TVET CERTIFICATE III IN CROP PRODUCTION

MODULE TITLE: OPERATING SMALL FARM TOOLS AND EQUIPMENT

CRPFT302

Operate small farm tools and equipment

Competence

Credits: 3

Learning hours: 30

Sector: Agriculture and food processing

Sub-sector: Crop production

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Purpose statement

This module describes the skills, knowledge and attitude required to operate small farm tools and equipment. It is designed for learners who have successfully completed nine years basic education or its equivalent and pursuing TVET Certificate III in crop production or any other related qualifications. At the end of this module, learners will be able to prepare, familiarize and maintain small farm tools and equipment. Qualified learners deemed competent may work with others for regional, national and international professional work under maximum supervision.

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	equipment according to their categories	
	3.3. Proper repairing of small farm tools and equipment referring their wear and faults	
	3.4 Proper record keeping as required by supervisor	

Learning Unit .1. Prepare for small farm tools and equipment operations

LO 1.1 Interpret instructions provided by supervisor

- Instructions on tasks to be done in small farm tools and equipment

In small farm tools and equipment, the interpretation of the instruction provided by the supervisor in a crucial stage to achieve the targeted result. Therefore, it is important to read careful and understand the given instruction on:

- ✓ Identify clearly Small Farm Tools and Equipment used in performing different activities of farm
- ✓ Perform correctly the manipulation of small farm tools and equipment used in different activities of agriculture.
- ✓ Identify clearly Small farm tools and equipment selection criteria according the activities to perform
- ✓ Perform correctly the maintenance and repairing activities of small farm tools and equipment used in farm
- ✓ Perform correctly the storage of small farm tools and equipment used in different activities of farm.

LO 1.2 Assess occupational Health and Safety (OHS) hazards and risks for reporting to the supervisor.

- **Types of hazards associated with small farm tools and equipment**

All hazards are assessed and categorized into three groups: biological, chemical and physical hazards. A general definition of a hazard as related to food and tools safety is conditions or contaminants that can cause illness or injury.

A) Biological hazards

Biological hazards are organic substances that pose a threat to the health of humans and other living organisms. Biological hazards include pathogenic microorganisms, viruses, and toxins (from biological sources, spores, fungi and bioactive substances.

B) Chemical hazard

Chemical hazard is a type of occupational hazard caused by exposure to chemicals in the workplace. Exposure to chemicals in the workplace can cause acute or long-term detrimental health effects. These hazards can cause physical and/or health risks. Depending on chemical, the hazards involved may be varied, thus it is important to know and apply the PPE especially during the lab.

Long-term exposure to chemicals such as silica dust, engine exhausts, tobacco smoke, have been shown to increase risk of heart disease, stroke, and high blood pressure.

C) Physical hazards

A physical hazard is defined as "A factor within the environment that can harm the body without necessarily touching it. Vibration and noise are examples of physical hazards".

Physical hazards include but aren't limited to electricity, radiation, pressure, noise, heights and vibration amongst many others.

Physical hazards include objects that are hard or sharp such as glass, metal, plastic, stones, pits, wood, or even bone. Physical hazards can lead to injuries such as choking, cuts, or broken teeth. Foreign material such as hair, insects, or sand that are not likely to cause injuries.

- Hazards risks

✓ **Risks associated to chemical hazards**

Risk of:

Burns, dermatitis, fire and explosion.

Possible causes:

Contact with fuel or battery acids.

Inadequate ventilation in battery charging area leading to hydrogen gas build up.

Failure to wear PPE.

✓ **Falling objects hazard**

Risk of:

Minor injuries such as cuts and bruises to serious injury even death.

Possible causes:

Lack of space resulting in goods falling from shelf, poorly loaded material falling from vehicle, damaged pallets, unsafe system of stacking and incorrect type of pallet for racking system.

✓ **Fire hazards**

Risk of:

Smoke inhalation, burns and death.

Possible causes:

Overloaded sockets or extension leads, faulty equipment, no or poor maintenance of equipment, blocked or obstructed fire exits, accumulation of rubbish, escape routes not clearly marked and goods stored too close to lights.

