spice





Figure 1.2. Bulk raw materials of herbs

Any activities in preparing modified storage for receiving raw material of spice and herbs should require be interpreting and confirming in a proper and safe manner. Creating a suitable working environment is required to confirm the work in a proper manner so a safe and suitable environment should be created. If any problems in countering during work activities of modified storage making a deep analysis based on the work require for farther activates and make clear information on it.

Before confirming the work preconditions has to be taken this are:

- ❖ Putting on all necessarily PPE
- ❖ Setting of proper procedures and guide line for the work to be confirmed
- ❖ Having every tools, equipment and materials where ready to the work
- ❖ Creating safe and suitable environment
- ❖ Dismantling and erecting equipment and materials if necessary



- ❖ Electrical equipment must remove or sealed or the power shall turn off
- ❖ Dusty environment could happen so sprinkling of water is necessarily before the work

Having arranging all the things now you can confirm the work in a safe and proper manner. After completing any work directed by supervisor any work outcome and work problems have to be interpreted.

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Self-check 1	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I. Short Answer Questions

1. List the preconditions to be taken before performing work activities? (3pts)
2. List the part of spice and herbs use as raw material for processing? (2pts)

### Test II choose (4pts)

1. Which part /organ of spice use as raw materials  
A. Stem    B. Bark    C. leaves    D. all
2. Which preconditions is/are set before the work  
A. Putting on all necessarily PPE  
B. Creating safe and suitable environment  
C. Dismantling and erecting equipment and materials if necessary  
D. All

**Note: Satisfactory rating - 9 points**

**Unsatisfactory - below 9 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Short Answer Questions

1. \_\_\_\_\_
2. \_\_\_\_\_

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## Information Sheet 2- Identifying OHS hazards, assessing risk and implementing suitable controls

### 2.1. OHS Hazard

OHS hazard is anything (e.g. condition, situation, practice, behavior) that has the potential to cause harm, including injury, disease, death, environmental, property and equipment damage. A hazard can be a thing or a situation.

Risks during modified storage preparation are divided into three categories:

- ✓ Physical Risks
- ✓ Biological Risks and
- ✓ Chemical Risks.

#### Physical Risks

Physical risks are physical items and materials (foreign bodies), that should not be present in the task and will have harmful effects on humans when ingested; e.g. Broken Glass, Metal fragments, pieces of jewelers, finger nails, plasters, buttons, soil and hair. Practical precautions that can be implemented to reduce these risks in storage preparation:

- ✓ Remove soil by washing or discarding soiled produce
- ✓ Check the condition of machinery and knives before use to minimise the risk of metal fragments contaminating the produce and check again after use to see that the equipment is still intact.
- ✓ Use glue or sticky tape not metal staples to construct cardboard cartons
- ✓ Check the hands of personnel working in the handling and packing of produce before they start work; Jewellery should be removed, and nails trimmed
- ✓ Use blue plasters to cover wounds and check that the plaster is still in place at the end of the shift

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## Biological Risks

Biological risks are certain types of bacteria, fungi and viruses that have the potential to cause poisoning, either directly or by the production of chemical toxins.

Common causes of contamination are:

- ✓ Contact with animal and human faeces
- ✓ Vermin; rodents, cockroaches, birds and flies
- ✓ Use of contaminated water to wash produce
- ✓ Produce being handled by infected workers

Practical precautions

- ✓ Explain the hygiene procedures to workers and supervise their actions to ensure that the rules are followed at all times
- ✓ Workers who show signs of gastric problems (Vomiting, diarrhoea or frequent toilet visits) should not be allowed to work
- ✓ All workers must wash hand and or use hand sanitizer before entering the storage area
- ✓ Open wounds on the hands must be covered with clean blue plasters issued by the storage area
- ✓ Water used for washing produce must be of potable standard, (Safe to drink) Where water reuse is practiced, filtration and chlorination will be necessary
- ✓ Produce that is heavily soiled should be discarded and lightly soil produce washed
- ✓ Vermin of all types must be excluded from the storage area and a monitoring and control system implemented
- ✓ Keep produce cool
- ✓ Use produce containers only for edible produce, (Not as rubbish bins or for seating and storage of personal belongings) and clean the containers regularly

## Chemical Risks

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Chemical risks include:

- ✓ Cleaning chemicals and disinfectants used for cleaning the storage area
- ✓ Rat poison
- ✓ Refrigerants, printing inks used in storage

**Practical precautions** that can be implemented to reduce these risks

- ✓ Use only cleaning products and disinfectants on surfaces that come into contact with the produce and follow the label instructions
- ✓ Store all cleaning products and disinfectants securely in a designated area outside the store
- ✓ DO not use rat poison in the storage and in areas used for product storage
- ✓ Supervise workers undertaking maintenance and repairs to ensure that their activities do not contaminate produce

## **2.2. Assessing risk**

Risk assessment is a routine operation and significant risks identified should be addressed promptly and mitigated or the problem reported to the supervisor. Obviously, the risks present in the pack house and storage areas used for postharvest operations depend in the site and type of produce and operations being undertaken. Some problems are however, commonly associated with postharvest operations and the examples shown in the table below are a useful guide on which to base a risk assessment.

## **2.3. Implementing suitable risk Control**

Implementing suitable risk control is taking actions to eliminate health and safety risks so far as is reasonably practicable. Where risks cannot be eliminated, then implementation of control measures is required, to minimize risks as far as is reasonably practicable. A hierarchy of controls has been developed and is described below to assist in selection of the most appropriate risk control measure/s.

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Table 2.2. The following table shows hazard, risk and risk mitigation

Hazard	Risk	Actions needed to mitigate the risk
Heavy items to be lifted,  e.g. Crates of produce	Back injury	<ul style="list-style-type: none"> <li>• Train workers in safe lifting and ensure that safe lifting is practiced</li> <li>• Limit the size / weight of filled Produce containers, Guideline &lt; 20Kg / person / lift</li> <li>• Use lifting and carrying aids, e.g. trolleys and fork lift.</li> </ul>
Moving vehicles	Crashes with workers	<ul style="list-style-type: none"> <li>• Use trained drivers and apply speed limits</li> <li>• Segregate workers and moving vehicles</li> <li>• Erect signs warning that vehicles / fork lifts are working in that area</li> </ul>
Wet floors	Slip and fall injuries	<ul style="list-style-type: none"> <li>• Workers to wear suitable footwear</li> <li>• Erect warning signs</li> <li>• Improve drainage and or mend leaks</li> </ul>
Incorrect electrical fittings and frayed cables	Electric shock	<ul style="list-style-type: none"> <li>• Report the problem to the line manager Problem to be corrected by the electrician.</li> <li>• Check how the cable was damaged and address the issue</li> </ul>
Working in enclosed spaces.  Cold rooms, storage rooms and stores	No able to get out quickly if a problem occurs	<ul style="list-style-type: none"> <li>• Access ways to be kept clear</li> <li>• Exit routs and doors to be signed clear</li> <li>• Doors can be opened from the inside</li> <li>• Fire drill practiced (in large packing facilities)</li> </ul>
Dusts and	Respiratory	<ul style="list-style-type: none"> <li>• Minimize the source of the dust</li> </ul>



microbial spores from rotting produce	infection	<ul style="list-style-type: none"> <li>• Wear a dust mask</li> <li>• Dampen the dust to facilitate clean up</li> </ul>
Machinery with Moving parts	Physical injury	<ul style="list-style-type: none"> <li>• Safety Guards to be kept in place</li> <li>• Turn the machine off and disconnect from the power supply before attempting to unjam or repair</li> </ul>
Persistent & loud noise	Hearing loss	<ul style="list-style-type: none"> <li>• Wear Ear protection</li> </ul>
Sharp knives	Cuts	<ul style="list-style-type: none"> <li>• Train staff in correct use of the knife</li> <li>• Train staff in First Aid and provide First Aid Equip.</li> </ul>





Self-Check – 2	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I Short Answer Questions**

1. Differentiate the following term?(9pts)

- A. OHS Hazard
- B. Risk
- C. Assessing risk

**Test II Fill the space provided (2pts)**

1. \_\_\_\_\_is a routine operation and significant risks identified should be addressed promptly and mitigated or the problem reported to the supervisor.
2. \_\_\_\_\_is taking actions to eliminate health and safety risks so far as is reasonably practicable.

**Note: Satisfactory rating - 10 points**

**Unsatisfactory - below 10 points**

**Answer Sheet**

Name: \_\_\_\_\_

Date: Rating: \_\_\_\_\_

Score = \_\_\_\_\_

**Short Answer Questions**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

You can ask you teacher for the copy of the correct answers

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### Information Sheet 3- Selecting, using and maintaining suitable personal protective equipment

#### 3.1. Selecting of suitable personal protective equipments

PPE should be selected based primarily on the hazards identified during the assessment. However, employers should also take the fit and comfort of PPE into consideration when selecting appropriate items for each employee. PPE that fits well and is comfortable to wear will encourage employee use of PPE. Most protective devices are available in multiple sizes and care should be taken to select the proper size for each employee.

Selecting the most suitable PPE should take into consideration the following elements:

- Ability to protect against specific workplace hazards (preparing storage area for access by spices and herbs carriers.)
- Should fit properly and be reasonably comfortable to wear
- Should provide unrestricted vision and movement
- Should be durable and cleanable

Based on above information, the suitable personal protective equipments relevant to the standard will be selected. These are boots, hats/hard hat, overalls, gloves, protective eyewear, hearing protection, respirator or face mask, and sun protection (sun hat, sun screen).

