



Basic Agricultural Production and Natural Resources Conservation Level-I Based on Version-3 March 2018 OS.

Training Module –Learning Guide 12-15

Unit of Competence: Support horticultural production

Module Title: Supporting horticultural production

TTLM Code: AGR BAN1 M04 TTLM 0919v1

October 2019



Unit of Competence: Support horticultural production

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This module includes the following Learning Guides

LG 12: Prepare materials, tools and equipment's for Horticultural production

LG Code:-AGR BAN1 M04 LO1 LG-12

LG 13: Undertake horticultural production work as directed

LG Code:- AGR BAN1 M04 LO2 LG-13

LG 14: Handle materials and equipment

LG Code:-AGR BAN1 M04 LO3 LG-14

LG 15: Record and document

LG Code:-AGR BAN1 M04 LO4 [M13.doc - EEL ICS3_01](#)LG-15

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Instruction sheet	Learning Guide # 12 Prepare materials, tools and equipment's for Horticultural production
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- ❖ **Prepare materials, tools and equipments for Horticultural production**
- ❖ *Identifying tools and equipment's*
- ❖ *Checking all materials tools and equipment*
- ❖ *Loading and unloading of materials*
- ❖ *Selecting and checking personal protective equipment's*
- ❖ *Providing crop work support based on OHS requirement*
- ❖ *Identifying and reporting OHS hazards*

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

⇒ **Identify required materials, tools and equipment available for horticultural production**

- ❖ *Identifying tools and equipment's*
- ❖ *Checking all materials tools and equipment*
- ❖ *Loading and unloading of materials*
- ❖ *Selecting and checking personal protective equipment's*
- ❖ *Providing crop work support based on OHS requirement*
- ❖ *Identifying and reporting OHS hazards*

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described
3. Read the information written in the information “Sheet
4. Accomplish each “Self-check respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to the next or “Operation Sheet
6. Do the “LAP test”

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Information sheet-1	Prepare materials, tools and equipments for Horticultural production
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In this level trainees are expected to work under a control or guidance of the supervisor.

Definition of horticulture: -

Horticulture can be defined as

- Garden cultivation or
- The process of cultivating, processing, and sale of fruits, vegetables, nut, ornamental plants and flowers.

Divisions of horticulture

- **Pomology;- deals with fruits**
- **Olericulture: - deals with vegetables**
- **Floriculture: -deals with flowers**
- **Landscape and nursery industry: - deals with growing different plants in landscape**

Working under supervision indicates a person is working with a limited knowledge and skill of what he/she is going to work, hence in such cases other people or person (supervisor) that have a wider knowledge and skill is involved in directing or guiding and monitoring the person to work under the standard requirement of the organization or the enterprise. Therefore a person who works following certain instruction given by a supervisor is said to work under supervision.

The term horticulture is derived from two latin words *hortus* ‘garden’ and *colere* ‘to cultivate’. Halfacre and Barden (1979) states that the first known use of the term horticulture was in 1631. Bailey (1939) observed that horticulture is concerned with production within an enclosure. Gardens are distinguished from fields by the concept of enclosure. One of the definitions of “Horticulture is the branch of agriculture concerned with intensively cultured plants used for food, for medicinal purposes or for aesthetic gratification.” Therefore if agriculture is defined as the technology of raising plants and animals, then horticulture would be that part of plant agriculture which deals with garden

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crops. Agronomy and forestry are the branches of agriculture covering field crops and forest trees respectively.

Horticulture crops often have high cash value and are intensively cultivated on relatively small areas. Thus melon can be either an agronomic or a horticultural crop. The high cash value of horticultural crops justifies a large input of capital, labour and technology per unit area of land.

Horticulture deals with a large number of plant species. Traditionally it includes fruits vegetables and ornamental plants. Even medicinal plants, beverage plants (tea, coffee), and spices are considered horticultural crops.

Horticulture is an art as well as a science. It deals with a combination of the botanical and agricultural aspects of plants. Thus, one may define horticulture as the culture and the biology of garden crops, including both the aesthetic and the scientific dimensions. Basic principles of physics, chemistry, and biology are used by horticulturists to understand and manipulate plant life. Biotechnology is now finding direct applications in horticulture.

Contribution of horticultural and floricultural crops to the total agricultural production in the country is quite significant due to highly favorable and varied agro-ecological diversities. Major Field operations for horticultural crops include ***nursery/seedling preparation, post hole digging for planting, intercultural, aeration, earthing, irrigation, plant protection, harvesting, handling, packaging transport.***

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**Self-Check 1****Written Test**

Name: _____

Date: _____

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

1. Define horticulture?
2. State the division of horticulture
3. Discuss differences of horticulture from other field of study?



Information Sheet-2

Identifying tools and equipment's

Depending on the type of fruit or vegetable, several devices are employed to harvest produce. Commonly used tools for fruit and vegetable harvesting are secateurs or knives, and hand held or pole mounted picking shears. When fruits or vegetables are difficult to catch, such as mangoes or avocados, a cushioning material is placed around the tree to prevent damage to the fruit when dropping from high trees. Harvesting bags with shoulder or waist slings can be used for fruits with firm skins, like citrus and avocados. They are easy to carry and leave both hands free. The contents of the bag are emptied through the bottom into a field container without tipping the bag. Plastic buckets are suitable containers for harvesting fruits that are easily crushed, such as tomatoes. These containers should be smooth without any sharp edges that could damage the produce. Commercial growers use bulk bins with a capacity of 250-500 kg, in which crops such as apples and cabbages are placed, and sent to large-scale packinghouses for selection, grading, and packing. Material's include

AXE

The axe is a simple hand tool, which consists of cutting edge and an eye for fixing of a handle. It is forged to shape from a single piece. Axes are available in various sizes and shapes. For operation, the operator holds the handle with both hands at convenient position and the tool is raised to suitable position and struck with force against the work. The penetration caused through impact action, which shears the slice of wood.

Uses

Axe is multipurpose **cutting tool used for felling and depluming of trees**, splitting of logs for firewood and dressing of logs for timber conversion. Small axes are also used for clearing of bushes. It is a cutting tool made from spring steel or vehicle axle

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BILLHOOK

Features

The billhook is a manually operated hand tool, which consists of a **curved blade** in hook shape and a tang to which a wooden or plastic handle is attached. The billhooks are available with single or double cutting edges. The cutting is accomplished through impact and shearing action. The blade and the tang are made from high carbon steel, manganese steel, tool steel or alloy steel and forged to shape.

Uses

The billhook is used for lopping of branches, cutting of shrubs and other hard vegetative material.

