Horticultural Crops Production

Level I

Learning Guide-29

Unit of Competence: - Apply Principles of Organic Production

Module Title: - Applying principles of organic Production

LG Code: AGR HCP1 M08 1219 Lo1-LG-29

TTLM Code: AGR HCP1 TTLM1 219v1

LO1. Prepare materials, tools and equipment for organic production work

Instruction Sheet	Learning Guide 29

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

- Identifying materials, tools and equipment's
- Conducting checks and reports on all materials, tools and equipment
- Demonstrating techniques of loading and unloading
- Selecting and checking personal protective clothing and equipment
- Identifying and reporting occupational health and safety

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

- Identify materials, tools and equipment according to supervisor instructions.
- Conduct and checks for serviceability on all materials, tools and equipment and insufficient or faulty items are reported to supervisor.
- Use techniques when loading and unloading materials demonstrate correct manual handling techniques and minimize damage to self, load and vehicle.
- Select and check suitable personal protective clothing and equipment prior to use.
- Identify and report occupational health and safety (OHS) hazards to supervisor.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3, Sheet 4 and sheet 5".
4. Accomplish the "Self-check 1, Self-check t 2, Self-check 3 and Self-check 4" in page -6, 9, 12 and 14 respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 " in page -20,21, and 22 respectively. .
6. Do the "LAP test" in page – 23 (if you are ready).

Information Sheet-1	**Identifying materials, tools and equipment's**

1.1 Introduction

Organic production is a holistic production management system which promotes and enhances agro-ecosystem health including biodiversity, biological cycles and soil biological activity and this is accomplished by using on farm agronomic, biological and mechanical methods in exclusion of all synthetic off farm inputs. It emphasizes the use of management practices in preference to the use of off farm inputs, taking into account that regional conditions require locally adapted systems. Organic farming refers to the way of agricultural products (food and fiber) are grown and processed. It excludes the use of chemical fertilizers and pesticides, plant growth regulators, and livestock feed additives. Genetically modified organisms (GMOs) are not allowed in organic farming. As far as possible, organic farmers depend on crop rotation, green manures, compost, mulching, biological pest control and mechanical cultivation to maintain productive soil and control pests.

1.2. Indentifying materials, tools and equipments

Tools and equipments for organic production include the followings and you need to know these tools and equipments by their name and should identify those tools and equipments physically. Every production area of organic production should have sufficient supply of tools and equipments for different operations. Tools and equipment required for organic production work may include:

- Bins , buckets and boxes
- Forks and hoes
- Hoses and hose fittings
- Knives and secateurs
- Pick mattock
- Digging forks/garden forks,
- Matches or cutlass
- sickle and water can
- Tape meter String ,
- rope and Peg
- Wheel barrow
- Ladder
- packing equipment
- Spades.

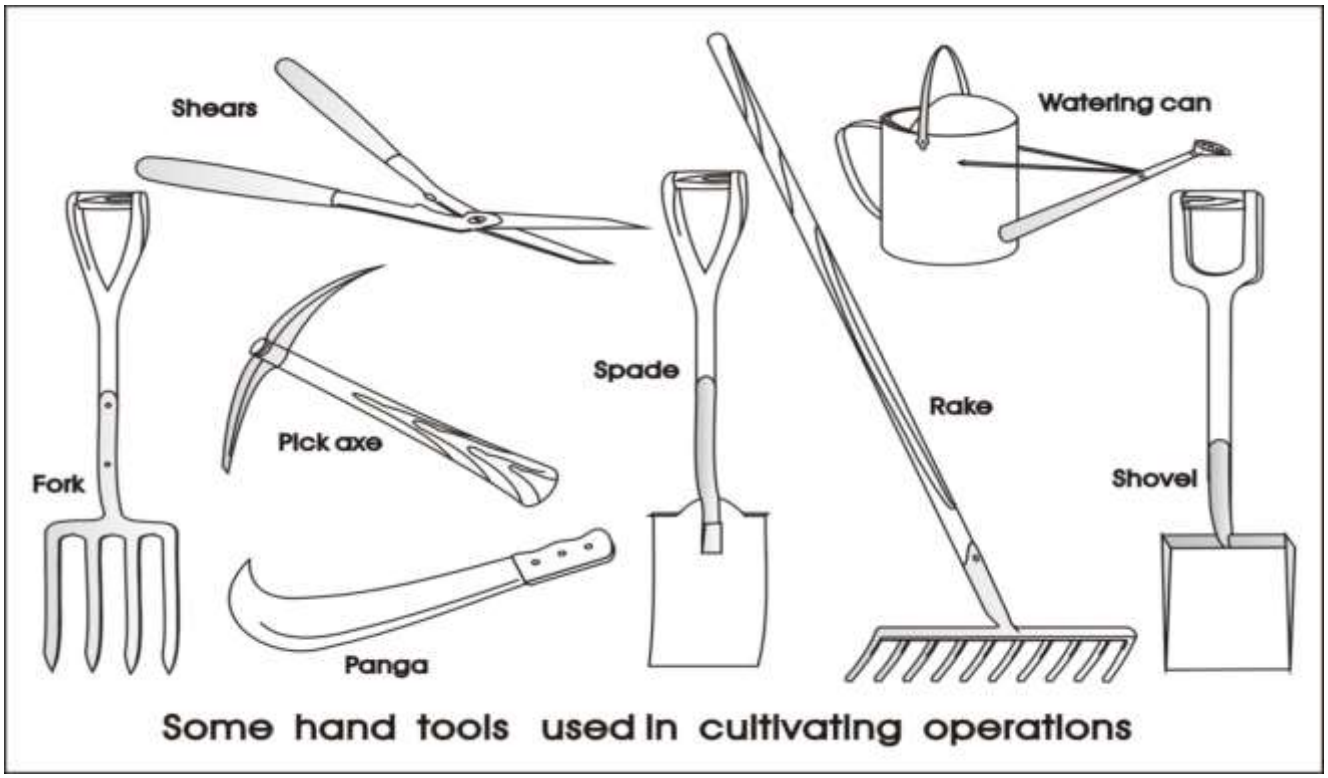

Figure 1: Tools and equipments which are used for organic production work

1.3. Handling techniques of materials, tools and equipments

A good care should be taken of the tools and equipments, which would then have a long life. It is not wise to keep workers sitting idle at critical periods of work because of shortage of tools. Rules in handling tools and equipments are:-

- Used all tools for what they are designed or constructed.
- Clean the tools and equipments always before storing them away.
- Store them in a neat dry place.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What does mean organic production? (3point)
2. Write down hand tools that used for organic production? (7pts)
3. List the rule of handling tools and equipments? (2 points).

Note: **Satisfactory rating – 12points** **Unsatisfactory - below 12 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Conducting checks and reports on all materials, tools and equipment

2.1 checks and reports on all materials, tools and equipment

Checks are necessary before and after using the different materials in organic production. This makes the equipment free from some things unpleasant, undesirable, damaging that happen unexpected during work operation in the work place. If the materials are damaged it is possible to report to the supervisor immediately. Every organic production should have a sufficient supply of tools for different operations. A good care should be taken of the tools, which would then have a long life. It is not wise to keep workers sitting idle at critical periods of work because of shortage of tools. All tools should be hung or otherwise stored in fixed place in the in the shop where they can be readily found. They should be stored in-groups of similar articles so that checking to ensure that all have been returned after work done at a glance.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the advantages of checking faulty and insufficient materials (10pts)
2. A good care should be taken of the tools, which would then have a long life? (10pts) A. True B. False

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	**Demonstrating techniques of loading and unloading**

3.1 Loading and unloading materials

During applying principle of organic production we need to 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 regarded 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.