##### 3.1.1. Eye and Face Protection

The selection of eye and face protection are also consider the above elements. Some of the most common types of eye and face protection include:

Safety Glasses	Safety glasses have safety frames constructed of metal or plastic and impact-resistant lenses. Side protection is required.
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Chemical Splash Goggles	Tight fitting eye protection that completely covers the eyes, eye sockets and facial area surrounding the eyes. Provides protection from impact, dust and splashes.
Dust Goggles	Dust goggles, sometimes called direct ventilated goggles, are tight fitting eye protection designed to resist the passage of large particles into the goggles.
Fluid Resistant Shields	These shields are fluid resistant or impervious and provide splash protection from biological material, such as human or non-human primate body fluids. These shields do not provide protection against chemicals or impact hazards
Face Shields	These shields extend from the eyebrows to below the chin and across the width of the employee's head. Face shields protect against potential splashes or sprays of hazardous liquids. When worn for protection against UV, must be specifically designed to protect the face and eyes from hazardous radiation. Used for chemical protection or UV protection
Laser Eyewear	Protective eyewear is required for Class 3 and 4 laser use where irradiation of the eye is possible. Such eyewear should be used only at the wavelength and energy/power for which it is intended.
Welding Shields	Constructed of vulcanized fiber or fiberglass and fitted with a filtered lens, welding shields protect eyes from burns caused by infrared or intense radiant light; they also protect both the eyes and the face from flying sparks, metal splatter and slag chips produced during welding, brazing, soldering and cutting operations

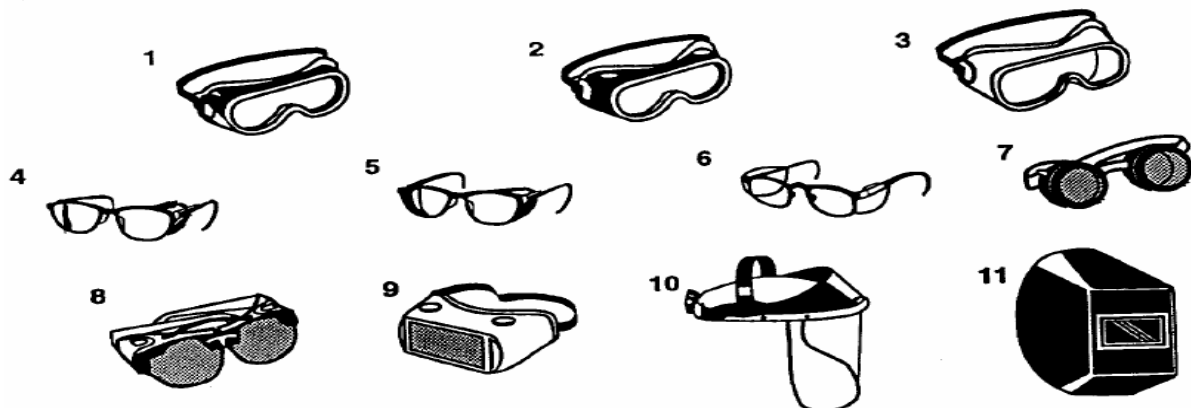


Figure 3.1.1: Different eye and face protectors

### 3.1.2. Foot and legs protective

Potential hazards which may lead to feet and legs injuries include falling or rolling objects, crushing or penetrating materials, hot, corrosive or poisonous substances, electrical hazards, static electricity, or slippery surfaces. Different footwear protects in different ways. Check the product's labelling or consult the manufacturer to make sure the footwear will protect the user from the hazards they face.

Foot and leg protection choices include the following:

- ❖ **Leggings.** Protect lower legs and feet from heat hazards, like molten metal or welding sparks. Safety snaps allow leggings to be removed quickly.
- ❖ **Metatarsal Guards.** Strapped to outside of shoes to protect instep area from impact and compression. Made of aluminium, steel, fibre or plastic.
- ❖ **Toe Guards.** Fit over the toes of regular shoes to protect only the toes from impact and compression. Made of steel, aluminium, or plastic.
- ❖ **Combination Foot and Shin Guards.** May be used in combination with toe guards when greater protection is needed.



❖ **Safety Shoes.** These have impact-resistant toes and heat-resistant soles that protect against hot work surfaces common in roofing, paving, and hot metal industries.

- May have metal insoles to protect against puncture wounds
- May be designed to be electrically conductive for use in explosive atmospheres
- May be designed to be electrically nonconductive to protect from workplace electrical hazards

### 3.1.3. Hand and Arm Protective

Potential hazards to hands and arms include skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, punctures, fractures or amputations. Protective equipment includes gloves, finger guards and arm coverings.

#### Types of Protective Gloves

There are many types of gloves available today to protect against a wide variety of hazards. The nature of the hazard and the operation involved will affect the selection of gloves. The variety of potential occupational hand injuries makes selecting the right pair of gloves challenging. In general, gloves fall into the following four categories:

**Leather, Canvas or Metal Mesh Gloves:** These types of gloves protect against cuts, burns and punctures. **Fabric and Coated Fabric Gloves:** These types of gloves are made of cotton or other fabric. They generally protect against dirt, chafing and abrasions.

**Insulating rubber gloves:** These gloves are used for protection against electrical hazards. For more information on insulating rubber gloves for electrical work,

**Chemical and liquid resistant gloves:** When working with chemicals with a high acute toxicity, working with corrosive materials in high concentrations

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Figure 3.1.3 Different hand gloves

#### 3.1.4. Hearing Protection

When an employee's noise exposure cannot be reduced to safe levels, then hearing protection must be worn. There are several options for hearing protection available that include ear plugs, ear muffs, and hearing bands, which are also known as canal caps. Each should be carefully considered for the noise reduction they will provide, as well as for comfort and fit.





Figure 3.1.4 Hearing protectors

### 3.1.5. Body Protective

Workplace hazards that could injure the employees' bodies include the following:

Intense heat

Splashes of hot metals and other hot liquids

Impacts from tools, machinery, and materials

Cuts

Hazardous chemicals, dusts and feed powdery

Contact with potentially infectious materials, like moulds

Radiation

#### Types of Body Protective

- ❖ Jackets
- ❖ Aprons
- ❖ Coveralls
- ❖ Full body suits



Figure 3.1.5. Body protective

### Materials for Protective Clothing

- ❖ **Paper-Like Fibre.** Disposable suits made of this material provide protection against dust and splashes.
- ❖ **Treated Wool and Cotton.** Adapts well to changing workplace temperatures. Comfortable and fire resistant. Protects against dust, abrasions, and rough and irritating surfaces.
- ❖ **Duck.** Protects employees against cuts and bruises while they handle heavy, sharp, or rough materials.
- ❖ **Leather.** Often used against dry heat and flame
- ❖ **Rubber, Rubberized Fabrics, Neoprene, and Plastics.** Provides protection against certain acids and other chemicals.

### 3.2. Using and Maintaining of PPE

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All PPE should be inspected for signs of degradation or puncture before use. Test for pinholes by blowing or trapping air inside and rolling them out. Do not fill them with water, as this makes the gloves and foot wears uncomfortable and may make it more difficult to detect a leak when wearing the glove. Disposable PPE should be changed when there is any sign of contamination. Reusable PPE should be washed frequently if used for an extended period of time.

While wearing gloves, be careful not to handle anything but the materials involved in the procedure. Touching equipment, phones, wastebaskets or other surfaces may cause contamination. Be aware of touching the face, hair, and clothing as well.

Before removing them, wash the outside of the glove. To avoid accidental skin exposure, remove the first glove by grasping the cuff and peeling the glove off the hand so that the glove is inside out. Repeat this process with the second hand, touching the inside of the glove cuff, rather than the outside. Wash hands immediately with soap and water.

Follow the manufacturer's instructions for washing and caring for reusable gloves.

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Self-Check – 3	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. List the elements considered in selection of most suitable PPE.(5pts)
2. What care you should take in using and removing of hand gloves?(2pts)

### Test II say true or false (2)

1. All PPE should be inspected for signs of degradation or puncture before use.
2. The nature of the hazard and the operation involved will affect the selection of PPE

**Note: Satisfactory rating - 7 points**

**Unsatisfactory - below 7 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Short Answer Questions

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

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## Information Sheet 4- Selecting, checking and maintaining suitable tools and equipment

### 4.1. Selecting and checking tools and equipments

Tools and equipment may include storage preparation, storage, cleaning agents, packing materials and containers, labels adhesives and performs .Tools, equipment and machinery may include: tractors, trailers, light trucks, forklifts, snips, knives, gloves, containers, grading machinery, washers, brushes, dryers, chemical applicators, gassing chambers, labeling devices, packing tools, scales, pallets hand trolleys and lifting aids, dry room, cool-rooms and dedicated storage facilities, knife, rope, nil, bags, bins, bamboo stick, boxes, and silos (types of storage containers for solids), tanks, vats, and vessels (types of storage containers for liquids) cold storage rooms (for chilled or frozen products) to allows raw material to be held between processing stages (or operations), and the final food product to be stowed and warehoused prior to distribution. Raw material can be stored by a variety of methods depending on the type of food being stored, the length of storage (i.e., short-term or long-term) and the storage requirements, and include. The tools, equipment and machinery that will be needed will depend on several factors including:-

- The type of produce
- The operations to be carried out
- The scale of farm operations and
- The tools, machinery and equipment available on the farm. Usually the tools, machinery and equipment to be used will be specified in the enterprise work procedures. Some examples are shown below:-

A number of manufacturers supply ranges of fixed and/or portable spices and herbs handling equipment and will advise on the selection of suitable models if provided with full information on the proposed operation. This must include:-

- The proposed capacity of storage areas,
- The types of spice and herbs raw materials available,

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➤ The types of spices and herbs processed

Equipments and containers selected should be made of non-toxic materials, capable of being disassembled to allow proper maintenance, cleaning and inspections.