BUDDING KNIFE

Features

The budding knife is an important hand tool of a gardener, which consists of a **folding blade** and a handle. The blade has two edges. One of the edges is sharpened all along its length; whereas the blunt or the other edge is sharpened on the tip and is slightly curved.

Specifications

The budding knives are available in various sizes according to the length of the blade.

The specifications of a typical budding knife are-

Blade length (mm): 60

Blade width (mm): 15 at the budding end and 10 mm at the handle

Blade thickness (mm): 1.5 which is sharpened to the cutting edge

Uses

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The budding knife is used for the budding operation, cutting of scion stick, defoliation of leaves and removing or cutting of unwanted thin twigs of the plants.

GRAFTING KNIFE

Features

The grafting knife is another important plant propagation hand tool, which resembles a household knife. The principal parts of the knife are blade and the handle.

Defoliation of the leaves of the scion stick, making 'V' groove for grafting and making of chisel point of the scion for insertion in the 'V' groove are the functions performed with the grafting knife. The outer portion of the handle is made from horn, plastic or good quality wood and the inner portion is fitted with aluminum or brass strips and a spring steel strip for locking of the blade in working position.

Uses

For cutting and defoliation of scion stick, making of chisel point and 'V' grooves for grafting and slashing of thin twigs and for general-purpose cutting.

PRUNING AND SLASHING KNIVES

Features

Pruning is a process of removing unwanted branches or twigs of a plant or tree for providing aeration, lighting and frame work which help in obtaining higher yields. Pruning and slashing knives are hand tools, which consists of a blade and tang joined rigidly to the handle. The tip of the blade is either hooked or curved in order to cut or slash the small branches or twigs of plant or tree by pulling action.

Uses

- 👉 For cutting and slashing of thin branches and twigs of plantation crops and orchards.

MULTIPURPOSE CUTTING KNIFE

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Features

The tool is similar to bill-hook in shape and consists of blade and tang. The tang is inserted in a wooden or bamboo handle. The blade of the tool is made from old leaf spring steel or mild steel flat by forging operation.

Uses

It is used for cutting shrubs, twigs and branches of trees, clearance of jungle growth, cutting and splitting of wood and bamboos. It is also used for domestic purposes like cutting and slicing of meat, fish and vegetables.

CHOPPING KNIFE



Features

The hand tool consists of blade and handle. The blade is made from old leaf spring steel or mild steel flat section and forged to shape. The cutting end of the blade is flattened and cutting side beveled to sharp edge.

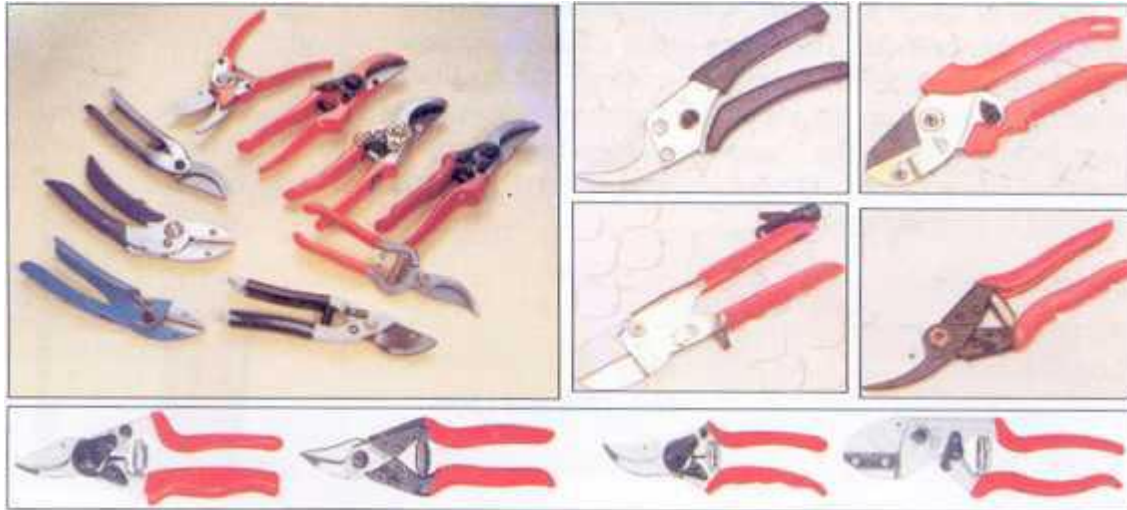
Uses

It is used for harvesting of crops, cutting of shrubs, tree branches splitting of logs, clearance of jungle growth. It is also used by meat seller for chopping meat.

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PRUNING SECATEURS



Features

The pruning secateurs consist of two cutting blades Or one cutting blade and an anvil, handle, volute spring to keep the blade and handle in open position and a locking device for keeping the secateurs in closed position.

Uses

For cutting of the unwanted branches or twigs of the orchard tree, vines, scion sticks, defoliation etc.

HEDGE SHEAR



Features

The hedge shear is manually operated hand tool for pruning, trimming and cutting of hedges and shrubs.

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Uses

The hedge shear is used for pruning and trimming of hedge and giving it desired shape. It is also used for cutting of shrubs and removing of haphazard growth in gardens and lawns.

Self-Check 2	Written Test
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Name: _____

Date: _____

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

1. Budding knife is used for digging hard pan soil.(5 pts)
2. What are the functions of grafting knife? (5 pts.)
3. Explain the use of hedge shear? (5 pts.)

Note: Satisfactory rating - 25 points

Unsatisfactory - below 25 points

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Information Sheet-3	Check all materials tools and equipment
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Checking and reporting of faulty and insufficient materials of all type is the first step

Check all the tools and equipment's before use, ask question like:-

- ✓ Are all the materials **functional and sufficient** in number?
- ✓ Are all **clean** of any contaminants?
- ✓ Check and report to your supervisor how much of the materials he provided in the list are functional and how much of them are faulty.
- ✓ Are the functional tools and equipment's sufficient enough to the horticultural crop work with the available labor power?
- ✓ After reporting the faulty and functional materials your supervisor will guide you what to do if there is insufficiency of material for that particular horticultural crop work.

To identify all materials used in horticultural crop works and separate faulty once follow the following steps

1st - use a list of materials provided by your supervisor and then classify the materials according to their purpose as materials used during land preparation, cultivation or harvesting, etc.