3.2 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, holing, 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 once. Therefore the care we should take during loading and unloading includes the following dos and undoes

- Do not through materials from ground on to the vehicle
- Do not through 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

3.3 Taking care of vehicle (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 through materials from ground on vehicle we could break the glasses of the vehicle, we might 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 -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the care you should take during loading and unloading materials, tools and equipments (10pts

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-4	Selecting and checking personal protective clothing and equipment

4.1 Selecting and checking personal protective equipment's

Selecting implies the process of ensuring that the personal protective equipment is directly related in protecting the person as related to the job performed. In the process one has to know the likely risks that might arise from the organic production. Therefore during loading and unloading the likely risks could be to be hit/ injured by the materials, mostly on hands and legs or foot, hence in addition to the care that we take during loading and unloading we need to protect our hands and legs. Therefore select *boot, hats, lotions, goggles, mask and gloves*. In similar manner you need to identify the likely risks that might occur on your body or sense organs from specific agricultural crop works, then once you identify the risks it is necessary to select the necessary personal protective equipment that fit the body or the sense organ involved.

4.2 Checking suitability of personal protective equipment

Checking involves many things such as the checking 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.

Personal protective clothing and equipment may include:.

• Ear protection

• Overalls and gloves

• Safety goggles and faces masks

• Steel capped boots/shoes

• Sunhats and sunscreen lotion.

Different types of PPE are described below

Foot protection

Workers must wear closed-toe shoes at all times to protect feet from chemical spills and sharp objects. Steel-toed footwear and puncture-resistant soles. Slip-resistant shoes for anyone who works in wet environments.

Eye protection: Use safety glasses for minor splash hazards, goggles for moderate hazards, and ***goggles*** combined with a ***face shield*** for severe hazards.

Hand protection: Hand protection is indicated for the possibility of severe cuts, lacerations, or abrasions, punctures, temperature extremes, and chemical hazards. (Nit rile loves are usually a good choice for general use.) Use heavy-duty gloves for non-incidental contact and gross contamination.

Body protection: Protective clothing includes lab coats, smocks, scrub suits, gowns, rubber or coated aprons, coveralls, uniforms, and pierce-resistant jackets and vests.

Head protection: Hard hats must be worn by electricians, construction workers, and any other workers when there is a danger of objects falling from above

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Mention some PPE? (10 PTS)
2. Write the function of some PPE? (10 pts.)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 20 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-5	**Identifying and reporting occupational health and safety**

5.1 Providing support based on OHS requirement

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

During organic production there are number of possible risks that may endanger your health and safety, the dangers could be those which cause physical injury during land preparation, loading, unloading, preparation of organic fertilizer, green manuring. Therefore in giving this apply organic production, 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 during organic production.

The *OHS requirement* is therefore to take care of the likely risks that might occur during the work activity (occupation) hence to prevent these risks the worker should use the appropriate PPE and other cares.

5.2 Identifying and reporting OHS hazards

- **Aims of occupational health and safety**

Occupational health and safety should aim at:-

- ✪ The *promotion and maintenance* of the highest degree of physical, mental and social well being of workers in all occupation

- ✪ The *prevention* amongst workers of departures from 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 his physiological and psychological capabilities and
- ✪ To summarize the adaptation of worker to man and of each man to his job.

5.3 **Providing Organic production support based on OHS requirement and recording OHS tips**

Do:

- ✹ Consider safety issues when purchasing equipment
- ✹ Plan to do jobs safely and think about the safety of everyday work processes
- ✹ Workplace inspections regularly
- ✹ Act on all reports of hazards and injury
- ✹ Follow safety procedures
- ✹ Wear protective equipment provided, e.g. hearing, gloves, etc
- ✹ Keep work area clean and clean up spills

- Consider the safety of others.

Don't:

- Ignore safety issues until someone gets hurt
- Allow faulty equipment to be used
- Ignore hazards
- Remove guards from machines
- Operate faulty equipment
- Work at heights without fall protection e.g. harness/safety line etc
- Forget to consider the safety of others
- Take short cuts to get the job done quickly

5.4 Identifying OHS hazards

Hazards are risks that occur when providing organic production work support that could affect our health or our safety.

In the different activities there could happen different hazards to our health and safety this could be identified as

- Solar radiation and dust and noise
- air- and soil-borne micro-organisms
- chemicals and hazardous substances,
- sharp hand tools and equipment

- manual handling
- Holes and slippery and uneven surfaces.

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Mention sources of OHS hazards (5pts? (5 pts.)
2. Explain OHS? (5 pts.)
3. What are aims of occupational health safety? (5 pts.)

Note: **Satisfactory rating - 20 points** **Unsatisfactory - below 10 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation Sheet 1	Identifying materials, tools and equipment’s

Identifying materials, tools and equipment’s

1. Preparing materials , tools and equipment for identification
2. displaying
3. exercising how to handle and use in the field

Operation Sheet 2	Conducting checks and reports on all materials, tools and equipment

Conducting checks and reports on all materials, tools and equipment

***1st* -** use a list of materials provided by your supervisor and then classifies the materials according to

Your supervisor will provide you with list of materials used in organic production

2nd – know the name of the materials listed in your supervisor's list organic production

3rd – Go to 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

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 apply organic production

Operation Sheet-3	Loading and unloading materials

Loading and unloading materials

1. First go to the store and check that the different organic production materials are already there the vehicle provided and you are also ready to load materials by wearing the suitable personal protective equipments
2. Then group yourself in pair of two person or more persons
3. 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.
4. Let one person or one group be on the vehicle and the other group on ground
5. 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
6. 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.
7. Finally close the back side of the carriage and move to the site of agricultural crop work or unload the materials
8. Use the same procedure above for unloading

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished:

_____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within---- hour.

Task 1. Identifying materials, tools and equipment's

Task 2. Conducting checks and reports on all materials, tools and equipment

Task 3. Loading and unloading of materials

List of Reference Materials

1. Njoroge, J.W (1999), Training manual on organic farming in Medium and High potential areas.

2. An overview of Organic crop Production. www.attra.org/attra pub/organicrop/tools2.html.

3. Ruth B.Madulu, Betty N. Chalamila (2007). Report on Organic farming technologies for empowering women in Mkuranga district.

Horticultural Crops Production Level I

Learning Guide-30

Unit of Competence: Apply Principles of Organic Production

Module Title: - Applying principles of organic Production

LG Code: - AGR HCP1 M08 Lo2-LG-30

TTLM Code: - AGR HCP1 TTLM1 219v1

LO2. **Undertake organic production work as directed**

Instruction sheet	Learning Guide-30

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

- Following and clarifying instruction and directions
- Working under safe environment
- Flowing Site quarantine, bio-security protocols requirements farm and personal hygiene requirements
- Enterprise's activities and food safety requirements
- carrying out Interactions with other staff and customers
- Observing enterprise policies and procedures
- Reporting problems and difficulties
- Maintaining clean and safe work site

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

- Follow instructions and directions provided by supervisor requirements
- Undertake work in an environmentally appropriate manner and according to workplace.
- Follow site quarantine, bio security protocols and farm and personal hygiene requirements as required by enterprise guidelines.
- Meet appropriate to enterprise's activities, food safety requirements are met.

- Carry out Interactions with other staff and customers in a positive and professional manner.
- Observe enterprise policies and procedures in relation to workplace practices, and handling and disposal of materials.
- Report problems or difficulties in completing work to required standards or timelines to supervisor.
- Maintain clean and safe work site while working.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1-8
4. Accomplish the "Self-check 1 -6 **in page 34,40,46,48 and -50** respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1, **in page -51.**
6. Do the "LAP test" **in page – 52** (if you are ready).

Information Sheet-1	Following and clarifying instruction and directions

1.1 Following the national standards for organic production

- Choice of crops and varieties standards
  - When organic seed and plant materials are available, they shall be used.
  - The certification program shall set time limits for the requirement of certified organic seed and other plant material.
  - When certified organic seed and other plant materials are not available, chemically untreated conventional materials shall be used.
  - The use of genetically engineered seeds, pollen, transgenic plants or plant materials is on used.
- Fertilization policy standards
  - Biodegradable materials of microbial, plant or animal origin shall from the basis of the fertilization program.
- Pest, disease and weed management.
  - Products used for pest, diseases and weed management, prepared at the farm from local plants, animals and microorganisms, are allowed.