Table 4.1. Materials, tools, equipment use to storage preparation

Task	Materials, tools, equipment and machinery that may be needed
(storage preparation)	Sharp knives or scissors or guillotine, meter, rope, peg, bamboo stick, nil, cement, aggregate, stone,
Storage	Plastic container, wood box container, jute bag, cane container
Packing	Packaging selected, weighing scales
Moving produce	Suitable containers, pallets and fork lift, wheel barrow
Storage temperature and temperature measurement	Thermometer, humidity meter
Protection	Appropriate PPE, (see product label), and measuring and application equipment





**Figure 1.1. Storage tools and equipments**

#### **4.2. Routine maintenance of tools, equipment and machineries**

All mechanical equipment is subject to wear and tear and regular maintenance should form part of the working schedule. Machinery manufacturers will give advice on maintenance programmes and a supply of spare parts should be kept in stock, a list of typical spare parts being given below. It is important therefore to budget for spare parts when purchasing new equipment or when determining annual inputs for an established spice and herbs storage area.

It is aimed to have trouble free machines and equipments producing defect free products for total customer satisfaction. This breaks maintenance down into 4 "families" or groups which were defined earlier.

- ❖ Preventive Maintenance
- ❖ Breakdown Maintenance

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- ❖ Corrective Maintenance
- ❖ Maintenance Prevention

With planned maintenance we evolve our efforts from a reactive to a proactive method and use trained maintenance staff to help train the operators to better maintain their equipment.

**Target:-**

- ❖ Zero equipment failure and break down.
- ❖ Improve reliability and maintainability by 50 %
- ❖ Reduce maintenance cost by 20 %
- ❖ Ensure availability of spares all the time.

**Quality maintenance:-**

It is aimed towards customer delight through highest quality through defect free manufacturing. Focus is on eliminating non-conformances in a systematic manner, much like focused improvement. We gain understanding of what parts of the equipment affect product quality and begin to eliminate current quality concerns, and then move to potential quality concerns. Quality maintenance activities is to set equipment conditions that preclude quality defects, based on the basic concept of maintaining perfect equipment to maintain perfect quality of products. The conditions are checked and measure in time series to verify that measure values are within standard values to prevent defects.

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Self-Check – 4	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. Write the importance of maintaining tools, equipment and machineries?(3pts)
2. How do you select those tools for specific purposes?(3pts)

### Test II Fill the blank space(4pts)

1. \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ type of maintenance

**Note: Satisfactory rating - 9 points**

**Unsatisfactory - below 9 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Short Answer Questions

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

You can ask you teacher for the copy of the correct answers.

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## Information Sheet 5- Identifying environmental implications in storage area

### 5.1. Storage environmental conditions

Routine monitoring of the environment in the store area and the condition of the produce in the store followed by implementation of appropriate action essential to minimize postharvest losses for spice and herbs raw materials in the store. Monitoring of the condition of the area in store involves inspection of the raw materials. This involved taking samples from transect through the batch of produce and examining the sample. Look for loss of condition, sprouting and storage rots or insect infestation.

Spices should be stored in tightly closed containers and should not be exposed to light, high temperatures, or high humidity conditions. This maintains their freshness for longer periods of time. Heat, moisture, and direct sun accelerate the loss of their flavor and aroma components of spics and herbs raw materials. Moisture and high temperatures will help mold growth that will cause spoilage. Generally, the moisture content of spice is 8% to 10%. High storage temperatures cause flavor loss, color changes, and caking or hardening of the ground spice. Spices need to be stored at 50°F to 60°F (10°C to 15°C) with a relative humidity (RH) of 55% to 65%. Spices should not be stored in the freezer as repeated removal from freezer creates condensation in containers which accelerates loss of their flavor and aroma. And always close containers tightly after each use. Ground spices generally keep for 2 to 3 years, whole spices for about 3 to 4 years, and seasonings for about 1 to 2 years if stored in ideal conditions. When exposed to steam, flavor and aroma are lost at a faster rate and caking occurs. Any moisture introduced into the bottle will result in caking.

### 5.2. Monitoring Storage

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Routine monitoring of the environment (temperature, humidity and ventilation) in the store area/site and the condition of the produce in the store followed by implementation of appropriate action is essential to minimize the losses for produce in the store.

**Monitoring of the condition of the raw materials in store house;** involves inspection of the raw materials. This involved taking samples from a transect through the batch of produce and examining the sample. Look for loss of condition, sprouting and storage rots or insect infestation. Record what you find and the percentage of the sample that is affected.

**Monitoring of storage area:**

- The presence of rubbish, old produce, unauthorized materials
- Arrangement of produce in the store; access, safe stacking, air circulation, etc.
- Careful handling of produce entering and leaving the store.

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<b>Self-Check – 5</b>	<b>Written test</b>
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I short answer**

1. What environmental impact to assess? (2pts)
2. What the environmentally related factor of raw material storage of spice and herbs?(3pts)

**Test II say true or false (2pts)**

1. Moisture and high temperatures will help mold growth that will cause spoilage.
2. High storage temperatures cause flavor loss, color changes, and caking of spice.

**Note: Satisfactory rating - 6 points**

**Unsatisfactory - below 6 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Short Answer Questions**

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

You can ask you teacher for the copy of the correct answers.

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## Operation Sheet 1- Selecting, checking and maintaining suitable tools and equipment

Objectives of this Operation in your training program are to:

- Ensure that you practice and acquire the skills needed to prepare bulk raw material storage
- To encourage you to apply and use your knowledge in a range of practical situations

In the work place organization of the necessary tools and equipment and risk assessment are essential for efficient operations and worker safety

**Operation sheet;** step to selecting, checking, and maintain suitable tools and equipment

1. Discuss about the task to be carried out with your Instructor and identify the work requirements for the task
2. Select the necessary materials, tools and equipment for the operations to be carried out
3. Carry out pre-start and safety checks on the tools and equipment provided
4. Complete an OHS risk assessment to Implement the necessary risk mitigation activities or Inform the Supervisor / Manager of the problems identified
5. Select suitable safety equipment or PPE and demonstrate safe working practices for the postharvest operations to be carried out.

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LAP TEST	Performance Test
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Name..... ID.....

Date.....

Time started: \_\_\_\_\_ Time finished: \_\_\_\_\_

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within **1** hour. The project is expected from each student to do it.

**Task-1 Perform the following task**

- A.** Select the tools and equipment needed to perform the identified operations
- B.** Carry out pre-start and safety checks on the tools and equipment provided
- C.** Complete an OHS risk assessment to be carried out and implement the necessary risk mitigation activities or inform the Supervisor / Manager of the problems identified
- D.** Select suitable safety equipment or PPE and demonstrate safe working practices for the operations to be carried out

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## LG #14

## LO #2- Prepare storage area

### Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Cleaning the storage area site
- Disposing refuse
- Maintaining the site in a clean and tidy condition
- Preparing storage site to meet OHS standards

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to:**

- Clean the storage area site
- Dispose refuse
- Maintain the site in a clean and tidy condition
- Prepare storage site to meet OHS standards

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.



## Information Sheet 1- Cleaning the storage area site

### 1.1. Cleaning storage area

A clean, safe and hygienic storage area site during storage preparation and storage of spice and herbs raw materials is essential for:

- Protecting spice and herbs raw materials from contamination
- Worker safety and
- Easy processing

Operator safety and food safety are important in all spice and herbs processing operations, but the procedures needed are often influenced by the scale of operation and the requirements of the target market. Prevent contamination of bulky spice and herb raw materials by covering the ground where raw materials will be placed or using clean containers.

- Remove organic wastes; e.g. crop trash, reject produce, animal manure and domestic waste should also be removed from the areas where raw materials are stored to reduce the risk on vermin which could eat and contaminate the raw materials. In a commercial fresh spice and herbs storage house facility, more comprehensive measures are necessary:-
- All workers in the storage house should receive training in safe working practices and hygiene.
- There should be a cleaning procedure and cleaning schedule for:
  - ✓ Produce containers, cold stores and dry stores
  - ✓ Products used for cleaning should be 'food grade', used in accordance with label recommendations and stored securely in a designated storage area of spice and herbs raw materials.
  - ✓ Cleaning activities should be recorded
- Machinery and equipment used in the storage preparation and raw materials processing must be cleaned at the end of each shift. Remember to turn machinery

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and equipment off and disconnect from the electric supply before attempting to dismantle and clean items.

- Waste materials; damaged packaging, reject produce, liquid wastes must be removed from the spice and herbs handling and storage area promptly to prevent raw materials contamination and to remove trip hazards.
- Workers should be provided with dust coats and head covering and workers personal belongings and food should be stored securely outside the work area
- Hand washing facilities must be provided at the entrance to the work area and at the toilet facility
- Toilets and canteen facilities must be kept clean at all times.