Your supervisor will provide you with list of materials used in horticultural crop

2nd – know the name of the materials listed in your supervisors list

3rd – Go to horticultural crop store or plant science department material store and identify all the materials physically one by one

4th – describe the use or purpose of each material

5th – check wear and tears of each material

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6th – separate a materials which doesn't have best match with handle, broken, have hole on containers, not sharp/can be easily broken, or can't function relative to the purpose of the work, or any other unspecified reasons.

7th – count the number of faulty, functional or material that can be maintained very easily.

8th – finally report to your supervisor the categories of material based on their purpose, the total number of each category, the number of faulty materials and also; and also if the functional materials are sufficient in number for the intended horticultural crop.

Self-Check 3	Written Test
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Name: _____

Date: _____

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

1. Write the steps of materials identification? (5pts)

Note: Satisfactory rating - 25 points

Unsatisfactory – below 25 points

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

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Information Sheet-4

Loading and unloading of materials

To do the horticultural crop work we need to properly prepare the working materials in a working area for this purpose materials should be transported from where they are stored to the working site. In this regard the required type and their sufficient number is already decided by the supervisor, hence these materials will be counted and will be loaded on a transporting vehicle and in the working site these materials will be unloaded.

Proper handling of the items or materials during loading and unloading

We already separated faulty materials not to be transported to working area, however while loading and unloading we should take the necessary care not to break, hole, etc. and not to make any of these materials faulty for the next time work, by properly handling materials we can prolong the time of service they can give and also minimize the cost of buying new materials in replacement to faulty ones. Therefore the care we should take during loading and unloading includes the following dos and don'ts.

- Do not throw materials from ground on to the vehicle (Can be any transporting system)
- Do not throw materials from vehicle on to ground
- Hold and place materials one by one rather than making more than one or two
- When placing materials on the vehicle place them in stable position
- Place materials on ground in stable position
- Place similar materials together on the vehicle while loading and on ground when unloading

Taking care of vehicle (Can be any transporting system) during loading and unloading

As already mentioned in the above topic, if materials will not be loaded properly, it is not only the materials that will be affected but also the vehicle as well. If we throw materials from ground on vehicle we could break the glasses of the vehicle, we might

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hurt the loading surface and lead to fast depreciation of the vehicle. We might also create a problem when unloading materials improperly.

The first principle in loading and unloading materials is hold the material properly in both hands, keeping balance and safely placing the materials on vehicles or on ground, for these purpose at least two or more people are necessary one or more on the vehicle and one or more on ground.

Self-Check 4	Written Test
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Name: _____

Date: _____

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

1.State Points that must be considered when a given weight lifted? (5pts)

2. Explain the function of proper handling of materials? (5pts)

Note: Satisfactory rating - 25 points

Unsatisfactory - below 25 points

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

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Information Sheet-5	Selecting and checking personal protective equipment's
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Definition

PPE, as defined by the Occupational Safety and Health Administration, or OSHA, is “**specialized clothing or equipment**, worn by an employee for protection against injury by blunt impacts, chemicals, infectious materials etc.”

Types of PPE Used

- ❖ **Gloves** – protect hands
- ❖ **Overall protect** skin and/or clothing



LI-105 Acid Suit

- Two piece suit with bib overall and jacket
- Elastic at wrists & ankles inset under sleeves & cuffs
- Vinyl flaps on all closures for added protection
- Snaps to secure flaps
- Green color indicates usage for hazardous material protection

In addition to style and product number, when ordering please specify:

Sizes:S, M, L, XL, XXL, XXXL
Colors: Opaque Green
Material: 8 mil PVC

- ❖ **Masks and respirators**– protect mouth/nose and respiratory tract from airborne infectious agents
- ❖ **Goggles** – protect eyes
- ❖ **Face shields** – protect face, mouth, nose, and eyes
- ❖ **Ear protectors-**
- ❖ **Steel capped boots/shoes**



LI-133 PVC High Top Bootie

- 17" high, 10-1/2" opening, 15" sole
- Economical and easy to remove
- Accommodates most shoes and boots
- Pinch seal reinforced seams
- Available in 4 mil or 8 mil PVC
- Color: Opaque yellow – others upon request
- Packaged 100 pair per case

Factors Influencing PPE Selection

When you are selecting PPE, consider three key things

- **Type of exposure anticipated-such as:-**
 - ❖ Splash/spray versus touch
 - ❖ Category of isolation precautions
- **Durability and appropriateness of the PPE for the task:-**
- **Fit:** - PPE must fit the individual user, and it is up to the employer to ensure that all PPE are available in sizes appropriate for the workforce that must be protected.

Dos and Don'ts of Glove Use

- ⌘ Work from “clean to dirty”
- ⌘ Limit opportunities for “touch contamination” - protect you, others, and the environment
- ⌘ Don't touch your face or adjust PPE with contaminated gloves
- ⌘ Don't touch environmental surfaces except as necessary

Change gloves

- ⊛ During use if torn and when heavily soiled (even during use on the same patient)
- ⊛ After use on each patient

Key Points about PPE

- ✓ Do before going to worksite
- ✓ Use carefully – don't spread contamination
- ✓ Remove and discard carefully, after finishing work

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- ✓ Immediately perform hand hygiene

Sequence for Removing PPE

- ⊗ Gloves
- ⊗ Face shield or goggles
- ⊗ Gown
- ⊗ Mask or respirator

Hand Hygiene

- ✧ Perform hand hygiene immediately after removing PPE.
- ✧ Wash hands with soap and water or use an alcohol-based hand rub

Checking suitability of personal protective equipment

Checking involves many things such as the checking in faultiness of the personal protective equipment, checking the size, and checking the sufficiency in number of the materials for the available work force. If one of these is missing based on the level of the risk that occurs the expected risk could occur. Therefore don't precede a job until the problems with the PPE will be solved. The size of PPE should be fit with your size, if the PPE is faulty it should be maintained or a new one should be provided, and if the number is not sufficient only people with the PPE should work the job.

Self-Check 5	Written Test
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Name: _____

Date: _____

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

1. State Points that must be considered when wearing PPE? (5pts)
2. State the sequence removing PPE (5pts)
3. Explain the function PPE? (5pts)

Note: Satisfactory rating - 25 points

Unsatisfactory - below 25 points

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

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Information Sheet-6	Providing OHS requirements according to workplace information
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Any work in the agricultural or horticultural industries may be dangerous in some way. It is important to know about your workplace's occupational health and safety procedures.

As an employee you have a responsibility to:

- ❖ Follow your workplace's occupational health and safety procedures
- ❖ Follow manufacturers' guidelines for machinery and equipment
- ❖ Respond to a situation where someone is put at risk of injury (as long as you do not endanger yourself)
- ❖ Report any incidents or situations which cause you or other people injury, or put you or others at risk.