- All equipments from conventional farming systems shall be properly cleaned and free from residues before being used on organically managed area.

- The use of synthetic herbicides, fungicides, insecticides and other pesticides is prohibited.

1.2 principles of organic agriculture

An agricultural organic production work mean all approaches based on local technology development that supplement existing know how among farmers with specific in sight.

Organic farming relies on natural cycle.

Principles of organic production

- Organic production system permitted substances lists, *provides lists of substances* that are allowed for use in organic production system.

- The principles aim to *increase the quality and the durability of the environment* through specific and production methods. So, trainees You have to remember the following principles:

  1. *Protect the environment minimize soil degradation and erosion*, decrease pollution, Optimize biological productivity and promote a sound state of health.

  2. *Maintaining long term soil fertility* by optimizing conditions for biological activity within the soil.

3. *Maintaining biological diversity* within the system.

4. *Recycling materials and resources* to the greatest extent possibility within the enter prize.

5. *Provide attentive care that promotes the health*

The Goals of organic production

- ❖ A sufficiently high level of productivity
- ❖ Compatibility of cultivation with the ***natural cycles***.
- ❖ Maintaining and increasing the long term fertility and biological activities of the soil.
- ❖ Maintaining and increasing natural diversity and agro bio diversity.
- ❖ Maximum possible use of renewable resources.
- ❖ Creation of a harmonic balance between crops and animal husbandry**.**

- ❖ Organic production is a form of sustainable agriculture that relies on techniques of:
  - natural soil fertility management
  - biological pest management
- ❖ Organic production excludes the following:
  - chemical fertilizers
  - synthetic pesticides

- growth regulators
- antibiotics
- Genetically modified organisms (GMOs).

1.3 Organic fertilizers

➢ Types of organic fertilizers

1.3.1 Green manures

Green manure refers to incorporation of live biomass into the soil in order to supply plant nutrients. When green and succulent tissues are used, decomposition of incorporated biomass is faster, thus the practice attained a name called 'green manure'. The crops grown to be incorporated are called green manure crops. Ideally, a green manure crop should be a fast growing, non-woody and short duration crop so that the practice of green manure is practically feasible in a given cropping system. A large number of fast growing nitrogen fixing crops like dhaincha (Sesbania sp.), sun hemp and cowpea may be used as green manure which can fix atmospheric nitrogen to the extent of 60-100 kg/ha. Generally, dhaincha (Sesbania esculenta, S. rostrata) and sunhemp (Crotolaria juncia) are ploughed in the soil after about 6 to 8 weeks of sowing when adequate vegetative growth is attained. Use of green manure is highly beneficial for organic production and maintaining soil health besides adding nutrients into the soil, green manures also improve the physical and microbial properties of the soil.

➢ **Advantages of green manure**

• Increasing organic matter, earthworms and beneficial micro-organisms

• Increasing the soil's available nitrogen and moisture retention

• Stabilizing the soil to prevent erosion

• Bringing deep minerals to the surface and breaking up hardpans

• Improving water, root and air penetration in the soil

• Smothering weeds

Steps for making green manure

• Growing a green manure crop is as easy as throwing out a handful of seed onto freshly cultivated ground, followed by raking to cover the seed.

• "Digging the crop in" at the end isn't necessary, as by cutting the plants at the base while still green and lush, usually just as flowers form and leaving the green manure crop on the surface you have 'instant' mulch. This is cheaper than constantly buying in mulch and doesn't introduce new weeds. A combination of a legume and a grass works well, the legume providing nitrogen.

• Green manures can be used to interrupt pest and disease cycles in much the same way as crop rotation. Particular green manures can be used to control root knot nematodes and root rot fungal pathogens, reducing the need to use toxic chemicals for soil fumigation.

• Green manures can be used to smother persistent weeds.

1.3.2 Compost

Compost is the most important fertilizer in organic agriculture. Organic growers are therefore very much concerned with producing good compost. Composting is the process of transforming organic material of plant or animal origin into humus in heap or pit.

Importance of compost

- Compost increases the level of organic matter in the soil, which has a positive effect on the soil organisms, soil structure, infiltration, water retention capacity and aggregate stability.
- Decrease soil erosion by wind and water
- Improve soil structure
- Improve pore space

- Increase water-holding capacity
- Better water supply for the crops
- Increases diversity of micro-organisms
- Better storage and exchange capacity for (micro)nutrients

1.3.2 Mulching

Mulching is a soil cover made of straw, chopped up branches or other protective material.

• In order to reap maximum benefits, a layer of mulch should be two to four inches thick.

• Coarse mulch will help to keep weeds from erupting in your farm.

• Fine mulch will decompose quickly, leading to more frequent mulching.

• Before mulching, remove all weeds and give the soil a good, thorough soaking.

- Advantages of mulching

Mulching is serving many purposes such as:

• Soil fertility improvement;

• Evaporation control;

• Soil and water conservation, as it prevents water evaporation

• A protective cover for the soil;

• Regulating soil temperature and micro-climate.

• It's designed to retain moisture, deter weeds and keep the soil from eroding.

• Mulch will enrich the existing soil and will prevent rain and other elements from washing it away

• It keeps the soil moist, reducing the need for constant watering or frequent rain

1.3.4 Farm yard manure

The term ‘farm yard manure’ is an expression to signify any manure prepared in the backyard using the farm waste, cattle urine and dung. Since very early ages, its use is prevalent in agriculture. Although very little scientific attention was paid till 1970’s to scientifically study the method of preparing FYM and possibility of improving the quality of decomposition. Three principal methods of preparing FYM are standardized on scientific lines in the last 15 to 20 years.

1.3.5 Vermin-compost

Vermin-culture technology is an aspect involving the use of earthworms as versatile natural bioreactors for effective recycling of non-toxic organic wastes to the soil. They effectively harness the beneficial soil micro flora, destroy soil pathogens, and convert organic wastes into valuable products such as bio-fertilizers, bio-pesticides, vitamins, enzymes, antibiotics, and growth hormones. The term vermin-compost refers to manure prepared out of large scale rearing of earthworms in an artificial or natural pit. Earthworms can be used in specifically designed pits or in any ordinary FYM pits. Frequently, a term vermin-culture is also used to denote a culture of young earthworms which are let in any undigested compost pit or in an agricultural field directly. They reproduce and grow in number. The fecal waste from large number of earthworm is available as manure. Generally, this method is adopted when soil has large undecomposed organic matter. The establishment of required population of earthworms may take more time to contribute sizeable manure

1.3.5 Crop residue

Use of crop residues is essential in organic production, which increases the soil organic matter content, maintains soil fertility status, and in turn increases the crop yield. Recyclable nutrients (N, P, K, S, Zn, Mn, Fe and Cu) from plant wastes can be used through scientific composting. The technology for converting waste into compost has been developed but it needs refinement as per the location and situation specific adaptation.

1.3.6 Minerals

The mineral based materials like rock phosphate, gypsum, lime stone, calcium chloride, Sodium chloride Magnesium rock and chalk etc can be applied in limited quantities when there is absolute necessity. The product such as Saw dust, wood shaving from untreated wood and plant preparation and extracts products are permitted for use in manure/soil conditioning in organic field.

1.3.7 cultural methods

Organic sources of nutrients augmented with different cultural methods are more effective. There is no involvement of additional materials but a mere shift in method of cultivation or pattern or system of cropping. These methods have been part of our agriculture since a long time and some have been introduced lately. These methods contribute to increasing nutrient concentration. Important cultural methods include:

• Effective and useful rotation of crops

• Ideal intercropping with complimentary interactions

• Alley cropping with N-fixing trees

• Practice of homestead farming

• Soil and water conservation practices

• Fallowing

• Establishment of vegetative bunds

a. Crop rotation and crop diversification

Growing of legumes as main or inter or companion crops with vegetable/cereal crop improves the organic load of the soil. Changing crop rotations and multiple crops ensure better utilization of resources. Legume crop like beans, peas, cowpea etc is to be included in the crop rotation to improve the soil fertility by fixing atmospheric nitrogen. Inoculation of legume crop specific rhizobium strains can further improve their N- fixing ability.

b. Weed management

The effect of herbicide on soil health has been totally ignored which is causing serious changes in soil ecology. Application of herbicide is not permitted in organic farming.