The spices and herbs raw materials should be cleaned properly to the desired levels prescribed in the national and international standards. Raw materials of spices should be protected from contamination by human, animal, domestic, industrial and agricultural wastes which may be present at levels likely to be a hazard to health. Adequate precautions should be taken to ensure that these wastes are not used and are not disposed of in a manner which may constitute.

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Self-Check – 1	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. List the importance of cleaning storage site and storage area?(2pts)

### Test II say true and false (2pts)

1. Protecting spice and herbs raw materials from contamination is essential.
2. Machinery and equipment off and disconnect from the electric supply before attempting to dismantle and clean items is very important.

**Note: Satisfactory rating - 4 points**

**Unsatisfactory - below 4 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

You can ask you teacher for the copy of the correct answers.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_  
\_\_\_\_\_ -



## Information Sheet 2- Disposing refuse

### 2.1. Storage and disposal of refuse

Waste material should be handled in such a way as to avoid contamination of food or potable water. Care should be taken to prevent access to waste by pests. Waste should be removed from the spice storage and other working areas as often as necessary and at least daily. Immediately after disposal of waste, receptacles used for storage and any equipment which has come into contact with the waste should be cleaned and disinfected. Storage area waste should be cleaned and disinfected the area.

### 2.2. Hazardous waste/refuse disposal operations

The types of waste generated by storage preparation and storing of spice and herbs raw materials operations will depend on the type of produce and the target market. The level of risk created by the waste generated will depend on the amount of waste and the situation in which the waste is generated. Each processing area should identify and document the types and amounts of waste generated and develop operational procedures for disposal that will:-

Minimize the effects of the waste on the environment and

Minimize the OHS risks to employees and the community around the produce handling and storage facility. These waste management operational procedures should be included in the processing environmental policy and plan, which provide guidance about waste management and to monitor practices to ensure that the environment and the safety of operators and the community is not compromised.

Table: 2.2. Some typical operational procedures are shown in the table below

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Type of waste	Typical operational procedures
Damaged during storage & damaged Crates	Minimize by careful handling and correct storage cardboard can be burnt  Plastic should be recycled where possible and otherwise buried
Waste produce and crop residue	Minimize by good spice and herbs husbandry and careful handling  Remove from produce handling area promptly
Waste waters from processing	Drain into a constructed wetland or onto un-cropped land, spice and herbs farm, not into the cropped field, the drainage system or the local river



Self-Check – 2	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Short Answer Questions**

1. List the type of storage refuse ?(3pts)
2. List typical refuse disposal procedures ?(3pts)

**Test II say true and false(2pts)**

1. Storage area waste should be cleaned and disinfected the area.
2. Waste material should be handled carefully to avoid contamination of raw materials.

**Note: Satisfactory rating - 8 points**

**Unsatisfactory - below 8 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

You can ask you teacher for the copy of the correct answers.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_
2. \_\_\_\_\_

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### Information Sheet 3- Maintaining the site in a clean and tidy condition

#### 3.1 Maintaining storage site clean and tidy

On sites, for example, tidying up tends to be left until the end of the shift. But that just means you're exposing yourself and others to trip hazards all day long – and that's when the accidents will happen. So here are 10 good site keeping rules for a tidy site. Implement these, and you should see a reduction in slip and trip accidents and near misses to your workforce.

##### 1. Designate an area for rubbish and waste

After all, if you want your work area free from waste materials, you need somewhere to put them. This could be a skip or other waste disposal bin depending on the amount of waste. Best practice is to segregate waste types for reuse, recycle or landfill.

##### 2. Stack and store materials safely

You need materials and tools for use throughout the project, store them safely. Poorly stacked materials can block access routes or topple over causing crushing injuries or damage to property.

##### 3. Maintaining a safe work area

Check your work area at regular intervals throughout the day and clear up as you go along. If trip hazards and mess is starting to build up, sort it out sooner rather than later.

##### 4. Keep access routes clear

A safe work area includes access and egress. Do not leave materials/tools/benches in gangways/corridors where they might impede someone's escape or cause a trip hazard (it might be you or a colleague who needs to get out in a hurry).

##### 5. Put tools away when you are done

If tools or equipment are out of use, put them away. It's easy to leave items lying around, but if you won't need them again in a hurry, put them away. If it's out of use, it should be out of sight, or at least out from under your feet!

##### 6. Set a tidy example

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Just because it's not yours, doesn't mean it's not your responsibility. If you see anything lying on floors, stairways, passages that could cause people to trip and fall, pick it up and put it in a safe place – DON'T WAIT FOR SOMEONE ELSE TO MOVE IT.

### **7. If it is broken, fix it**

Fix it, or ditch it. Good housekeeping is also about keeping things in good working order on site. Damaged tools or equipment must be taken out of use and immediate steps are taken to have them repaired and put them somewhere safe.

### **8. Don't let cables trip you up**

Trailing leads and cables from equipment are common trip hazards, particularly when using portable equipment. You may not have a socket close the working area, but make sure you route the lead away from walkways or access points. Route cables where they do not cause a trip hazard to you or to others.

### **9. Avoid fire risks**

Make sure waste or the storage of materials does not build up in fire escapes as you may need to use these escapes at some point. Don't allow waste materials to be stored close to sources of ignition. If all rubbish is regularly collected and put into the skip, in the event of the fire, the danger is confined and more easily dealt with.

### **10. Make others aware**

A tidy work area requires commitment from everyone. Raise awareness on site with our free good housekeeping toolbox talk. Gets everyone practicing the same good housekeeping techniques and you will be on your way to a tidy, and safe site, for everyone.

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Self-Check – 3	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Short Answer Questions

1. List the 10 good site keeping rules?(8pts)

**Note:** Satisfactory rating - 8 points      Unsatisfactory - below 8 points

You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

You can ask you teacher for the copy of the correct answers.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_  
\_\_\_\_\_

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## Information Sheet 4- Preparing storage site to meet OHS standards

### 4.1. Preparing site for spice and herbs raw material storage

#### General requirements for storage site preparation

- ❖ The to make proper storage, minimize contamination, deterioration and the to minimize storage pests and diseases
- ❖ To make sufficient size storage house, to store expected amount of bulk raw materials

#### Site location

The storage site should preferably be located in areas which are free from objectionable odors, smoke, dust or other contaminants and are not subject to flooding.

#### Roadways and areas used by wheeled traffic

The roadways and area serve the establishment which is within its boundaries or in its immediate vicinity should have a hard paved surface and suitable for wheeled traffic. There should be adequate drainage and provision should be made to allow for cleaning.

### 4.2. Spices and herbs raw materials storage preparation

During storage construction to receive spice and herbs raw material to store, the following thing should be under consideration;-

**Floors** - Where appropriate, should be of water-proof, non-absorbent, washable, non-slip and non-toxic materials, without crevices, and should be easy to clean and disinfect. Where appropriate, floors should slope sufficiently for liquids to drain to trapped outlets.

**Walls** - Where appropriate, should be of water-proof, non-absorbent and washable materials, sealed and free of insects and should be light colored. Up to a height appropriate for the operation these should be smooth and without crevices, and should be easy to clean and disinfect. Where appropriate angles between walls, between walls and floors, and between walls and ceilings should be sealed and coved to facilitate cleaning.

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**Ceilings** - should be so designed, constructed and finished as to prevent the accumulation of dirt and minimize condensation, mould development and flaking, and should be easy to clean.

**Windows and other openings** - should be so constructed as to avoid accumulation of dirt and those which open should be fitted with insect-proof screens. Screens should be easily movable for cleaning and kept in good repair. Internal window sills, if present, should be sloped to prevent use as shelves.

**Doors** - should have smooth, non-absorbent surfaces and where appropriate, be self-closing and close fitting.

**Stairs** - Lift cages and auxiliary structures such as platforms, ladders and chutes should be so situated and constructed as not to cause contamination to food. Chutes should be constructed with inspection and cleaning hatches.

**Overhead structures and fittings** - should be installed in such a manner as to avoid contamination of the finished product and raw materials by condensation and drip, and should not hamper cleaning operations. These should be insulated, where appropriate, and be so designed and finished as to prevent the accumulation of dirt and to minimize condensation, mould development and flaking. They should be easy to clean.

**Living quarters, toilets** and areas where animals are kept should be completely separated from and should not open directly on to spice handling areas. Where appropriate, establishments should be so designed that access to various sections can be controlled. The use of materials which cannot be adequately cleaned and disinfected, such as wood, should be avoided unless its use would clearly not be a source of contamination.

### **Water Supply**

- ❖ An ample supply of water, under adequate pressure and at suitable temperature should be available with appropriate facilities for its storage, where necessary, and distribution, and with proper protection against contamination.
- ❖ **Ice** should be made from potable water; it should be manufactured, handled and stored so as to protect it from contamination.

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- ❖ **Steam** used in direct contact with food or surfaces in contact with food should contain no substances which may be hazardous to health or contaminate the food.
- ❖ **Non-potable water** - used for steam production, refrigeration, fire control and other similar purposes not connected with processing should be carried in completely separate lines, identifiable preferably by color, and with no cross-connection with or back siphon age into the system carrying potable water.