Environmental issues

In agricultural and horticultural workplaces hazards including **dust, noise, chemicals, machinery and organisms can affect the health and safety of workers** and other people in the surrounding **environment**. Examples are wind-borne chemical drift, chemicals getting into water supplies and drainage and dust blowing into a neighbor's premises. Horticultural workers should recognize their duty of care to others and ensure that no harm is caused to off-target sites or downstream properties, and those that work there.

OHS RISK

Safety in the Horticultural Industry: Strategic approaches to reducing farm injury risk are multifaceted and include:

- ⤴ identifying elimination and substitution options
- ⤴ improving design and engineering solutions
- ⤴ Administrative or work practice solutions, including education and skills development
- ⤴ Identification of requirements for personal protective clothing and equipment
- ⤴ Identification of incentives for adoption of improved systems



- ▲ Ensuring compliance with regulatory requirements for supply of safe plant and equipment and safe operation in the farm workplace.

While providing the support there are possible risks that may endanger your health and safety, the dangers could be those which cause physical injury during land preparation, loading, unloading, mounting different plowing implements to tractors, etc.

In agricultural crop work support, there are jobs or activities that might harm your health and safety, hence you need to take care of those hazards by using the appropriate personal protective equipment, and by taking all the necessary care as it has been said **“prevention is better than cure”**; even sometimes the risk may not be cured letting the person to die. Great care should be taken when transferring chemicals from its main container to spraying equipment’s

Self-Check 6	Written Test
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Name: _____

Date: _____

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

1. State responsibilities’ of employees in horticultural industries? (5pts)

2. State the environmental issues conserving about horticultural production (5pts)

Note: Satisfactory rating - 25 points

Unsatisfactory - below 25 points

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

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Information Sheet-7

Identifying and reporting OHS hazards

Definition: Occupational health and safety is concerned with health and safety in its relation to work the working environment.

Aims of occupational health

Occupational health should aim at:-

1. The ***promotion and maintenance*** of the highest degree of physical, mental and social well being of workers in all occupation
2. The ***prevention amongst*** workers of departures from health caused by their working conditions.
3. The ***protection of workers in their employment*** from risks resulting from factors adverse to health.
4. The ***placing and maintenance of*** workers in an occupational environment adapted to his physiological and psychological capabilities and
5. To ***summarize the adaptation of worker*** to man and of each man to his job.

✓ Hazards

These may be introduced into fresh fruit and vegetable products at numerous points in the production chain as a result ***of bad agricultural practices.***

Hazards associated with production flow that could be harmful to the consumer

There are three main types of hazards associated with fresh produce:

- ▲ Biological
- ▲ Chemical
- ▲ Physical

Biological hazards

- ***Food-borne micro-organisms***, such as bacteria, viruses and parasites, are often referred to as biological hazards. Some ***fungi*** are able to produce toxins and also are included in this group of hazards.

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- **Micro-organisms** able to cause human **disease** may be found on raw produce. Sometimes they are part of the **fruit** or **vegetable micro flora** as incidental contaminants from the soil, dust and surroundings. In other instances they get introduced onto the produce through **poor production** and **handling practices**, such as the use of untreated manure, the use of contaminated irrigation water or unsanitary handling practices.
- **Pathogenic bacteria**

Microbiological Risks Reason for occurrence

- ⤴ Slurry spread
- ⤴ Pathogens present (or numbers too high)
- ⤴ Contamination from livestock and human sewage
- ⤴ Water, Salmonella, Poor quality control at harvest
- ⤴ Inadequate pre-harvest container and equipment cleaning
- ⤴ Harmful and domestic animals
- ⤴ Inadequate temperature control during storage
- ⤴ Decaying matter, Poor stock management
- ⤴ Parasitism,
- ⤴ Poor waste management

Chemical hazards

- Chemical contaminants in raw fruits and vegetables may be naturally occurring or may be added during **agricultural production**, **post-harvest handling** and other unit operations. Harmful chemicals at **high levels** have been associated with **acute toxic** responses and with chronic illnesses.
- Examples of chemical hazards:
 - ⤴ Pesticides
 - ⤴ Fertilizers
 - ⤴ Antibiotics
 - ⤴ Heavy metals
 - ⤴ Oils and grease

Chemical hazards Risks Reason for occurrence

- ⊗ Residues of non-approved pesticides

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- ⊗ Wrong pesticide selection
- ⊗ Incorrect dosage/concentration
- ⊗ Harvest interval not observed
- ⊗ Poor calibration of sprayer
- ⊗ Sprayer drift
- ⊗ Inadequate cleaning between uses
- ⊗ Contamination of produce due to pesticide storage conditions
- ⊗ Spillage of pesticides on produce
- ⊗ Use of contaminated water to mix spray
- ⊗ Oils, grease and fuel contamination
- ⊗ Inappropriate use of produce containers to store pesticides, fertilizers or oil
- ⊗ Lack of inspection and servicing equipment
- ⊗ Heavy metals

Physical hazards: foreign bodies

- Examples of **physical hazards** include:
- ⌘ Residual soil and stones found on fruits and vegetable;
 - ⌘ Packaging remaining from harvesting (wood, metal, etc.);
 - ⌘ Packing materials and storage facilities, e.g. packaging plastics and cardboard;
 - ⌘ Foreign matter collected during harvesting;
 - ⌘ Glass and sharp objects;
 - ⌘ Personal effects: jewels, hair, pens

Physical hazards Risk Reason for occurrence

- ✱ Soil Presence in finished products
- ✱ Machinery
- ✱ Dirty packaging materials
- ✱ Inadequate inspection of field equipment and packing facilities
- ✱ Inadequate maintenance of containers and machinery
- ✱ Discarded rubbish, e.g. bottles, cigarette butts
- ✱ Inadequate cleaning schedule
- ✱ End product contains: jewelers and pieces of clothing

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- ✿ Staff untrained in personal hygiene
- ✿ Inappropriate working clothes

Ergonomic hazards

Ergonomic (human engineering) is a way of thinking and planning work so that it is organized to suit the abilities and needs of the people doing it.

Despite progress in technology, there is still a lot to be done before machinery and equipment are designed for use by people. as a result of poor design ,for example , people often suffer from lower back pain and injury to muscles and joints .visual problems are increasing with the wide spread use of various display units and inspection work .

Self-Check 7	Written Test
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Name: _____

Date: _____

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

1. Define occupational health and safety?
2. State aims of occupational health and safety?
3. State work place hazards?
4. Discuss chemical hazards briefly?