Roll cage hazard

Risk of:

Bruises, trapped hands or feet, musculoskeletal disorders and serious injuries even death.

Possible causes:

Overloading or overbalancing of cages, not loading and unloading on level ground, no brakes or handles on cage, no system for removal or reporting of faulty cages, repetitive loading and unloading of cages, pushing or pulling heavy cages, roll cage falling off lorry and trapping hand between wall and cage.

- ✓ **Slips, trips and falls hazards**

Risk of:

Minor injuries such as cuts to major injuries such as broken bones, concussion and even death.

Possible causes:

Even floors, obstructed floors, surfaces or aisles, trailing leads or cables, poor housekeeping, wet or contaminated floors due to spilt goods, stretch wrapping or leaks, trips due to discarded packaging, strapping or pallets, poor lighting and inappropriate footwear.

- ✓ **Storage and racking hazard**

Risk of:

Serious physical injury, death, property and goods damage.

Possible causes:

Racking collapse due to overloading or collision of vehicle with racking, falling objects, unsafe method of stacking, storing and retrieving goods, no racking protection in place and Safe Working Load (SWL) for racking not known and displayed

- ✓ **Vehicular movement hazards**

Risk of:

Serious physical injury even death and property damage.

Possible causes:

Person, vehicle or property being hit by delivery vehicle or forklift truck, no traffic management system, lack of driver training, poor workplace set up, reversing vehicles, inadequate separation of people and vehicles, unauthorized drivers, no designated pedestrian routes, no restricted access to area and loss of vehicle control e.g. due to uneven surfaces.

- ✓ **Work at height hazards**

Risk of:

Minor injuries such as bruises and cuts to major injuries such as concussion, broken limbs and death.

Possible causes:

Lack of proper access equipment to good stored at height.

Improper use of equipment such as standing on the forks of a lift truck in order to access goods.

Incorrect or unsuitable equipment used for the job and climbing racking to access goods.

1.3. Select PPE according to the desired operation.

- Content/Topic 1. Types/ categories of PPE according to the desired operation

PPE: is used to prevent exposure to infectious materials. In other words, it acts as barrier to stop the spread of germs. Infectious materials can be air born in the form of droplets, or happen through contact routes.

The selection of appropriate PPE is based upon the hazard assessment. One can follow the following assessment steps:

- Identify the potential hazard
- Determine the types of protective equipment available for the present hazards
- Evaluate the effectiveness of PPE

- Select the appropriate protective equipment

Depends on the identified hazard, the selected PPE should fulfil some of or the following conditions on which **SAFETY** stands for.

- The equipment should protect the head/**Skill**
- The equipment should protect the **Arms**
- The equipment should protect the **Face**
- The equipment should protect the **Ears/Eyes**
- The equipment should protect the **Toes**
- The equipment should protect **Yourself**

Types of PPE are:

1. **Eyes and face protection equipment:** they include

- **Face shields**: Covers the face with a clear plastic screen. They protect the face from infectious droplets and contact with contaminated materials. Without a face shields, germs can gain access through the mucous membrane like those in the mouth, eyes and nose.
- **Goggles and glasses**: protect the eyes from infectious droplets and in the same cases, from contact with infectious agents.

2. **Hand protection equipment**

Gloves: Cover the hands and wrists protecting the skin from contact and droplets exposure. Gloves are most widely used type of PPE.

3. **Body protection equipment**

- **Gowns**: Protect clothing and skin from droplets and contact with infectious materials. Some are placed over clothing and tied in the back, adequately covering the arms and torso and parts of the legs. Other are more like a long drape or suit that covers most of the body.
- **Head covers**: protects the spread of germs through droplets or contact routes. It can also prevent some accident injury like up down fall mass over the head.
- **Shoes covers/ Rain boats:** Prevent accident on the toes and feet

4. **Respiratory protection equipment:**

A face cover fitted with a finer filter that removes small particles than masks. Respirator are classified in number and letter. We have respirator with 95, 99 and 100. It means the percentages of particles that are removed by the filters are 95%, 99% and 100% respectively.

They are also classified as N, R and P as the ability to resist to oil. N respirator is not oil resistant; R respirator is more resistant to oil while P respirator is oil proof.