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Self-Check – 4	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. The list features of the site use to prepare spice and herbs raw material storage?(8pts)

### Test II say true or false(2pts)

1. The storage site should preferably be located in areas which are free from objectionable and bad odors

**Note: Satisfactory rating – 9 points**

**Unsatisfactory - below 9 points**

You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_  
\_\_\_\_\_

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## LG #15

## LO #3- Prepare storages

### Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Preparing bulk material storages
- Cleaning, drying and aerating bulk material storages area
- Checking bulk material storages for structural safety
- Preparing and erecting temporary storages to meet the need

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Prepare bulk material storages
- Clean, dry and aerate bulk material storages
- Check bulk material storages for structural safety
- Prepare and erect temporary storages to meet the need



### Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.



## Information Sheet 1- Preparing bulk material storages

### 1.1. Preparing storage

Raw materials stored in the plant premises should be maintained under conditions that will protect them against contamination and infestation and minimize deterioration. Spices not scheduled for immediate use should be stored under conditions that prevent infestation and mould growth.

The warehouse/storage house should be of sound construction and well equipped so that it will provide suitable storage and adequate protection for spices. Any breaks or openings in the walls, floors, and roof shall have been repaired. Any breaks or openings around doors, windows and ventilators should be repaired or screened. Screens should be used only in those areas of the building where moisture entry from precipitation cannot occur. The building should have sufficient ventilation to prevent accumulation of moisture. Provision should be made in existing storage or at the design stage in new storage for gas tightness to permit in situ fumigation of spices. Areas with new concrete floors or walls should not be used for storage until it is absolutely certain that the new concrete is well-cured and free of excess water. It is safer to use an approved plastic cover spread over the entire new concrete floor as a moisture barrier prior to use for spices. However, other means of protecting the spices against moisture from "sweating" concrete can be used, such as stacking of containers on pallets. The plastic can be removed when the warehouse is emptied. This system will protect against moulding of the spices due to the sweating of new concrete. Products which affect the storage life, quality or flavor of spices should not be stored in the same room or compartment as spices.

Modern practices- of storing or enclosing commodities, especially perishables in airtight plastic containers or self-sealing plastic foils before storing under refrigerated conditions may provide a potentially hazardous situation. The airtight conditions may keep the

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products moist, particularly on the surface of commodities, thereby providing favorable conditions for the growth of fungus. Therefore, even though refrigeration temperature may be an ideal means of controlling mould growth, care should be taken not to turn it into an ideal environment for aflatoxin production by maintaining temperatures preferably at 0°C. However, the use of cold temperatures for large scale storage of spice and herbs crops is generally not economically feasible.

There is quality storage both on-farm and off-farm, with cool stores and warehousing facilities linked to post-harvest spice and herbs management. Spices deteriorate rapidly in adverse conditions and should be stored in well-prepared and maintained storage facilities. It is essential the moisture level of the spice to be stored is at a safe level prior to storage.

The store houses should be damp-proof, below vermin –proof and bird-proof and where possible have controlled ventilation and device to control humidity and temperature. A dehumidifier fitted to a storage room, by keeping the atmosphere always dry, can eliminate mould and insect attacks. The room should be fumigated before storage, the walls white washed regularly and the facility kept dry. Fumigation against pest infestation should be carried out only when necessary, and should be carried out by licensed or trained personnel. Only registered chemicals authorized by the regulatory authorities of the source country and the countries of intended end-use should be used. The regulatory authorities of the source country and the countries of intended end-use should be used. All fumigation, fumigation chemicals, and dates of application should be documented. When freezing or saturated steam is used for pest control, the humidity of the materials should be checked after treatment. Some specific examples for major spices are described below.

### **Operating procedures for storage of raw materials**

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As a Supervisor responsible for the storage of raw materials on the farm you need to make regular checks on the operation of the stores and the condition of the produce in the stores. Checks of the environment in the store and the condition of the produce in store should be recorded for future reference and evidence of 'Due Diligence'.

### **General points before storage**

#### **The need for storage**

- ❖ Most spice and herbs are seasonal
- ❖ cultivation and harvest periods are much longer in tropical and subtropical areas
- ❖ Demand is year round
- ❖ Then to ensure continuity of supply

Storage time depends on:

- ❖ The intrinsic characteristics and perishability of the product
- ❖ Shelf life ranges from
- ❖ Storage conditions also depend on specific product characteristics.
- ❖ Some commodities tolerate temperatures close to 0°C such as leafy spice.
- ❖ Others, such as most tropical spice cannot tolerate exposure to temperatures below 10°C.
- ❖ Not more than one crop should be stored in the same room, unless for a short period of time Why?

Different crops have differences in

- ❖ Temperature and RH requirement
- ❖ Chilling and ethylene sensitivity;
- ❖ Odor contamination and other problems affecting shelf life and quality

### **Requirements and general characteristics for a storage facility**

I. Storage facilities are linked or integrated to packinghouses

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II. Altitude reduces temperature by 10 °C for every 1000 meters of elevation

III. Building design is an important factor to be taken into consideration

A **square shaped floor** perimeter is **thermally** more efficient than a **rectangular one**

- ❖ Floors should be of concrete, isolated from soil humidity
- ❖ Doors need to be wide enough for mechanized handling
- ❖ Roofs must be constructed to reduce heat gain and accumulating moisture

IV. Storage facilities should be thoroughly cleaned before filling

V. Before product is placed in the storage room, inspection and

Pre-sorting should be undertaken

VI. Product should be stacked in such a way that there is free circulation of air

VII. First in first out principle should be employed

### Storage methods

There are different types of storage used to store spice and herbs raw materials before processing. The storage methods depend on

- Raw materials of spice and herbs
- The length of storage time can be
- The technology utilized depends on whether the benefits (higher prices) outweigh the costs

Based on the above mentioned factors storage method may be

#### **Natural or field storage/temporary storage**

- ❖ Most basic system and is still in use for spice and herbs.
- ❖ Spice and herbs should be left in the soil until preparation for the market
- ❖ Although widely used, effects of pests, diseases and adverse weather is high
- ❖ have detrimental effect on quality
- ❖ Another method widely used is field storage in heaps

#### **Modified/Improved storage structures**

A good storage structure should:

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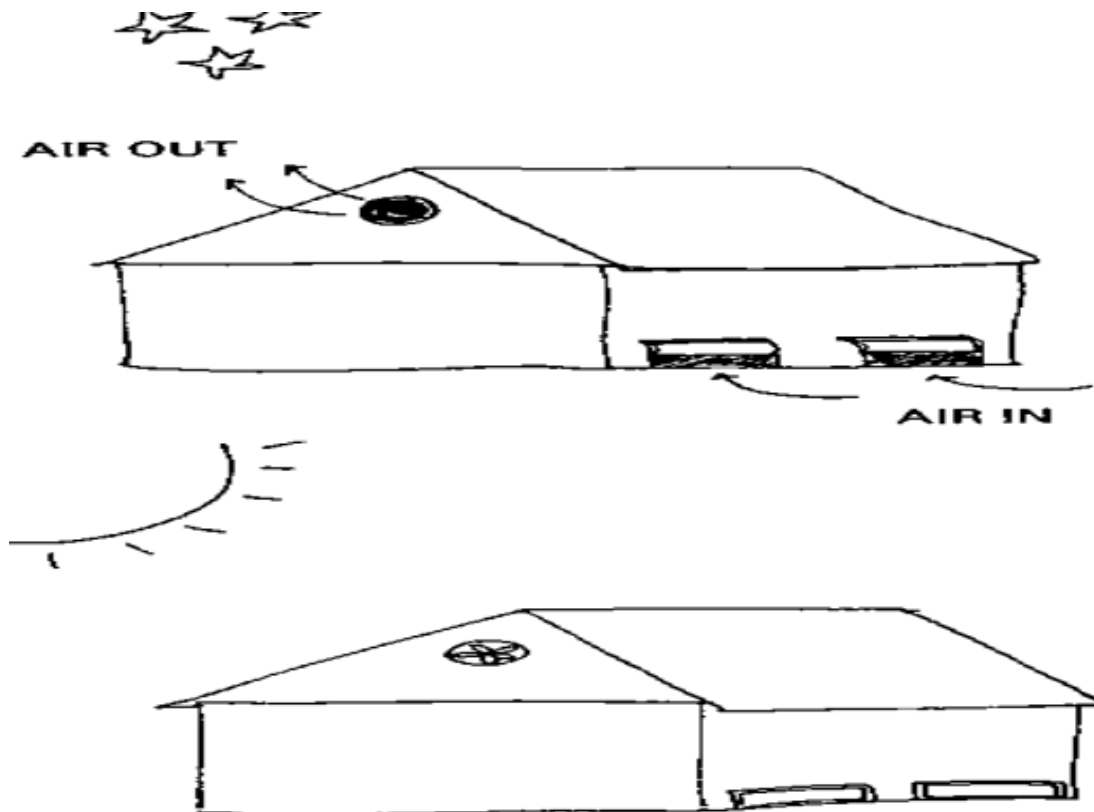
- ❖ Provide protection from common storage loss agents such as insect pests, rodents, moulds, birds and man.
- ❖ Maintain an even, cool and dry storage environment. The raw materials should be placed on pellets above the floor to avoid cold conditions that may lead to moulds
- ❖ Should not allow re-wetting of grain by either moisture migration or rain.
- ❖ Offer reasonable protection from thieves.
- ❖ Be simple and inexpensive to construct using, where possible, locally available materials and skills. Be easy to clean and repair.
- ❖ Grain should be protected from rodents
- ❖ It takes advantage of the natural airflow around the product
- ❖ Buildings providing some form of protection from the external environment
- ❖ **Modified storage has side , top and bottom ventilation structure**



Figure Side and bottom ventilated storage structure

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Picture 1.1. Modified storag

## Bag storage

- ❖ Each bag contains a definite quantity, which can be bought, sold or dispatched without difficulty;
- ❖ Bags are easier to load or unload.
- ❖ It is easier to keep separate lots with identification marks on the bags.
- ❖ The bags which are identified as infested on inspection can be removed and treated easily and
- ❖ The problem of sweating of produced does not arise because the surface of the bag is exposed to the atmosphere.