Weed management is becoming ineffective due to emerging herbicide resistance in weeds. Scientists have come out with the technology, which reduces the weed density and increases the crop competition with weeds. Control of weeds including Phalaris minor can be done to a larger extent through changing the crop dynamics and timely sowing. Mechanical weeding is highly beneficial for crop establishment. Cultivation practices may be devised in such a way that help the crops in capturing the resources easily and grow vigorously in comparison to weeds. Biological control of weeds can be highly effective. However, under Indian conditions; the approach has to be evolved. Use of locally available mulching materials or polythene sheets to reduce weed growth moisture conservation can be effectively employed in vegetable cultivation Novel preparations such as biodynamic formulations etc can be used in appropriate quantity.

Use of Biodynamic preparations, such as BD-500 and BD-501 as foliar spray has also been found to be effective in growth promotion

Advantages of crop rotation

a. • Prevents soil depletion
b. • Maintains soil fertility
c. • Reduces soil erosion
d. • Controls insect pests.
e. • Reduces reliance on synthetic chemicals
f. • Reduces the pests' build-up
g. • Prevents diseases and helps control weed

Self-Check -1	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

3. List advantages of green manure? (10pts)

4. Write the advantages of mulching?(6pts

Note: **Satisfactory rating - 8 points** **Unsatisfactory - below 16points**

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

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-2	**Working under safe environment**

2.1 Land Preparation

Land preparation prior to crop production consists of clearing, terracing (if need), installation of irrigation pipe or ditches (if needed), fencing, planting of windbreaks, and digging planting holes.

1. Site clearing:
    - All trees shrubs perennial weeds and big stones should be removed
    - Divide the land in to the blocks if commercial
    - Grade the land for convenience of irrigation
    - Construct irrigation cannels and drainage system in areas of saline soils
    - Fence the area
    - The extent of the clearing operation necessary prior to planting on field depends on whether the land has been previously cropped
    - Terracing is important depending on the slope of the area
2. Terracing and irrigation
    - terracing and ridging should be done on slope to control erosion
    - combination of ridging, terracing and cover crops are necessary in crop production if sever erosion is to be prevented
    - installation of pipes and digging of ditches prior to planting
    - The irrigation system must be considered in conjunction with layout planning and soil conservation practices.

A. Digging holes for planting

- large holes 0.6 –1m in both width and depth are dug prior to planting
- pile topsoil and subsoil separately
- leave the soil for one month
- one month later refill the topsoil only
- refill the hole with a mixture of 50% top soil and 50% well rotted manure

B. Planting seedlings and aftercare

- ❖ Trees planted at the start of rainy season.
- ❖ Some of the soil is removed from the previously prepared hole.
- ❖ Any posts or stakes should be inserted into the planting hole before planting (later insertion may result in damage to the root system).

a) planting bare root seedlings

2.1.1 Site clearing and cultivation

Objectives of site clearing and cultivation:

1) Increasing the water containing capability of the soil, decreasing soil water evaporations and improving soil's water conditions.

2) Enlarging soil porous degree; increasing soil temperature; enhancing micro-organism activities in soil; accelerating soil weathering in order to release the potential nutrients of the soil.

3) Destroying weeds and insect pests.

Effectively improve the relationship of water, fertility, aeration, heat in soil; provide good circumstances for seed-germination and root-growth. In general the purpose of clearing is:-

- ☞ avoiding competition of nutrients, water, light, air and space
- ☞ reduction of shading
- ☞ elimination of the shelter of insect pests and disease
- ☞ enhancing good vegetable crop development

Materials to be removed from the site

- ➢ un wanted vegetation (trees, bushes, weeds etc)

- tree roots
- stones
- stumps

Clearing operation

- removing of shrubs and trees
- cutting, burring, burning, all diseased vegetation
- removing stones and larger pebbles

Avoiding cleared material from the site

- burning waste, woods and vegetation
- use the crop trash for making compost heaps

Uses of cut trees and shrubs

- fences
- stakes
- fire wood
- construction materials

2.1.2 Tillage operation (ploughing the land)

After the land has been cleared various deep and thorough tillage operation should be carried out twice or thrice in two directions.

Tillage refers to mechanical manipulation of the soil to provide suitable soil conditions which are favorable for the growth of crops.

Establishing good soil condition includes

- loosening the soil to the right depth
- moistening the soil

- aerating the soil

Types of tillage

There are two types of tillage practices:-

i.Conventional tillage

ii. Conservational tillage

Conventional tillage

Involves removal and burying of crop residue followed by cultivation. Here, the entire field is stirred up to a certain depth (ploughing depth) depending on soil depth of the area. Materials used for conventional tillage

- Mould board plough
- Chisel plough
- Disk plough
- Harrow
- Row metal
- Field cultivator

Conventional tillage could be

A. **Primary tillage operation: -** the land is cultivated to incorporate crop residues, kill weeds; breaking compacted /silted/ crusted hard pan layers of the soil. Used to burry the remaining plant material especially the remaining materials of cleared land. The top soil is stirred up to a depth of 15-30 cm.

Primary tillage operations depend on:-

- Soil type (clay, sandy, silty)
- Soil moisture (dry and wet)
- Climatic conditions(frost, chilling, sunny, cloudy, and snow etc)
- Time of planting the crop

B. Secondary tillage operation

Follow the primary tillage operation in order to prepare, create a fine tillage (tilth) for planting. It controls weed, pulverizes clods, prepare firm planting site. Secondary tillage usually done at depth of 5-15cm and it pulverizes the clods left by primary tillage.

i. Conservation tillage

Conservational tillage type is the practice by which some crop residues remain on the soil surface after planting. Conservational tillage has got different forms. Such as:-

- Stubble / mulch tillage / tillage practices that involve leaving crop residues on the soil.
- Zero tillage /no tillage/slot tillage/sod surface planting/ecofallow/ does not involve actual tillage.
- Reduced /minimum tillage soil is disturbed only to the extent suitable for planting.

The main objective of conservation tillage is:-

- To reduce soil erosion by different causes of soil erosion (erosion factors)
- To conserve water especially in water deficient areas/ regions
- Reduce evaporation and maintains soil moisture
- Reduce salinity mainly in low rainfall areas.

2.1.3 Plowing

Plowing is initially done to open the compact or hard soil. During these operations the soil is inverted, weeds are uprooted and stubbles incorporated into the soil. The depth of plowing varies from 10 to 30cm. The implements used for plowing may be bullock drawn country plough and Mould Board Plough or tractor drawn implement like mould board plough, disc plough, chisels plough etc.

Importance of plowing the land

- Cutting and turning the soil.
- Loosening the soil and good root penetration
- Aerating the soil and making it permeable.
- Reducing erosion be collecting water in unbroken furrows.
- Improving the physical structure of the soil.
- Preparing the soil for growing crops.
- Reducing weeds and insect infestation.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the Importance of plowing the land? (5PTS)
2. List the main objective of conservation tillage? (10 PTS)

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

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-3	**Flowing site quarantine, bio security protocols requirements**

Farm bio-security is a series of measures that aid in protecting production areas from harmful insects, weeds, and various plant diseases. They are collectively referred to as ‘plant pests,’ that have the potential to adversely affect plant health. Proper bio-security signal; insect, weed and pest surveillance; and on-farm clean down facilities are three commonly used farm bio-security measures.

1. Bio-security signal

Biosecurity signal informs visitors and guests that they are entering a bio secure farm and that individuals are expected to abide by the established procedures.

Signs should direct visitors and guests to register their presence to the owner or farm manager prior to entering the property. Signs with bold and contrasting colours are recommended for the greatest effect.

Install and maintain signage throughout the property. Effective signs should be clear, visible and well maintained in locations where visitors cannot help but notice. For this to occur, signs should be located at all entrances to the farm.