Note: Satisfactory rating - 30points Unsatisfactory - below 30 points

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

Operation sheet 1

Loading and unloading materials

Objective

- ✓ To take care for materials
- ✓ To avoid hazards

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Materials required

- Vehicle or any transporting system
- Personal protective equipments
- Hand cart

Before loading and unloading your materials you will be provided with agricultural crop work materials in the store, vehicle on which to load materials and suitable personal protective equipments.

Procedures

- ⌘ First go to the store and check that the different agricultural crop work materials are already there the vehicle provided and you are also ready to load materials by wearing the suitable personal protective equipments
- ⌘ Then group yourself in pair of two person or more persons
- ⌘ Open the back or the side of the carriage for easy loading if necessary, for loading the materials you should take care of the vehicles glasses or the vehicle could be carriage and a tractor.
- ⌘ Let one person or one group be on the vehicle and the other group on ground
- ⌘ Let the group on ground take materials from store and give it for his counterpart on the vehicle, note material should be taken one by one, or if suitable two by two or more if suitable
- ⌘ Let the group or person on the vehicle receive the material from the person on the ground and place it on the vehicle. Note the materials should be placed orderly and safely, by note throwing the materials on the vehicle.
- ⌘ Finally close the back side of the carriage and move to the site of agricultural crop work or unload the materials
- ⌘ Use the same procedure above for unloading

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Instruction sheet	Learning Guide 13; Undertake horticultural crop work as directed
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

Undertake horticultural crop work as directed

Carrying out & checking all materials, tools & equipment

- ❖ *Identifying instruction*
- ❖ *Undertaking Cropping work in a safe and environmentally appropriate manner*
- ❖ *Carrying out Interactions with other staff and customers*
- ❖ *Reporting problems or difficulties in completing work*

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

⇒ **Conduct checking on all materials, tools and equipment with faulty items reported to supervisors**

- ❖ *Identifying instruction*
- ❖ *Undertaking Cropping work in a safe and environmentally appropriate manner*
- ❖ *Carrying out Interactions with other staff and customers*
- ❖ *Reporting problems or difficulties in completing work*

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described
3. Read the information written in the information “Sheet
4. Accomplish each “Self-check respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to the next or “Operation Sheet
6. Do the “LAP test

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Information Sheet-1	Undertake horticultural crop work as directed
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Identifying instruction

You will be given instructions and directions by supervisor and clarification sought when necessary. Your supervisor will provide the necessary information about **land preparation, planting, managing, picking, packing, loading and transporting techniques and storing**. Your supervisor will also provide the necessary personal protective clothes help you to practice your work in safe manner. Safe work manner can be defined as practicing the without causing injury to the person, environment and yourself.

Agricultural works should be conducted on appropriate instructions and direction. In agricultural crop work there are a serious of steps that must followed by the workers .The farmers must conduct that steps in order to get a good result. The steps include:

- 1. Site selection**
- 2. Land preparation**
- 3. Seed sowing**
- 4. Harvesting**

Self-Check 1	Written Test
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Name: _____ Date: _____

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

- 1. Explain the purpose of instruction and direction of horticultural crop production? (5pts)
- 2. State the steps of conducting horticultural crops? (5pts)

Note: Satisfactory rating - 25points Unsatisfactory - below 25 points

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



Information Sheet-2	Undertaking Cropping work in a safe and environmentally appropriate manner
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Good agricultural practice(GAP) related to soil fertility improvement include maintaining and improving organic matter, appropriate crop rotation, manure application, rational mechanical and conservation tillage, maintaining soil cover, minimizing soil erosion losses by wind and water, and application of organic and inorganic fertilizers in amount and timing, and by methods appropriate to agronomic, environment and human health requirements.

Maintaining soil organic matter through mulching

- ◆ Higher organic matter in the soil creates porous soil and improves the aerations.
- ◆ Organic matter improves soil moisture.
- ◆ Soil organic matter acts as buffer against adverse environmental effects such as higher temperature and drought.

Crop rotation

- Planting crops with different requirements in rotation, such as leguminous and cereals, also intercropping deep-rooted crops with shallow-rooted ones.

Aerate the soil

- Aeration – by ***double digging, adequate ground cover and mulching*** – provides both soil micro-organisms and plant roots with much-needed oxygen to breathe.

Provide drainage

- Too much water can cause serious damage to the soil and plants; by applying mulching, adding humus to the soil and ridging can help prevent water logging.

Protect the land from soil erosion and degradation

Practices that can help to protect against soil erosion and minimize the loss of topsoil are strongly encouraged such as:

- Terracing
- Conservation tillage
- Planting bunch grasses

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- Planting tree hedges and shelter belts
- Planting perennial crops such as fruit trees with cover crops.

Application of compost, manure and inorganic fertilizer in a correct amounts and timing and by methods that are appropriate to agronomic and environmental requirements

Fertilizer

Categories of fertilizers

Depending on the **source of materials**, fertilizers can be divided into two categories:

- ❖ Organic fertilizer
- ❖ Inorganic fertilizer

Organic fertilizers

Raw materials used for the production of organic fertilizers include:

- Animal manure
- Post-harvest material
- Organic waste

Composting

To convert organic waste into safe fertilizers (compost), practices should be followed to reduce the presence of pathogenic bacteria. Composting is **a natural, biological process** by which **organic material is broken down and decomposed**. The heat produced by the micro-organisms during the composting process not only contributes to their own growth, but also speeds up the decomposition process and helps in killing pathogenic micro-organisms.

Human and animal waste materials are important sources of microbiological contamination of produce.

Hazards associated with animal manure

When animal manure is used for fertilizers without proper treatment, there is danger of contamination of fruits and vegetables with pathogenic bacteria.

GAP in the management of Organic fertilizers

It is necessary to follow certain practices when manufacturing Organic fertilizers, during their application and during harvest. These include:

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- ➔ The location for storage and treatment of animal manure should be **away from production areas**.
- ➔ Barriers or some type of physical containment should be used as part of the manure storage areas
- ➔ Contamination of groundwater supplies can be minimized if animal manure is stored on a cement floor or in special holes lined with clay.
- ➔ Manure piles should be covered with plastic or other materials and/or stored under a shed
- ➔ The minimum distance from the manure storage facility to the production field depends on many factors, such as
 - ✧ The configuration of the plantation fields,
 - ✧ Land slope,
 - ✧ Existing barriers to entrap water and
 - ✧ The possibility of bacterial spread by wind or rain.
- ➔ Treated manure should be **kept covered** and away from waste and garbage to prevent recontamination by birds or rodents.