Picture 1.2. Bag storage

## Glass storage

Glass storage/containers have more variable dimensions than either plastic or metal containers because of the nature of their manufacture. It is therefore important to check particular dimensions to ensure that

- ❖ A container has the expected capacity;
- ❖ The neck is properly formed and will allow the lid to fit properly;
- ❖ The container is vertical to prevent it breaking in a filling machine, and
- ❖ The weight of a sample of empty containers is checked to find the heaviest in a batch for use in check-weighing.

Glass pieces are also a particular danger to customers if they become mixed into the product. It is therefore essential that the checks described below are routinely performed on all glass containers. Finally glass containers are often re-used and may have become contaminated by kerosene, pesticides or other materials. They should be thoroughly washed and inspected by looking and smelling to ensure that no residues remain before the food is filled.

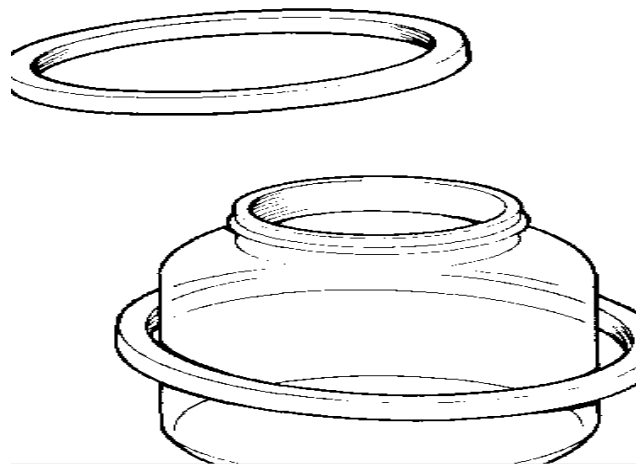






Figure 1.3. Canning storage

### Plastic crates bins storage

- ❖ Robust and suitable for re-use
- ❖ Suitable for stacking and can be designed to allow air circulation
- ❖ Easier to clean than wooden containers



Figure 1.4. Plastic storage

### Wooden boxes and bulk bins

Robust and suitable for re-use and 'recycling', suitable for stacking and can be designed with corner post for additional strength and air circulation difficult to clean



**Figure 1.5. Wood box storage**

### Modified atmosphere storage

A modified atmosphere is one in which the normal composition of air has been changed or "Modified". This modification usually results in a reduction in the oxygen of the air, while increasing the level of carbon dioxide and nitrogen in the atmosphere.

Modified Atmosphere Packaging (MAP) is becoming increasingly popular as a method of food preservation. MAP has been defined as "the enclosure of food products in high gas barrier materials in which the gaseous environment has been changed to slow respiration rates, reduce microbiological growth and retard enzymatic spoilage with the intent of extending shelf life. MAP is mainly used for the retail distribution of small pre-packed units and the concentration of CO<sub>2</sub> used in these products is generally much higher. MAP involving various gas mixtures of CO<sub>2</sub>, O<sub>2</sub> and N<sub>2</sub> has been used to extend the chemical and microbiological shelf life, and however, despite the antimicrobial effect of CO<sub>2</sub> enriched atmospheres on the growth of aerobic spoilage microorganisms, several studies have shown that moulds can grow in the presence of elevated levels of CO<sub>2</sub> if oxygen is present. MAP is the enclosure of the food product in gas barrier materials, in which the gaseous environment has been enhanced to slow respiration

rates, reduce microbiological growth and retard enzymatic spoilage. However, there is no data with respect to aflatoxin production in foods packaged under MAP.

Controlled atmosphere (CA) – generally refers to systems (storage chambers) with gas injection and continuous precise control of the gas composition.



Figure 1.6. Controlled atmosphere storage

Modified atmosphere (MA) –the atmosphere usually generated within plastic packages due to the interaction of produce respiration with packaging material (plastic film, m.b. with addition of chemicals absorbing or producing gases).





Figure 1.7. Modified atmosphere storage

## Cooling

Cooling slows down the physiological processes relating to ripening, senescence and decay so it / can be used for all types of spice raw materials produce to extend the shelf life and conserve the eating quality and nutritional value of the produce.

Cooling occurs when produce is placed in an environment with a lower temperature, e.g. when placed in the shade in the field or stored in a cool shed or refrigerated cold store or washed in cold water. In this case cooling occurs due to contact with cold air or water. In the case of air cooling, the rate of cooling is improved by a large area of the produce being exposed to the cool air and by good air circulation around and through the stacks of produce. Cooling also occurs when water is evaporated from the surface of the produce or from the environment immediately around the produce. This process is called 'evaporative cooling' and works because heat energy is needed for evaporation and this heat is taken from the produce.

### **Natural shade or a simple field shelter made from poles and reeds**

Facilitates a little natural cooling but its real benefit and primary purpose is protecting the harvested from the sun (solar gain).

Is most effective when produce is harvested when it is cool

Is only suitable for short term storage (few hours max.)

### **Small Scale Evaporative Cooling**

Cooling box, (Double walled box with sand placed in the cavity between the walls) or Small Shelter (made with Charcoal contained between wire mesh walls)

Cooling is provided when the sand or charcoal is kept wet and evaporation occurs.

Cooling is most effective when produce is harvested when it is cool and the facility is not overfilled





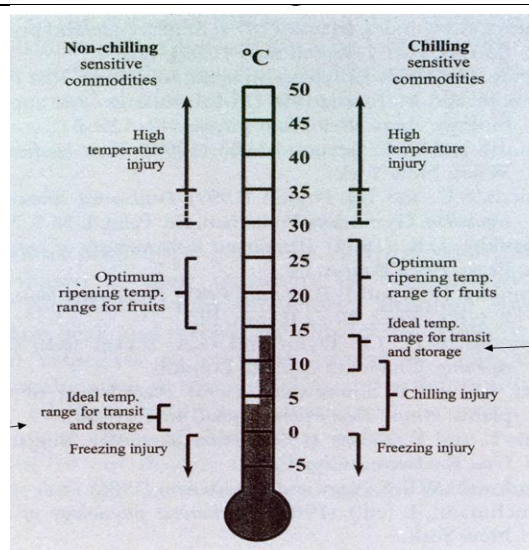
Picture 1.8. cooling storage

### Refrigerated cold stores

Refrigerated cold storage and refrigerated transport is used on large scale commercial farms for high value fresh produce, e.g. flowers and leaf spice for export or high end local sales.

Efficient operation requires that the door is kept closed and produce is arranged so that the cold air passes through the stacks of produce.

Most products can be kept at low temperature in these stores for several weeks but in practice storage is usually only for a few hours or days to facilitate maintenance of the cold chain during the postharvest period.



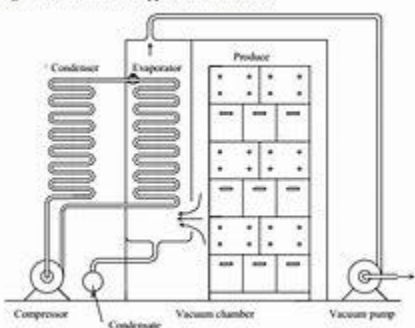
Picture 1.9. Refrigerated cold stores

### Vacuum Cooling

### Hydrocooling



Figure 1. Schematic of a typical vacuum cooler.



Picture 1.10. Vacuum cooling storage



Picture 1.11. Hydrocooling storage



<b>Self-Check – 1</b>	<b>Written test</b>
-----------------------	---------------------

Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short answer

1. List different storage methods used to store bulk raw materials of spice and herbs?(4pts)
2. What are the difference between temporary storage and modified storage of spics?(3pts)
3. What Information should be included at storage preparation?(3pts)

### Test II say true or false(2pts)

1. The moisture level of the spice to be stored is at a safe level prior to storage.
2. Glass storage/containers have more variable dimensions than either plastic or metal containers because of the nature of their manufacture.

**Note: Satisfactory rating - 10 points**

**Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

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## Operation Sheet 1- undertake preparation of modified storage

**Objectives of this operation in your training program are to:**

- Ensure that you practice and acquire the skills needed to prepare bulk raw material storage
- To encourage you to apply and use your knowledge in a range of practical situations

In the work place organization of the necessary tools and equipment and risk assessment are essential for efficient operations and worker safety

### **Operation sheet; Steps to prepare modified storage for garlic**

1. Discuss about the task to be carried out with your Instructor and identify the work requirements for the task
2. Select the necessary materials, tools and equipment for the operations to be carried out
3. Carry out pre-start and safety checks on the tools and equipment provided
4. Prepare construction materials (bamboo stick, plastic nil, cement, wood metal, cane, stone ,aggregate and ferro- metal
5. Select suitable site
6. Check the temperature and humidity
7. Make survey and layout
8. Prepare modified storage (5m\*5m) small capacity storage  
Prepare Side, bottom and top ventilated structure the side walls of this structure is constructed with bamboo plastered with mud.  
Top and bottom ventilated mud plastered structures for hot and humid areas and modified bottom with extended roof have found promising
9. Dispose waste materials occurs during storage preparation
10. Clean tools and equipment
11. Return tools and equipment the store
12. Make record the work activities

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### 13. Make report to the supervisor



Figure 1.1. Modified storage for garlic



LAP TEST	Performance Test
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Name..... ID.....