Supplement signage with additional on-farm biosecurity practices. For example, signs should direct guests to specific visitor parking whereupon they can register their presence with the owner and undergo a farm induction. Signs should also clearly indicate where foot washes and vehicle or machinery clean-down facilities are located.

2. Pest surveillance

Proper surveillance is essential for maintaining plant health and can provide security against quarantine measures. There are several important aspects to consider when implementing surveillance on your property. Monitor Routinely monitor for pests to maintain plant health and identify risks before they become endemic. It is important to be aware of the pests, diseases and weeds that are located in your region and, most importantly, those found in and around your property to accurately identify risks. Identify Proper

identification can streamline spray applications or alternative treatment methods to rid plants of pests. Exotic pests should also be included in routine monitoring: consult you industry biosecurity plan for a list of priority exotic pests. It can also be helpful to consult with neighbouring properties on anything suspicious as the problem is unlikely to remain contained to one area. Record all observations of pests and disease, including a lack of observations. The date of any observation made, identity of any pest, growing areas affected, the level of infestation and the proposed treatment plan should be recorded. If no observations were made, this should also be noted. Proper surveillance and record keeping can be important for retaining market access. Report any significant findings to the relevant state or territory agriculture agency.

3. On-farm clean-down facilities

A clean-down facility is where people can clean and disinfect farm equipment and machinery entering or leaving growing areas. Plant soil and debris can often be collected on vehicle and machinery surfaces as well on the shoes worn by workers and visitors. This poses a biosecurity risk as bacteria, fungi, viruses, viroids, nematodes, insects and insect eggs can remain stable in soil and plant matter for extended periods of time. Routine usage of these facilities is essential for reducing the chance of introducing pests to the property and the potential for pests to spread. Proper clean-down practices can also improve production yields and aid in market access.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

3. Write the three commonly used farm bio-security measures? (10 PTS)
4. Define farm bio-security? (10 pts.)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 20 points**

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

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-4	Following farm and personal hygiene requirements

4.1 Definition of Hygiene practices

Implementing hygiene practice- Hygiene in farm one of the most rewarding processes in organic production. However, the opportunity for pest and diseases to severely impact on plant success should not be underestimated. Poor hygiene in organic production can lead to complete production failure or retardation in plant growth, both of which have significant cost implications. By improving your farm hygiene standards, you can increase production efficiency and minimize endemic problems within the farm.

Hygiene practices

Storing different types of material separately to avoid cross contamination, cleaning and disinfecting work areas, tools and equipment between groups, contact restrictions, and footbaths.

Avoiding infected planting material from the farm.

Do not cultivate fruit trees for fresh fruit consumption near areas with a presence of potentially harmful substances, for example:

- Sewage
- Sludge
- Heavy metals
- Dangerous chemicals
- Toxic weeds
- Aerial contamination
- Place where operations with livestock or birds are made or with an unusual quantity of wild life, etc.

These can cause the contamination of those food or their derivatives at levels constituting a health risk

Self-Check -4	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is hygiene according to organic production? (8 pts.)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 8 points**

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

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-5	Enterprise's activities and food safety requirements

5.1 Enterprise's activities and food safety requirements

There might be guidelines to keep the quality of the product. Guidelines provide a description of what is formally confirmed by a certificate, so certification requires standards**.** This helps to keep the environment and the workers safety.

To produce food of high nutritional quality in sufficient quantity

• To encourage biological cycles within farming systems by involving the use of microorganisms, soil flora & fauna, plants and animals

• To maintain and increase the long-term fertility of soil and biodiversity

• To use renewable resources in locally organized production systems

• To work as much as possible within a close system with regard to organic matter and nutrient elements and draw up on local resources

• To avoid all forms of pollution that may results from Agricultural techniques

• To reduce the use of fossil energy in agricultural practice to the minimum

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the importance of keep the environment and the workers safety.

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-6	**carrying out Interactions with other staff and customers**

6.1 **Interacting with other staffs in appositive and professional manner in relation to work place**

Since organic production work is a local technology, the supervisor may invites different experts about organic production how can the trainees apply more, what are the things needed for organic production, how can we alleviate environmental problems by using organic production

Since organic production work is a local technology, the supervisor may invites different experts about organic production how can the trainees apply more, what are the things needed for organic production, how can we alleviate environmental problems by using organic production work.

Communicating ideas and information to other staff and customers

Before starting operation, communicating ideas and information to customers and other concerned bodies is the most important part of organic production work. Communicating and sharing of ideas and information to work team members and supervisors regarding the organic production work operation is important to:-

- ❖ Reduce work load among workers
- ❖ Reduce work place hazards and risks
- ❖ Successfully complete the organic production work
- ❖ Reduce disagreement and biasness among workers
- ❖ Operate the activities based on crop type, skill level and enterprise work procedures.
- ❖ Solve different problems that may occur during organic production operation.

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the importance carrying out Interactions with other staff and customers? (5 PTS)

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

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

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-7	Reporting problems and difficulties

7.1 Identifying and Reporting problems or difficulties in completing work

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 organic production, of which some of them are as follows:

a. *Faultiness* of the tools and equipments
b. *Lack of materials* for maintaining tools and equipments

c. *Lack of personal protective closes*
d. Unsuitability of personal protective closes
e. Lack of materials, tools and equipments during the work
f. *Lack of agricultural inputs*,
g. Loss of tools and equipments during the work
h. 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 -7	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

2. List the number of problems occurred during organic production? (5 PTS)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-8	Clean and safe work site is maintained while working

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.

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 -8	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the meaning of clearing? (5point)
2. *List the main activities that used in maintaining and cleaning tools and equipment*? (5pts)

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

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

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation Sheet -1	**Flowing site quarantine, bio security protocols requirements**

Flowing site quarantine, bio security protocols requirements

step1.Clean-down -clean all incoming and outgoing vehicles and machinery using high pressure water hoses or compressed air to remove plant soil and debris.

step2. Decontaminate- apply decontaminant solution, e.g. antibacterial, antifungal and antiviral, to all vehicle surfaces where plant material may be located.

step3. Rinse -prior to moving the vehicle, use a high pressure water hose to direct debris to sump areas. Concrete of gravel are preffered clean-down facility surfaces.

LAP Test	Practical Demonstration

Name_____ Date: _____

Time started: _____ Time finished:_____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within hour.

Instructions:

Task 1. Flowing site quarantine, bio security protocols requirements

References 1.

Njoroge, J.W (1999), Training manual on organic farming in Medium and High Potential areas.

2. An overview of Organic crop Production. www.attra.org/attra pub/organicrop/tools2.html.

3. Ruth B.Madulu, Betty N. Chalamila (2007). Report on Organic farming technologies for empowering women in Mkuranga district.

Horticultural Crops Production Level I

Learning Guide -31

Unit of Competence:- **Apply Principles of Organic Production**

Module Title: **Applying Principles of Organic Production**

LG Code: AGR HCP1 M08 Lo3-LG-31

TTLM Code: **AGR HCP1 TTLM1219v1**

LO3: Handle materials and equipment

Instruction sheet	Learning Guide -31

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

- Storing waste materials
- Handling and transporting materials tools and equipment

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

- Store waste material produced during work in a designated area
- Provide appropriate handling and transporting materials, tools and equipment are according enterprise guidelines.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1and Sheet 2”.
4. Accomplish the “Self-check 1, and Self-check 2” **in page 63, and 65** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1,” **in page 66.**
6. Do the “LAP test” **in page 67** (if you are ready).

Information sheet -1	**Storing waste materials**

1.1. Plants debris and materials storing techniques

1.1.1 Materials storage

Safe and efficient materials storage depends on good co-operation and co-ordination between everyone involved including, client, contractors, suppliers, and the construction trades. On all project, the arrangements for materials storage should be discussed and agreed between contractors and the project client. Larger notify able projects should have arrangements for materials storage included in the construction phase plan one of the simple and easy ways of processing agricultural wastes is making compost.