Key questions on fertilizer use

⌘ What type of chemical fertilizer is appropriate for use?

- Only reputable suppliers should be used.
- Chemical fertilizer composition should match the actual requirements of the crop based on soil analysis.

⌘ What quantity of fertilizer should be applied?

- A soil balance sheet approach should be used, based on requirements of the crop, past cropping history and current nutrient status of the soil – check soil analysis records.

⌘ How should fertilizers be applied?

- ✳ Smallholders can apply fertilizers **by hand** close to the take-up point of the roots.
- ✳ Fertilizers should be worked into the soil to avoid leaching or runoff.
- ✳ Large single doses should be avoided, as uptake is generally improved and leaching reduced when smaller doses are applied at intervals.

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- ☛ Wear groves during the application of fertilizers and remember to wash hands after application.

⌘ **When should fertilizers be applied?**

- 📖 **Basal dressings**, where required, should be applied at seed bed preparation time.
- 📖 Top dressings should be applied only when the plant can take them up.
- 📖 Fertilizers should not be applied during periods of heavy rain, water logging or unusual climatic conditions when the dangers of leaching or other barriers to immediate take-up are high.

Self-Check 2	Written Test
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Name: _____

Date: _____

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

1. Explain the purpose of organic matters? (5pts)
2. State the types of fertilizers? (5pts)
3. Write the raw materials used for organic fertilizers preparation? (5pts)

Note: Satisfactory rating - 25points Unsatisfactory - below 25 points

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



Information Sheet-3

Carryout a positive and supportive Interactions with other staff, farmers and customers

The interaction between the farmers, customers and staff members should be carried out in a positive manner. Reporting is informing all information related to the work to a person who concerns about. It helps to the supervisor and other concerned persons' to know the standard of the work and at what level the work activities are found and also help to supply solution by concerned people if problems are there.

There are a number of **problems occurred during crop work**, of which some of them are as follows:

- ✿ Faultiness of the tools and equipments
- ✿ Lack of materials for maintaining tools and equipments
- ✿ Lack of personal protective closes
- ✿ Unsuitability of personal protective closes
- ✿ Lack of materials, tools and equipments during the work
- ✿ Lack of agricultural inputs,
- ✿ Loss of tools and equipments during the work
- ✿ Damage to the vehicle etc

The problems occurred during undertaking crop work should be reported to the supervisor so that there will be solution for the coming work cycle.

Self-Check 3

Written Test

Name: _____

Date: _____

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

1. There are a number of problems occurred during crop work? (5 PTS)

Note: Satisfactory rating – 20 points

Unsatisfactory - below 20 points

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



Information Sheet-4

observing and applying workplace policy and procedures in relation to workplace practices

Agriculture is one of the riskiest occupations for human health and safety. People are always exposed to health risks and injuries because agricultural practices involve tools and equipment's that may cut and create wounds and injure body and harmful chemicals such as pesticides.

- Occupational health and safety is a discipline with a broad scope involving many specialized fields. In its broadest sense, it should aim at:
 - the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;
 - The prevention among workers of adverse effects on health caused by their working conditions;
 - The protection of workers in their employment from risks resulting from factors adverse to health;
 - The placing and maintenance of workers in an occupational environment adapted to physical and mental needs;
 - The adaptation of work to humans.

In other words, occupational health and safety encompasses the **social, mental and physical well-being of workers**, that is the “whole person”.

Self-Check 4	Written Test
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Name: _____

Date: _____

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

1. List the aim of OHS? (5 pts.)

Note: Satisfactory rating – 20 points Unsatisfactory - below 20 points

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

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Information Sheet-5	maintain work site clean and safe
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Identification of work plays are a central role in people's lives, since most workers spend at least eight hours a day in the workplace, whether it is on a plantation, in an office, factory, etc. Therefore, work environments should be safe and healthy. Yet this is not the case for many workers. Every day workers all over the world are faced with a multitude of health hazards, such as:

- dusts;
- gases;
- bad smell
- smoke
- noise;
- vibration;
- extreme temperatures.

Work-related accidents or diseases are very costly and can have many serious direct and indirect effects on the lives of workers and their families. For workers some of the direct costs of an injury or illness are:

- The pain and suffering of the injury or illness;
- The loss of income;
- The possible loss of a job;
- Health-care costs.

It has been estimated that the indirect costs of an accident or illness can be four to ten times greater than the direct costs, or even more. An occupational illness or accident can have so many indirect costs to workers that it is often difficult to measure them. One of the most obvious indirect costs is the human suffering caused to workers' families, which cannot be compensated with money.

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Self-Check 5	Written Test
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Name: _____

Date: _____

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

1. What are the magnitudes of work place hazards? (5 pts)
2. List some direct costs of an injury or illness of workers? (5 pts.)

Note: Satisfactory rating – 20 points Unsatisfactory - below 20 points

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

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Instruction sheet	Learning Guide 14 Handle materials and equipment
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

Handle materials and equipment

- Correcting manual handling
 - ❖ *Storing waste material produced during cropping work*
 - ❖ *Handling and transporting materials, equipment and machinery*
 - ❖ *Cleaning materials after completion of work*

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

⇒ **Identify correct manual handling for each materials, equipment and tools**

- ❖ *Storing waste material produced during cropping work*
- ❖ *Handling and transporting materials, equipment and machinery*
- ❖ *Cleaning materials after completion of work*

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described
3. Read the information written in the information “Sheet
4. Accomplish each “Self-check respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to the next or “Operation Sheet
6. Do the “LAP test

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Information Sheet-1	Storing <i>Waste material</i> in a designated area
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Materials should be handled in a safe manner and disposed properly after and before work.

It should be:-

- ◆ Stored
- ◆ Transported and
- ◆ Cleaned

Horticultural works create much kind of wastes, among those wastes crop residues and waste pesticides and chemicals take the leading part. Crop residues have good advantage if we properly manage them where as waste pesticides and chemicals have Hazardous effect on environment and animals.

Crop residue

Crop residue is defined as the vegetative crop material left on a field after a crop is harvested, pruned or processed. As much as possible farmers are encouraged to work crop residues back into the soil or compost them for use as a soil amendment. Recycling crop residues helps prevent erosion and preserve or improve soil quality.

Advantage of crop residue

A) Maintenance of soil organic matter

Maintenance of soil organic a matter is important to nutrient supply and to soil physical properties that are critical to soil tilth, water infiltration and water holding capacity. Soil organic matter is maintained by decomposition of plant bio mass returned to the soil. Both above ground and below ground plant parts (shots, roots and root exudates)

B) Control water erosion and runoff

The value of maintaining ground cover to reduce water erosion and slow runoff is well known. Crop residue or a cover crop can provide the needed soil protection.