Date.....

Time started: \_\_\_\_\_ Time finished: \_\_\_\_\_

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within **1** hour. The project is expected from each student to do it.

**Task-1 Perform the following task**

- A. Select site for modified storage preparation
- B. Check temperature and humidity
- C. Prepare modified storage for garlic



## Information Sheet 2- Cleaning, drying and aerating bulk material storage area

### 2.1. Cleaning

Cleaning the storage site or area prior to storage and processing, is to ensure that the spice is of the highest quality and will obtain the highest price. Cleaning should remove all the foreign matter that lowers the quality and endangers the sale. Raw materials also should clean by sieves, grading tables, flotation tanks and screens can all be used to ensure that the quality standards are met and an even line of high quality spice is obtained. Winnowing is carried out to remove stones, chaff, dust, broken seeds, etc. from dry spices. This may be carried out very simply using a winnowing basket and allowing the wind to blow away light material such as dust or chaff. Stones are removed by hand. Such simple methods are only suitable for very small quantities of raw material. Cleaning of leafy herbs has to be done manually and any unsound material or foreign matter removed. Small enterprises generally use electric powered winnowers which have a variable speed fan and adjustable baffles that separate stones from sound material and light material (chaff, dust). It is recommended that the weight and type of contaminants from each supplier are recorded in the raw material inspection book so that low quality suppliers may be identified.

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Figure 2.1. Cleaning storage area for spice and herbs

## 2.2. Drying and aerating bulk material storage area

Various types of dryers are used for storage site and for processing herbs and spices, ranging from simple sun drying to gas or kerosene-fired dryers. During the early stages of drying, conditions in the dryer (high humidity and moderate temperature) are ideal for the growth of micro-organisms. The quicker the drying time the better the final microbial quality of the product. Drying rates may be increased in two ways: by increasing the air flow and by increasing the air temperature. However temperatures should not be too high as they cause damage to the product. This is particularly true of herbs and spices as there is the risk of losing delicate flavors or colors. The processor therefore needs to experiment and find the best temperature for each product. Herbs and spices must be dried to a moisture content that is low enough to prevent the growth of micro-organisms such as moulds and bacteria.



Self-Check – 2	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. Write down the importance of cleaning spice and herbs raw materials and storage?(3)

### Test II say true or false (2)

1. Winnowing is carried out to remove stones, chaff, dust, broken seeds, etc. from dry spices.
2. Herbs and spices must be dried to a moisture content that is low enough to prevent the growth of micro-organisms

**Note:** Satisfactory rating - 5 points      Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_

### Information Sheet 3- Checking bulk material storages for structural safety

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### 3.1. Storage structure and facilities safety check

- ❖ Buildings and facilities should be of sound construction and maintained in good repair. All construction materials should be such that they do not transmit any undesirable substances to spice and herbs raw materials. All construction materials should be such, that when construction is completed, they do not emit toxic vapors.
- ❖ Adequate working space should be provided to allow for satisfactory performance of all operations.
- ❖ The design should be such as to permit easy and adequate cleaning and to facilitate proper supervision of food hygiene.
- ❖ The buildings and facilities should be designed to prevent the entrance and harboring of pests and the entry of environmental contaminants such as smoke, dust, etc.
- ❖ Buildings and facilities should be designed to provide separation, by partition, location or other effective means, between those operations which may cause cross-contamination.
- ❖ Buildings and facilities should be designed to facilitate hygienic operations by means of a regulated flow in the process from the arrival of the raw materials at the premises to the finished product, and should provide for appropriate temperature conditions for the process and the product.

<b>Self-Check – 3</b>	<b>Written test</b>
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. Write down the importance of structural safety check for spice and herbs ?(4)

### Test II say true or false (2)

1. Adequate working space should be provided to allow for satisfactory performance of all operations.
2. All construction materials should be such that they do not transmit any undesirable substances to spice and herbs raw materials.

**Note: Satisfactory rating - 6 points**

**Unsatisfactory - below 6 points**

You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_

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### Information Sheet 4- Preparing and erecting temporary storages to meet the need

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#### 4.1. Erecting temporary storage

The storage house/ware houses are kept erect by pressure of forced ventilation. Once erected and working satisfactory, bagged produced can be moved in and out of the buildings easily. Constant flow of air keeps the interior of consideration and moisture and structure's coated fabric provides protection from adverse environment condition.

#### 4.2. Sitting and orientation

The store should be located on a raised site with good drainage to ensure that there is no stagnant water in its store.

Set up the store with the longitudinal side on an East-West axis (less radiation on the building).

<b>Self-Check – 4</b>	<b>Written test</b>
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Name..... ID..... Date.....

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**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test 1 Short Answer Questions

1. Write down the importance of erecting spice and herbs ware houses/storage?(2)

### Test II say true or false (1)

1. Set up the store with the longitudinal side on an East-West axis (less radiation on the building).

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_



## LG #16

## LO #4- Prepare bulk material handling machinery

### Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Cleaning, drying, aerating bulk material handling machinery
- Adjusting and setting bulk material handling equipment
- Preparing bulk material handling equipment ready for use

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to:**

- Clean, dry, aerate bulk material handling machinery
- Adjust and set bulk material handling equipment
- Prepare bulk material handling equipment ready for use

### Learning Instructions:



1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.



## Information Sheet 1- Cleaning, drying, aerating bulk material handling machinery

Equipment and machineries should be cleaned and sterilized according to the manufacturer's specifications, enterprise procedures and regulations. This is used to increase the life span of equipment and machineries, avoid scarcity of equipment and machineries at critical periods. Always before storing of equipment and machineries, cleaning is a must and storage area of equipment and machineries should have ventilation.

The machinery and equipment which are used to receive bulk materials of spice and herbs should be clean, dry, and aerated. General guidelines are:- There should be periodic tightening of bolts and nuts.

- ❖ Machines should be cleaned and dislodged of remnant materials.
- ❖ Machines should be kept from environmental hazard.
- ❖ Worn-out components of the equipment should be replaced.
- ❖ Clogged straws should be removed from the screen from time to time.
- ❖ Adjustment of clearance between the cylinder and screen should be carried out periodically.

The machine or component should be cleaned. Dirty or dust between any moving parts will cause that component to wear much quicker than it would otherwise. Cleaning methods will vary with the machine or part being maintained or repaired.

- ❖ Cleaners and solvents
- ❖ Air compressors
- ❖ High pressure cleaner
- ❖ Sand blasting

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Self-Check – 1	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. List and discuss the cleaning methods of equipment and machineries?(4)

### Test II Fill the blank space(4)

1. \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ are cleaning methods.

**Note: Satisfactory rating - 7 points**

**Unsatisfactory - below 7 points**

You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_  
\_\_\_\_\_

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## Information Sheet 2- Adjusting and setting bulk material handling equipment

### 1.1. Adjusting and setting bulk material handling equipment

During storage preparation checking and setting equipment and machine used to receive spice and herb raw material to store. Technical know-how-skill personnel should be employed to operate machines and equipment so as to meet the demand of each machine and its working operations. Generally, take under consideration the following during storage preparation and receiving raw materials of spice and herbs for processing.

- ❖ Proper storage condition setting.
- ❖ sanitize all the transfer equipment
- ❖ supply sanitize all the transfer equipment
- ❖ supply quality water

Table 2.1. Adjusting, setting and checking bulk material handling equipment

Typical Equipment in Use	Setting an checks required
<b>Knives, axe, scissors and other cutting equipment during storage preparation</b>	Blades must be sharp and intact This ensures that produce is not damaged and that there is less risk of the blade slipping and injuring the operator.
<b>Electrical equipment and cables</b>	Check for loose connections and frayed cables Do not run cables over places where people walk Switches and sockets should be of a waterproof type
<b>Moving parts on machinery, e.g. cutting blades, drive belts and cogs, tanks, vats, vessels, scales and weighing</b>	Safety guards should be in place whenever the equipment is switched on



<b>system</b>	
<b>Emergency Stop button, fire extinguisher</b>	Check that this works and if not get it repaired immediately
<b>Machinery parts and alignment</b>	Check to see that there are no loose parts and the parts are aligned correctly. Metal fragments entering in the produce are a food safety hazard and uneven wear of machinery parts will shorten the effective working life of the parts concerned
<b>Storage rooms</b>	Check that the door can be opened from the inside Check ventilation
<b>PPE</b>	Check PPE is clean and intact, and the Respirator Filters are of the correct type and still active. Check application equipment is in good working order and not leaking. Calibrate as necessary.
<b>Weighing scales, thermometers and other sensing equipment</b>	Check battery life Check calibration Check proper setting
<b>Check for broken light bulbs and for signs of vermin</b>	Produce contaminated with broken glass must be removed from the food chain Vermin must be reported to the Manager



Self-Check – 2	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Short Answer Questions

1. Write down the importance adjusting and setting equipment and machineries before and after work activities?(4)

**Note:** Satisfactory rating - 4 points

Unsatisfactory - below 4 points

You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_  
\_\_\_\_\_

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## Information Sheet 3- Preparing bulk material handling equipment ready for use

### 3.1. Prepare tools and equipment

Prepare the definitive tools and equipments to receive and use spice and herbs bulk raw materials for future use of agro- processing. For guidance however, the most common requirements of bulk materials receiving, handling and using in storage operations are shown in the table below.