Composting organisms require four equally important things to work effectively:

1. Carbon: For energy, the microbial oxidation of carbon produces the heat.
   - High carbon materials tend to be brown and dry.
2. Nitrogen: is used to grow and reproduce more organisms to oxidize the carbon.
   - High nitrogen materials tend to be green (or colourful, such as fruits and vegetables) and wet.
3. Oxygen: for oxidizing the carbon, the decomposition process.
4. Water: in the right amounts to maintain activity without causing anaerobic conditions.

Methods of Compost Preparation

There are two methods of making compost. These are:

1. **Pit Method** –it is a compost making process in pits, which is much better to be used in moisture stress and cold areas. This is because in moisture stress areas the pit keeps the available moisture for a longer time while in the cold, the pit keeps the inside temperature high enough for the decomposition process to continue.
2. **Heap or Piling Method** – piling method is a compost making process on the surface. It is an appropriate method for areas where there is excess moisture.

Material Used To Make Compost

1, Plant materials (both dry and fresh)

- Weeds grasses
- House wastes
- Crop residues: stems, leaves, straw and chaff1 of all field crops and horticultural crop
- Dropped leaves and stems

2. Animal dung

- Dung and droppings from some domestic animals, including from horses, mules, donkeys and chicken from night pens and shelters, or collected from fields.
- Chicken droppings are important to include because they are rich in nitrogen
- Urine from cattle and people

Materials not used for compost making

- Eucalyptus,
- fuel (kerosene, diesel, petrol), engine oil & stones
- pieces of iron, broken glass& plastic materials
- Any pieces of clothes
- Hyena cat and dog droppings
- Crops treated by chemical pesticides(up to 6 months)
- Avoid use of torn or spin trees branches leaves
- Any type of wax, any type of fat, hide/skin & etc.

Compost Making Aids

They help speed up the process of decomposition. It includes:

- Good top soil and old compost: These contain bacteria, fungi and many small animals to work on breaking down the materials into mature compost.
- Ashes: they contain phosphorous, Potassium and many micro-nutrients like zinc, iron and magnesium. And also neutralize acid produced during decomposition
- Micro organisms: like earthworms and beetles, in old moist compost, old animal dung or good top soil and add these to the Compost making materials without drying and sieving them.

➢ Do NOT put the compost making aid material as a layer by itself. It needs to be mixed with the other materials so it can accelerate the compost making process. Ash is good as it contains minerals, BUT if you put a high quantity in one layer, the minerals are strongly concentrated and can slow down or stop the activities of microorganisms.

Material, Equipments and Tools Required

Materials	Tools	Equipment
Wood ash	Graduated Stick	Thermometer
Green leaves	Rope	Wheel barrow
Plant residues	Tape measure	PPE
sorghum and maize straw	Pick axe	
Top soil and ash	Watering can and hammer	
Water	Rake and machete	
Animal dung and urine	Peg and shovel	

Heap method

Procedure

1. Select a site where to make the compost

⇒ Under the shade of the tree to protect from
- ✓ strong sunlight
- ✓ high rainfall

⇒ Avoid area exposed to flooding

⇒ Near to field where the compost will be used

2. Mark out the area for heap compost
- ✓ By =1.2m wide and 2.5m long for heaping and turning

3. Dig a trench about 20-25cm deep
- ✓ For holding moisture and prevent leaking out of nutrients from the base.

4. Chop rough and long plant material to 5cm-12cm

5. Put 1st a layer of dry plant materials
- ✓ Strong straw and stalks of maize and sorghum
- ✓ 10-15cm thick
- ✓ It provides ventilation for air to circulate and excess water to drain out of the upper layers

6. Sprinkle some water on this layer

7. Put on 2nd layer of green plant material
- ✓ Either fresh or wilted weeds or grass, herbaceous or soft stem and leaves
- ✓ Left over from harvesting vegetables
- ✓ Damaged fruits and vegetables
- ✓ Leafy branches from woody plants
- ✓ 15 cm thick
- ✓ Water should NOT be sprinkled over this layer

⇒ 8. Put on 3rd layer of animal manure 2cm thick

9. Put on 4th layer of wood ash 2cm thick

Sprinkle some water (moist but do not over wet)

10. Put on 5th layer of top soil 2cm thick

9. Repeat the Layering process (sequence)
- ✓ Until the heap is about 1–1.5 meters tall
- ✓ Why the heap is much taller than 1.5 meters?
- ✓ The microbes at the bottom of the heap will not be able to work well

10. Place one or more ventilation and/or testing sticks
- ✓ Vertically in the compost heap

- ✓ The stick long enough to stick out of the top of the heap
- ✓ Ventilation and testing sticks are used to check if the decomposition process is going well or not
- ✓ A hollow stick or bamboo makes a good ventilation stick
  - ➢ It allows $C0_2$ to diffuse out of and oxygen to diffuse into the heap
- ✓ A testing stick is needed
  - ➢ It can be taken out to check on the progress of decomposition in the heap
  - ➢ serve as thermometer (how dry or wet the pile is)(after three days)

11. Cover the heap with dry vegetation
    - ✓ To reduce moisture loss through evaporation
12. Turnover of the pile
    - ✓ After 2-3 weeks
    - ✓ If the thermometer is cold or if it has white substances on it
13. Ready for use after 2-3 months
    - ✓ Compost has fresh earth smell

Pit methods

Procedure

1. Select a site where to make the compost

⇒ Under the shade of the tree to protect from
⇒ strong sunlight
⇒ high rainfall
⇒ Avoid area exposed to flooding
⇒ Near to field where the compost will be used

2. Dig the pit
   - ✓ With size of 1m deep 1-2 m wide and 1.5-2m long
   - ✓ The Smaller pits usually dry out too quickly so good quality compost is not made
   - ✓ Pits deeper than 1 meter can be cold at the bottom and the micro-organisms cannot get enough oxygen to work properly and if beyond 1m turning is also difficult
3. Cover the bottom and sides of the pit
   - ✓ With a mixture of animal dung and water – a slurry
   - ✓ Or a mixture of top soil and water can be used(helps to seal the sides of the pit so that moisture stays in the compost making materials)

4 Chop rough and long plant material to 5cm-12cm

5. Put 1st a layer of dry plant materials

- ✓ Strong straw and stalks of maize and sorghum
- ✓ 10-15cm thick
- ✓ It provides ventilation for air to circulate and excess water to drain out of the upper layers

6. Sprinkle some water on this layer

7. Put on 2rd layer of green plant material

- ✓ Either fresh or wilted weeds or grass, herbaceous or soft stem and leaves
- ✓ Left over from harvesting vegetables
- ✓ Damaged fruits and vegetables
- ✓ Leafy branches from woody plants
- ✓ 15 cm thick
- ✓ Water should NOT be sprinkled over this layer

8. Put on 3rd layer of animal manure 2cm thick

9. Put on 4th layer of wood ash 2cm thick

Sprinkle some water (moist but do not over wet)

10. Put on 5th layer of top soil 2cm thick

9. Repeat the Layering process (sequence) until the pit is filled

10. Place one or more ventilation and/or testing sticks

- ✓ Vertically in the compost pit
- ✓ The stick long enough to stick out of the top of the pit
- ✓ Ventilation and testing sticks are used to check if the decomposition process is going well or not
- ✓ A hollow stick or bamboo makes a good ventilation stick
  - ➢ It allows $C0_2$ to diffuse out of and oxygen to diffuse into the pit
- ✓ A testing stick is needed
  - ➢ It can be taken out to check on the progress of decomposition in the heap
  - ➢ serve as thermometer (how dry or wet the pile is)(after three days)

11. Cover the pit with dry vegetation (banana leaves)

- ✓ To reduce moisture loss through evaporation

12. Turnover of the pile

- ✓ After 2-3 weeks

- ✓ If the thermometer is cold or if it has white substances on it

13. Ready for use after 2-3 months

Compost has fresh earth smell.