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C) Control Wind erosion

Wind erosion is best controlled with ground cover of crop residue or a cover crop. Wind erosion often exceeds water erosion, especially during periods of extended drought. In addition, blowing soil particles can damage young plants and reduce air quality, affect human and animal health and cause traffic accidents due to reduce visibility.

D) Soil water

Crop residue affects soil water by reducing evaporation, reducing runoff and enhancing infiltration.

Hazardous/ waste pesticides

Special waste is waste which has hazardous properties and is subject to additional controls to protect the environment and human health. Examples of special waste include: waste pesticides and chemicals which have hazardous properties; waste oils from farm machinery.

Self-Check 1	Written Test
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Name: _____

Date: _____

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

1. State the advantage of crop residue?(5 pts)

Note: Satisfactory rating – 25 points Unsatisfactory - below 25 points

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

Information Sheet-2	Check tools, equipment and machinery and prepared for transporting/storage
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Transporting: - is taking of material, tools, equipments and machinery from place of storage to place of work and visversa.

Transporting can be

- Traditional method like **push carts, animal drawn carts, on animals and persons.**
- Modern method like Lorries, tractors etc.

Before transporting of materials, tools, equipments and machineries, it is important to check whether they are functional or not. Materials, tools, equipments and machineries should be transported to the site of work timely and properly. Transporting activity should take place according to the instruction of your supervisor.

Materials handling in agriculture is concerned with the movement and handling of materials and products in a systematic manner from point of origin to destination. Movement may be in any direction--horizontal, vertical or any combination of the two. Handling of agricultural materials and products is important, not only because of the **work involved, but because of its effect on costs, product quality and management.** Materials handling costs account for as much as 25 percent or more of the total production cost for certain agricultural crops. These costs can be lowered with efficient materials handling systems in which the components are integrated to provide a smooth flow of materials.

The tools, equipments, and materials should be **returned to store on completion of the work** after they have been cleaned and checked. Any dirt (soil, and other) adhering with the tools and equipments should removed before storage. Similar tools should be stored separately without mixing with other tools which help you to identify easily. During performing work, some tools, equipments and materials can be broken, detached the handle from the main part, so such damaged tools should be maintained if the problem is simple. The broken tools should be identified and store alone until maintained. When materials are broken highly and not be maintained by other experts, they should be disposed of according to supervisor's instruction.

Self-Check 2	Written Test
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Name: _____

Date: _____

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

1. State the transportation of materials? (5 pts)

Note: Satisfactory rating – 20 points and above points

Unsatisfactory - below 20

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

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Information Sheet-3	cleaning and storing materials, equipment and machinery
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A clean and organized work area is essential to any agricultural mechanics project. Knowing where to find tools, supplies and materials will save time and useful in maintaining the proper inventory of tools and materials. A work place area that is cluttered and disorganized will not only be unsafe, but will hinder the proper maintenance of tools and equipment. A disciplined approach to daily cleaning and organizing will save time and effort in the long run and help ensure that accidents are prevented.

Starting the gardening season off right requires a thorough check of your garden equipment. Ideally it should be ***cleaned and evaluated after each use*** but we all know that doesn't always happen. Rust, broken parts and dull blades are an inevitable part of using these helpful implements.

Lay a large tarp out in an open area and bring everything out where you can see it. Wash all the gardening tools completely and allow them to air dry before proceeding with the next step.

You will need the proper equipment to manage your garden tool collection. Keep on hand rags, machine oil, small spare parts and extension cords or battery chargers as necessary.

Once cleaned every tool should be sharpened. There are special sharpening items available for the purpose or you can use an all purpose file. Sharpen blades but also any digging implements. Shovel blades may be sharpened to increase the ease in which they plough through even hard pan clay. Sharpen at a 45 degree angle by running the file across the edge two or three times.

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Self-Check 3	Written Test
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Name: _____

Date: _____

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

1. What is the advantage of cleaning and storing tools? (5 pts.)

Note: Satisfactory rating – 20 points and above
points

Unsatisfactory - below 20

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

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Instruction sheet	Learning Guide 15 Record and document
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

➤ **Record and document**

- ✓ Report problems or difficulties in completing work
- ✓ Recording and reporting Materials, equipment and machinery condition after work
- ✓ Reporting work outcomes

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

➤ **Record and document**

- ✓ Report problems or difficulties in completing work
- ✓ Recording and reporting Materials, equipment and machinery condition after work
- ✓ Reporting work outcomes

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described
3. Read the information written in the information “Sheet
4. Accomplish each “Self-check respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to the next or “Operation Sheet
6. Do the “LAP test

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Information Sheet-1	report problems or difficulties in completing work
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Many hand tools for the horticulture production come with wooden handles which need special care **to prevent splitting and breaking**. At least twice a season sand them with a medium grit sandpaper and then rub in linseed oil to create a protective barrier. Wood handled tools need to be stored indoors and dried before storage.

If a handle fails or breaks, replacements can usually be found in hardware or garden stores. Generally it is simply a matter of removing the old screws and installing the new handle with fresh hardware.

How to clean and Store horticultural Tools



Clean and Store Gardening Tools for the Winter

Putting **horticultural** tools away properly for the winter can add years to the life of your equipment. Your tools will be **protected from rust and wear**, and better yet, they'll be ready to go the moment spring fever hits on that first balmy day next year.

Things you'll need

- ⌘ Penetrating Oil
- ⌘ Work Gloves
- ⌘ Paste Wax
- ⌘ Red Paint

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- ⌘ Steel Wool Pads
- ⌘ Wire Brushes
- ⌘ Large Bucket
- ⌘ Metal Files
- ⌘ Sand

Tips & Warnings

- Protect wooden handles and make tools easier to find by giving them a coat of red paint before putting them away for the winter.
- Never leave **horticultural hoses** outside over the winter, as this dramatically increases their chances of springing leaks. Instead, drain the hoses at the end of the season and hang them in a garage or other protected spot until spring.

Cleaning is the removal of dirt and organic substances from surfaces of tools and equipments. Through the cleaning procedures, high numbers of microorganisms (90% and more) present on the mentioned objects will be removed. However, many microorganisms stick very firmly to surfaces, in particular in tiny almost invisible layers of organic materials and will not entirely be removed even by profound cleaning but persist and continue multiplying.

Inactivation of those microorganisms requires **antimicrobial treatments**, carried out through **hot water or steam or through the application of disinfectants**. **Disinfectants** are chemical substances, which kill microorganisms but should not affect human health through hazardous residues and not cause corrosion of equipment.