Table 3.1. Tools and equipment required to receive and use bulk raw material of spice and herbs

Items required	Use
Work boots and leather gloves	Routine work involving manual handling of heavy items
Gumboots, Waterproof apron and rubber Gloves	Cleaning Produce containers and work areas
Warning signs, e.g.: Slippery floor Keep out (Fumigation) Fork Lift in operation Exit route and exit door	Worker information Place in appropriate areas where the signs are easily visible Provide signage in English and local language Explain to all workers
Fire extinguisher	Storage area
Boots, Overall, rubber Gloves & Respirator	Provide in accordance with label recommendations for operation



Sit Stand Workstations	Needed Hall for workers involved in storing where there is limited opportunity to move around the work area
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<b>Self-Check – 3</b>	<b>Written test</b>
-----------------------	---------------------

Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Short Answer Questions**

1. List down equipment used to prepare storage?(2)

**Note: Satisfactory rating - 2 points**

**Unsatisfactory - below 2 points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. \_\_\_\_\_  
\_\_\_\_\_



## LG #17

## LO #5- Complete maintenance operation

### Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Recording workplace information clearly and accurately
- Collecting and disposing of or recycling waste
- Cleaning storage tools and equipment

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to:**

- Record workplace information clearly and accurately
- Collect and dispose of or recycling waste
- Clean storage tools and equipment

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.





## Information Sheet 1- Recording workplace information clearly and accurately

### 1.1. Recording and reporting storage activities

Data to be recorded include:

- Details condition of storage preparation
- Store environmental conditions  
Temperature and humidity
- Produce deterioration
- Date of entry of produce into the store: monitoring produce age
- Environmental conditions: Evidence of Due Diligence and a useful indicator of conditions that could result in produce deterioration
- Produce deterioration and losses: Indicates what changes are needed to reduce losses in the future

**Deviation from any normal or agreed situation should be reported promptly to the supervisor;** Prompt action by the supervisor may be needed to:

- Adjust marketing arrangements and keep good relations with clients or to
- Prevent further losses.

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Self-Check – 1	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Short Answer Questions**

1. List the importance of data recording?(2)
2. Which data's are record during modified storage?(1)

**Note: Satisfactory rating – 3 points      Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

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## Information Sheet 2- Collecting and disposing of or recycling waste

### 2.1 Collecting, recycling and disposing waste

The types of waste generated by post-harvest operations will depend on the type produce and the target market. The level of risk created by the waste generated will depend on the amount of waste and the situation in which the waste is generated. Each Commercial farm should identify and document the types and amounts of waste generated and develop operational procedures for disposal that will:-

- Minimize contamination of spice and herbs bulk raw materials
- Minimize the effects of the waste on the environment and
- Minimize the OHS risks to employees and the community around the produce handling and storage facility.

Table 2.1. Some typical waste operational procedures are shown in the table below

Type of Waste	Typical Operational Procedures
Damaged packaging & Damaged Crates	Minimize by careful handling and correct storage Cardboard can be burnt Plastic should be recycled where possible and otherwise buried
Waste produce and crop residue	Minimize by careful handling Remove from produce handling area promptly Reuse waste materials for compost preparation
Waste waters from produce collecting, storing, washing	Drain into a constructed wetland or on to uncropped land, not into the cropped field, the drainage system or the local river
Pesticide wastes; Containers and dip residues	Refer to guidelines and handle according to the enterprise Waste management procedures.

### 4.2. Monitoring hazardous waste disposal

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Monitoring Waste disposal practices is essential to ensure that:

- Unnecessary waste is prevented
- Produce is not contaminated
- The safety of operators is maintained
- The local community is not adversely affected
- The Environment is protected:
- Produce waste is kept to a minimum by careful handling and correct storing
- Waste is segregated to facilitate safe and correct disposal and to avoid risk to livestock feeding on the organic wastes.

**Remember** that plastic, thorns and metal staples can kill a Cow!

- Waste is removed promptly from the work area and storage house surrounds to avoid contamination of produce and attracting vermin
- Operators follow the work procedures and minimize the risk to themselves, other workers, produce and the environment of dust or chemical contamination
- Waste waters, pesticide residues and leachate from decomposing organic wastes do not enter water sources
- Workers must be careful not to mix reject produce with the produce grades for the target market.
- Each worker's work station should be kept clean and have clearly defined areas for Incoming produce, graded produce and reject produce.
- Reject produce must be removed promptly and regularly from the area used for storage.
- Workers must also be careful not to mix with contaminate reject produce, trimmings and plant trashes with other waste materials, e.g. plastics, strapping material, staples, etc. as this will make the onward disposal more difficult. After removal from the operation area, the rejected produce, produce trimmings and other organic trashes must be handled, stored and disposed in accordance with the farm/enterprise environmental procedures.

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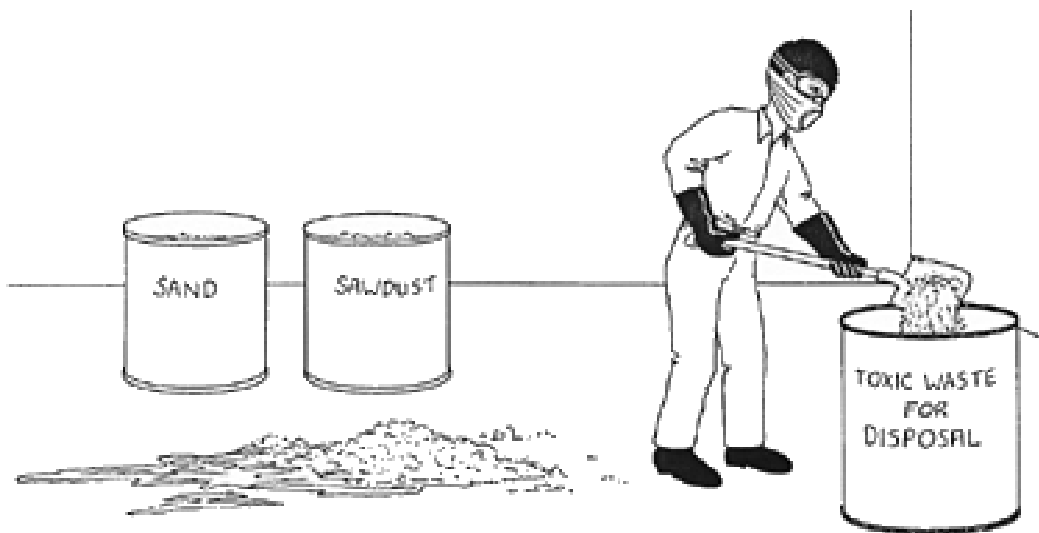


Figure 2.1. Disposing of waste and debris materials



Self-Check – 2	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. Explain the following term?(6)

- A. Storage waste disposing
- B. Waste collection
- C. Waste recycling

### Test II say true or false(2)

- 1. Operators follow the work procedures and minimize the risk to themselves, other workers, produce and the environment of dust or chemical contamination
- 2. Reject produce must be removed promptly and regularly from the area used for storage

**Note: Satisfactory rating - 7 points**

**Unsatisfactory - below 7 points**

You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

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### Information Sheet 3- Cleaning storage tools and equipment

#### 3.1. Cleaning tools and equipment

Plant sap and organic debris builds up on parts of tools and equipment that are in regular contact with produce, e.g. knives, rollers, hoppers, etc. This plant sap and organic debris will cause corrosion of metal parts, reducing the life of the equipment and the sharpness of the cutting blades. Unnecessary damage to produce occurs and the risk of injury to the operator increases when blunt tools and equipment are used. Produce may also be contaminated by the residues left on tools and equipment from previous use.

#### 3.2. Maintenance:

Maintenance of all storage house tools, equipment and machineries should be carried out in accordance with the manufacturer recommendations. When carrying out maintenance activities remember OHS.

- Turn the machine off and disconnect from the electricity before starting work
- Do not put your head and hands into moving machinery
- Replace the safety guards are cleaning
- Only work on tasks and machinery that you are authorized to work on
- Account for all tools, equipment and machinery parts on completion of the job
- Supervise external contractors to ensure that they observe the rules of the pack house.

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Self-Check – 3	Written test
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Name..... ID..... Date.....

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

### Test I Short Answer Questions

1. Explain the reason why clean tools and equipment?(3)

### Test II say true or false (2)

1. Maintenance of all storage house tools, equipment and machineries should be carried out in accordance with the manufacturer recommendations.
2. plant sap and organic debris will cause corrosion of metal parts, reducing the life of the equipment and the sharpness of the cutting blades

**Note: Satisfactory rating - 5 points**

**Unsatisfactory - below 5 points**

You can ask your teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. \_\_\_\_\_  
\_\_\_\_\_

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