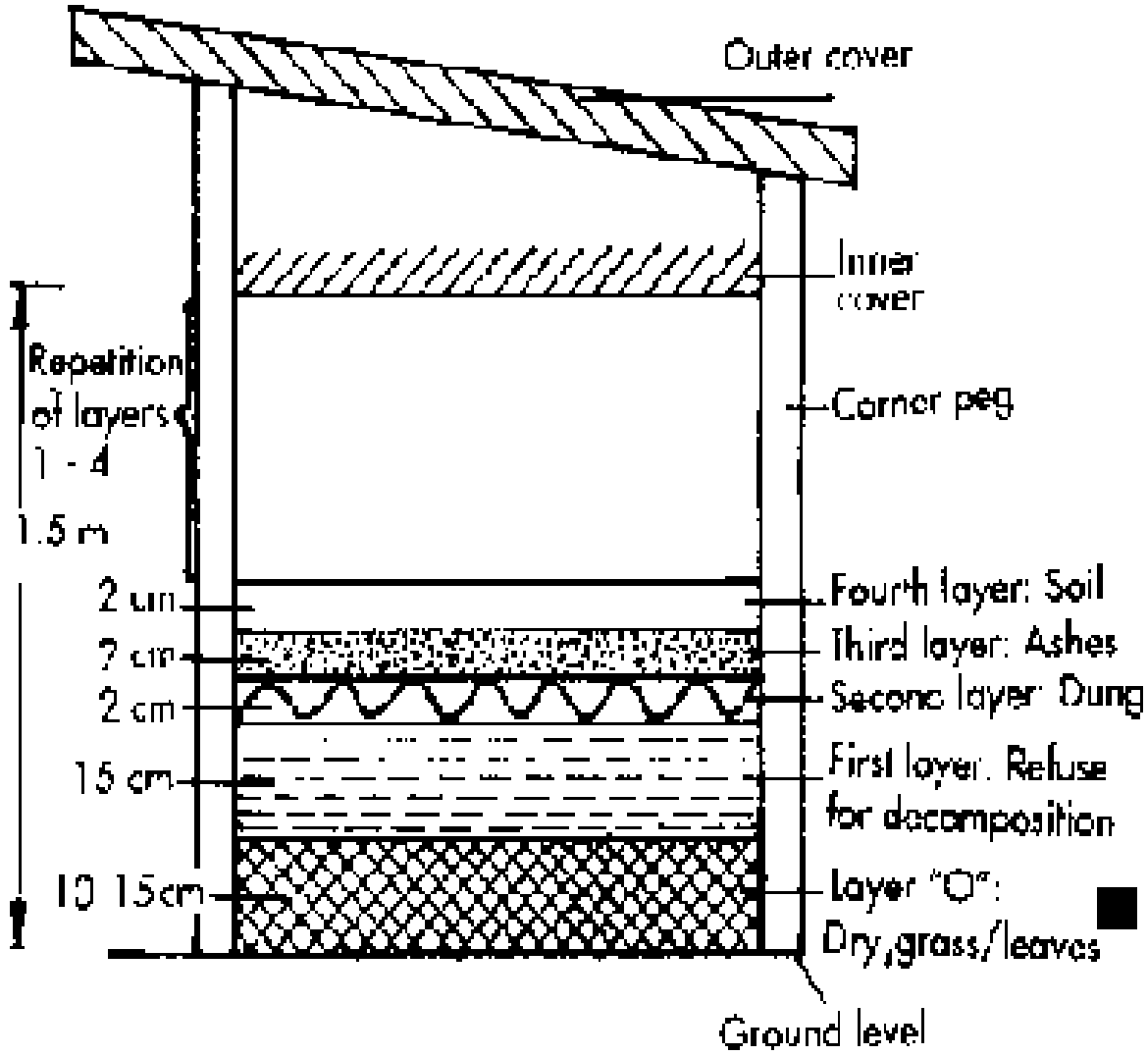

Figure 2 heap compost

figure Stages of composting

A good composting process passes through 3 consecutive stages, these are as follows:

(1) Heating phase (fermentation)
(2) cooling down phase
(3) maturation phase.

. Heating Phase:

- During the first stage of composting, the compost heap starts to heat up considerably. This effect is known as fermentation and is the result of the breaking down of the complex and tough fibrous material of the organic matter.
- This fermentation process (decomposition) is strongest in the centre of the heap.
- The fermentation stage usually begins after 4-5 days and may take 1-2 weeks. Maximum fermentation takes place at a temperature of 60-70 °C in the compost heap.
- If the temperature is too high, the necessary micro-organisms may die and decomposition comes to a halt. Due to its temperature, fermentation also has a hygienic effect.

Temperature taste: A simple way to see if the fermentation process has started is as follows:

- Put a stick in the centre of the heap about 5 days after completing the compost heap or after the final turning over.

- Leave it there for about 5 to 10 minutes. After taking it out, feel it immediately. It should be considerably warmer (60 - 70 °C) than body temperature.
- If not, then this is an indication that something is wrong, perhaps the material used or aeration is at fault.

II. Cooling down phase; -

- The fermentation phase gradually changes into a cooling down phase. Decomposition occurs without much generation of heat and the temperature drops slowly.
- During this period new types of micro-organisms convert the organic components into humus. The heap remains clammy and hot inside and the temperature drops from 50 °C to 30 °C. By regulating the temperature, air and water supply, the process can be accelerated or slowed down.

How long this cooling down stage takes, it depends on

- the type of heap
- the material
- the attention given to it
- The climate etc. The cooling down period usually takes a few months, but in unfavorable conditions may require up to a year.

III. Maturation phase: -

- In this end phase of decomposition, the temperature drops to soil temperature, depending on the climate, 15-25 °C.
- Apart from the micro-organisms mentioned, the large soil fauna are active at this stage too.
- In temperate regions, earthworms in particular, feed on the strongly decomposed organic material, and in this way contribute to decomposition.
- In the tropical to semi arid regions, termites in particular play an important role, although these can also be very troublesome.
- This phase never really comes to an end; the decomposition process can go on infinitely at a slow rate.

Characteristics of well decomposed product of organic fertilizer are:-

- Crumbly structure
- Does not stick in the hand
- Dark grey or blackish in color

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the preparation method of compost? (5point)
2. List the Characteristics of well decomposed product of organic fertilizer? (7pts)

Note: **Satisfactory rating – 12points** **Unsatisfactory - below 12points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet -2	Handling and transporting materials tools and equipment

2.1 Handling and transporting materials, tools and equipments safely after work

Transporting is taking of material, tools, equipments and machinery from place of work to place of storage of work.

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

Name: _____ Date: _____

Time started: _____ Time finished: _____

1. List at least 3 traditional system of materials and tools transporting method (5 points)
2. Define transporting? (5points)
3. Write the modern and traditional transporting system(5points)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

Operation Sheet 1	Preparation of compost

Preparation of compost

Step1. Select site

Step2. Prepare raw materials

Step3. Dig to make pit composting

Step4. Measure 2m X 1.5m

Step5. 10-15 cm of material, which is difficult to decompose (twigs, stalks)

Step6. 15 cm of material which is easy to decompose (green and fresh)

Step7. 2 cm of animal manure

Step8. 2 cm of wood ash

Step9. 2 cm of soil from the surface of arable land to obtain the micro-organisms needed for the composting process

1. Repeat step 6-9 until the heap reaches 1 to 1.5m high

Cover with grass or leaves (such as banana leaves) to prevent water loss

LAP Test	Practical Demonstration on

Name_____ Date: _____

Time started: _____ Time finished:_____

Instructions:

Task1. **Storing waste materials**

.1. Ruth B.Madulu, Betty N. Chalamila (2007). Report on Organic farming technologies for empowering women in Mkuranga district.

2. Francis, Charles A. 2009. *Organic Farming: The Ecological System*. Madison, WI: American Society of Agronomy, 2009. ISBN: 978-0-89118-173-6.

3. Barker, Allen V. *Science and Technology of Organic Farming*. Boca Raton, Florida: CRC, 2010. ISBN: 978-1-4398-1612-7.