The first step in equipment cleaning is **to physically remove scrap**, i.e. coarse solid particles, with a dry brush or broom and shovel. This is usually referred to as “**dry Cleaning**”. Using large amounts of water to remove this material would be extremely wasteful and eventually cause drains to clog and waste water treatment facilities to become overloaded.

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More profound clean-up procedures require water in sufficient quantities. **Manual Cleaning** using brushes or scrapers is widely applied in small-scale operations although labor and time-intensive.

Self-Check 1	Written Test
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Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given a calculator, lot data computation sheet, coordinates of the corner of the lot, you are required to perform the following tasks –

1. What is the importance of cleaning materials before returning them? (3 point)
2. State positive indicators properly cleaned materials? (5pts)

Note: Satisfactory rating – 25 points and above Unsatisfactory - below 25 points

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

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Information Sheet-2	recording and reporting Materials, equipment and machinery condition after work
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Consistent **horticultural** tool care is more effective when the equipment is stored in favorable conditions. Garden tools should be stored indoors where possible, in a clean dry environment. They should be stored upright or hanging where air can circulate freely.

You should invest in good waterproof covers for items that must be stored outdoors due to lack of storage, such as lawnmowers.

Caring for garden tools can be money and time saving chore when done on a biannual schedule.

Tools and equipment should be stored and disposed according to the manufacturer's specifications, enterprise procedures and regulations. This is used to increase life span of tools and equipments and avoids scarcity of tools and equipments at critical periods.

After completion of all field establishment activities all containers, leftover fluids, waste and debris should be disposed safely and appropriately. Waste materials which may be toxic to human beings or pollutants environmental conditions should be properly disposed to minimize hazards.



Self-Check 2	Written Test
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Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given a calculator, lot data computation sheet, coordinates of the corner of the lot, you are required to perform the following tasks –

1. Write harmful effects waste materials? (5pts)

Note: Satisfactory rating – 25 points and above Unsatisfactory - below 25 points

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

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Information Sheet-3	Reporting work outcomes
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On completion of crop work out comes like **productivity, production, strengths of production, weaknesses of production, and problems of production should be reported** to you supervisor according to instructions and formats given from the supervisor. The work outcomes can vary depending on objective; it can be fruit, seeds, leafy parts, stem parts, flowers, lawns, etc. Reporting work out come helps you to get feedback by your supervisor so that you can leave your weakness and encourage your strength. It also helps the supervisor to get full information about the production. The reporting format may vary but it can be as follows:

S. No.	Work outcomes	Productivity (kg/quintal)	Production (kg/quintal)	Problems

Self-Check 3	Written Test
---------------------	---------------------

Name: _____

Date: _____

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

1. What is the need of reporting work outcomes? (4 points)
2. What are the possible work outcomes of agricultural crop work? (3 points)

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Note: Satisfactory rating – 25 points Unsatisfactory - below 25 points

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

Operation sheet 2.

Cleaning and storing materials

Objectives

- To clean materials
- To reuse materials
- To reduce rust

Materials required

- ❖ Penetrating Oil
- ❖ Work Gloves
- ❖ Paste Wax
- ❖ Red Paint
- ❖ Steel Wool Pads
- ❖ Wire Brushes
- ❖ Large Bucket
- ❖ Metal Files
- ❖ Sand

Procedures

- ⌘ Scrape off any excess mud or dirt. Use a stick to knock off large pieces and a wire brush for tougher spots. If the soil is really caked on, you may need to let the tool soak in a bucket of water for a few minutes before tackling it again.
- ⌘ Wipe off the tool with an old rag and let it dry thoroughly.
- ⌘ Remove any rust by rubbing it vigorously with a small piece of steel wool. (Be sure to wear gloves.)

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- ⌘ Sharpen the tool, if it has a sharp portion (this includes spades), with a file made especially for sharpening tools. Hold the tool steady against a solid object, such as a tool bench, and draw the file repeatedly across the edge at a 45-degree angle
- ⌘ Condition wooden handles by sanding any rough or splintery portions with sandpaper. Follow up by rubbing paste wax over the handle.
- ⌘ Spray metal parts with a penetrating lubricating oil to protect from rust.
- ⌘ Store in a dry spot. Avoid leaving tools on the floors of garages or other places likely to get damp during the winter.

LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

1. You are required to perform any of the following:

- 1.1 Cleaning and storing materials
- 1.2 loading and unloading materials



List of Reference Materials

- ⌘ An introduction to horticultural crop production. Available on: <https://www.countyofsb.org/ceo/asset>.
- ⌘ FAO (1984). Guide to establishing small packing stations for fruit and vegetables in rural areas. FAO, Rome.
- ⌘ ITC. (1988). Manual on the packaging of fresh fruits and vegetables. International Trade Centre, UNCT AD/GATT, Geneva.
- ⌘ Kader, A. (1985). Post-harvest technology of horticultural crops. Cooperative extension, University of California
- ⌘ Ingram, J. S., and J. R. O. Humphries, Cassava storagea review, *Trop. Sci.* 14:131 (1972).
- ⌘ Scherry, R. W., Manioc: A tropical stuff of life, *Econ. Bot.* 1:20 (1947).
- ⌘ Ghosh, S. P., T. Ramnujam, J. S. Tos, S. N. Moorthy, and R. G. Nair, *Tuber Crops*, Oxford and IBH Publishing Co., New Delhi, 1988, p. 87.
- ⌘ .Roca, W. M., A. Rodriguez, L. F. Pitena, R. C. Barbara, and J. C. Toto, Improvement of propagation techniques for cassava using single leaf cutting: preliminary report, *Cassava Newsletter* 8:4 (1980).
- ⌘ Abraham, T. E., K. C. M. Raja, V. P. Sreedharan, and H. S. Nathan, Some quality aspects of a few varieties of cassava, *J. Food Sci. Techno.* 16:237 (1979).
- ⌘ .Salunkhe, D. K., and B. B. Desai, Cassava, in *Postharvest Biotechnology of Vegetables*, Vol. II, CRC Press,
- ⌘ .Material identification for horticultural crops <https://www.youtube.com>
- ⌘ . Botanga, M., Biotechnology and cassava processing in Africa, *Food Technol.* 49(1):86 (1995).
- ⌘ Booth, R. H., Storage of fresh cassava (*Manihot esculenta*) II. Simple Storage technique, *Exp. Agric.* 13:119 (1977).
- ⌘ Horticultural crop material's transportation. <https://www.youtube.com> accessed 23/09/19

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