Horticultural Crops Production

Level I

Learning Guide-32

Unit of Competence: Apply principles of organic Production

Module Title:- Applying Principles of Organic Production

LG Code: - AGR HCP1 M08 Lo4-LG-32

Code: AGR HCP1 TTLM1219v1

LO4. Clean up on completion of work

Instruction sheet	Learning Guide -32

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

- Storing waste materials
- Handling and transporting materials tools and equipment

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

- Return materials to store or disposed of according to supervisor instructions.
- Clean, maintain and store tools and equipment according to manufacturer specifications and supervisor instructions.

Report work outcomes to supervisor.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, and Sheet 3”.
4. Accomplish the “Self-check 1, Self-check t 2, and Self-check 3” in page -73, 78 and 80 respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1,” in page -15.
6. Do the “LAP test” in page –81 (if you are ready).

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Information sheet--1	Storing and disposing materials

1.1. Understanding of waste materials

Waste materials may be from different sources. Such as, ***hazardous materials, agricultural wastes, industrial wastes*** etc.

Agricultural wastes include ***pesticides and herbicide***s as well as their containers.

Material wastes are ***damaged and unusable farm tools, materials and equipments***.

Industrial wastes are the byproduct of materials.eg ***Fluoride waste*** are byproducts o f phosphate fertilizer production.

Top 10 Tips for managing your wastes and developing your waste strategy

- *Understand the legal implications* of the waste produced in your organization by identifying the specific legislation that affects you.
- Look at your *general environmental issues* – what role does waste play in these?
- *Quantify and identify your waste*. Where does it arise and how much does it cost? Undertake a walk around audit and look at your bills. Using the waste hierarchy, identify what currently happens to the waste as it arises.
- *Identify a waste management champion or team* to drive things forward.
- *Produce an action plan* for reducing your wastes
- *Get commitment from senior management* for the action plan.
- *Identify the possible disposal options* where you cannot reduce or recycle.
- *Select your waste carriers* carefully and make sure your
- Duty of Care responsibilities is met.
- *Monitor and review your achievements*.
- *Communicate your successes to your staff, senior managers and outside your organization to interested stakeholders*.

1.2 Surplus materials removal techniques

Follow the procedures for disposing waste materials, work instruction or verbal instruction from supervisor OHS legislative requirement and relevant code of practice.

The hygiene practices which may include

- Disinfestations and storage of planting media (soil)

- Disinfestations of contaminated plants and plant and materials
- Hand washing, foot paths, sterilizing tools, equipment and benching, access restrictions, and handling practices which minimize cross contamination

Self-Check -1	Written Test

Name: _____ Date: _____

Time started: _____ Time finished: _____

1. What are agricultural wastes? (6poits)
2. What are the top ten waste management strategies? (8points)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

Information sheet--2	Cleaning, maintaining and storing tools and equipments

2.1 Cleaning and maintaining tools and equipment

Cleaning is the ***removal of dirt and organic substances from surfaces of tools and equipments***.

The main activities that used in maintaining and cleaning tools and equipment include:-

- **Clean tools last longer**

If nothing else, tools should be cleaned after each use. Doing so keeps diseases, fungi, insect eggs, and weed seeds from being unwittingly spread around the garden. Cleaning also extends the life of a tool by removing moisture-laden, rust enhancing soil from steel surfaces. For tools with a keen edge, a good cleaning keeps rust from eating the edge away.

Fig.1 After every use, wash soil and grime from tools with a steady spray of water from the garden hose

- **Apply oil to prevent rust**

Even after washing and drying, steel tool heads are still susceptible to rust when exposed to oxygen. In fact, as a general rule, the better the grade of steel used, the more vulnerable it is to rusting. So, considering the high cost of quality gardening tools, it just makes sense to keep rusting to a minimum.

Motor oil is inexpensive and effective rust preventer. When applied to steel surfaces, the oil insulates the steel and prevents it from oxidizing.

Fig.2 Oil steel tool heads to prevent them from oxidizing. The oil creates a barrier between the air and the steel.

- **Remove rust with a wire brush**

Extremely rusty tools require special attention. Use a sheet of 80-grit sandpaper to remove light coatings of rust. For a slightly heavier coat, a stiff wire brush can be effective.

Fig.3 Sand away a light coating of rust. 80-grit sandpaper should be coarse enough to get the job done.

Fig.4 Use a wire brush to remove a layer of rust.

Fig.5 For a very heavy coat of rust, use a drill with a wire brush attachment.

- **Sharpen tools for peak efficiency**

Sharpening tools is a slightly more complicated procedure than removing rust. Some tools like shovels, axes, hoes, and trowels are best sharpened with a hand file, while other tools like pruning shears and knives call for a honing stone. Depending on how dull an edge is, some tools may require a session with a high-speed grinding stone.

Fig.6 Use a hand-held mill file to sharpen hoes and shovels. The key to successful sharpening is keeping the tool steady and the file at the proper angle.

Fig.7 Sharpen pruning blades and knives by sliding an oiled honing stone in one direction across the tool's beveled edge.

- **Grind battered tools into shape**

Since the grinding process removes metal quickly, only the most battered tools are candidates for regular grinding. Tools like lawn-mower blades and grub axes usually merit an annual trip to my grinder. An electric bench grinder is the best way to retrieve a keen edge because it has an adjustable tool-rest platform that allows for more exacting edges.

Fig.8 Grinding sharpens tools quickly. .

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the meaning of clearing? (5point)
2. *List the main activities that used in maintaining and cleaning tools and equipment*? (5pts)

Note: **Satisfactory rating – 10 points** **Unsatisfactory - below 10 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet--3	Reporting work outcomes

3.1 Reporting working out comes

Reporting means informing related information to a person who concerns.

On completion of your work, you should have to record and report what you have got from your work so far. Your record should include strong side of your work, weak side of your work, problems that you have faced during the work, possible solutions that is taken and the overall conditions of the work.

Now, depending on your objectives of the work, you should have to report the workout comes to your supervisor. A recording and reporting work outcome is important to:-

- ❖ Get the feedback of the work
- ❖ Improve the weakness and encourage your strength
- ❖ Get full information about the work
- ❖ Know the total cost wasted during the work(cost of production)
- ❖ Know the total yield (profit) obtained from the work and etc.

For example if we want to report the problems we can use the following table format

Table.1 Example of problems reporting format

No	Activities	Type of problem	Possible solution
1			
2			
3			

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the importance of recording and reporting work outcome (3point)
2. What is reporting? (3pts)

Note: **Satisfactory rating – 6 points** **Unsatisfactory - below 6 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation Sheet 1	Cleaning and maintaining Tools and equipment

Cleaning and maintaining Tools and equipment

1. Collect tools together
2. Remove some dirty material properly
3. Apply oil to prevent rust
4. Remove rust with a wire brush
5. Sharpen tools for peak efficiency
6. Grind battered tools into shape
7. Put tools and equipment properly on shelf for storage

LAP Test	Practical Demonstration on

Name_____ Date: _____

Time started: _____ Time finished:_____

Instructions:

Task1. **Cleaning and maintaining Tools and equipment**

Reference

1. Cooper, Julia, Urs Niggli, and Carlo Leifert. *Handbook of Organic Food Safety and Quality*. Boca Raton, Florida: CRC, 2007. ISBN: 978-0-8493-9154-5.
2. Francis, Charles A. 2009. *Organic Farming: The Ecological System*. Madison, WI: American Society of Agronomy, 2009. ISBN: 978-0-89118-173-6.
3. Barker, Allen V. *Science and Technology of Organic Farming*. Boca Raton, Florida: CRC, 2010. ISBN: 978-1-4398-1612-7.
4. Reed, Matthew. *Rebels for the Soil: The Rise of the Global Organic Food and Farming Movement*. London: Earthscan, 2010. ISBN: 978-1-84407-597-3.
5. *Fließbach, A.; Oberholzer, H.; Gunst, L.; Mäder, P. (2006). "Soil organic matter and biological soil quality indicators after 21 years of organic and conventional farming". Agriculture, Ecosystems and Environment.* ***118****: 273–284. doi:10.1016/j.agee.2006.05.022.*

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Profile of trainers participate on special Horticultural Crop Production TTLM development for level I at Adama 2019