5. **Hearing protection equipment:** To protect the farmer from noise during farming activities where noisy machines are used

- Content/Topic 2.PPE selection criteria

During selecting PPE, one should consider the following criteria:

- **Potential hazards/Working environment** : one have to assess the environment by identifying all available hazards
- **Compatible/Available PPE to the hazard** : one match PPE to the hazards
- **Level of protection/Effectiveness of PPE to the hazards**: Ability of PPE to protect the exposed person to varieties of infections.
- **Fitiness/Size to properly fit the user**: Not too small or not too large compared to the size of the user.
- **Use orTask to perform**: PPE used by a farmer during tillage activities is different from those used during pests and diseases control.
- **Durability of PPE**: Has long life span
- **Awareness of limitation/Frequency to be used**: It should be reusable after properly cleaning.
- **Cost of PPE**: Even though the PPE should protect the user, it should not be expensive

LO 1.4: Identify environmental implication of small farm tools and equipment for discussing with supervisor

Definition

Environmental Impact Assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-**economic, cultural and human-health impacts, both beneficial and adverse.**

- **Content/ topic 1.Types of impacts of incorrect use of small farm tools and equipment on environment**

Agriculture is essential in sustaining human life; the practices associated with it have been known to have certain impacts on the environment. Some of the environmental impacts of agriculture include climate change, pollution, soil degradation, and deforestation.

A) Negative impact:

The most notable of these effects includes climate change, deforestation, pollution, and general environmental degradation

Climate Change

Agriculture and climate change have a reciprocal relationship.

Climate change affects agricultural production through precipitation levels and temperature variations. In return, poor agricultural practices by incorrect use of tools increase climate change. The most significant climate change associated with agriculture is brought about by methane, nitrous oxide and carbon dioxide, all of which are greenhouse gases released into the Earth's atmosphere from farming.

Pesticides and fertilizers application affect the quality of air through production of compounds like phosphorus, nitrate and ammonia.

Pollution

In order to enhance agricultural production quantity and quality, several additives to the soil are used in farming. The widely used are pesticides and fertilizers, which end up as

pollutants in water run-off from the soil. This run-off can adversely affect more people and animal wildlife.

Soil Degradation

In all ecosystems, the waterlogging and biodiversity held in soil is massive. Healthy soils are vital to creating ample food production. Although agriculture is not the sole cause of soil degradation, poor farming practices are known to cause a considerable decline in the quality of soil. This mainly results from pesticide contamination, salting. Soil erosion leads to loss of soil fertility and structure.

Deforestation

Deforestation provides more land for crops and pasture. Deforestation enhances the effects of climate change. Destruction of habitat amongst species also leads to fragmentation and depletion. Extensive deforestation affects the water cycle, which results in interferences with precipitation.

Soil Erosion

Excessive water-supply and wind removes the top fertile layer of the farm. Loss of nutrient rich soil not only reduces productivity, but also results in silting of water bodies and streams and induces release of soil carbon from particulate organic material, which contributes to global warming.

Water-logging and salinity

Due to improper drainage, water gets accumulated in the farm known as water-logging. When water evaporates, it causes salinity in the soil. As a result, the crop plants die.

Eutrophication

When the water runoff with chemical fertilizers reach to the nearby water body small water plants grow in excess known as Algal Bloom.

Positive impact:

Agriculture affects the environment positively in the following ways:

Agriculture preserves ecosystems

Agriculture helps preserve valuable ecosystems. A perfect example is the extensive farming of increasingly rare permanent grasslands.

Grasslands provide habitat to a great number of animals and native plants. Both methods naturally maintain and enrich these habitats, promoting healthy regrowth of unique high-biodiversity vegetation.

Agriculture boosts soil fertility

One of the key features of sustainable agriculture is the focus on the health of soils.

Practices such as crop rotation, cover cropping, no-tillage and the application of compost improve soil fertility naturally and can even speed up the process of new topsoil formation.

In addition to preventing the exhaustion of soils, and therefore, helping secure stable yields, these practices increase biodiversity of favourable soil fauna and flora.

Soils rich in organic matter and flourishing with life also contain greater concentrations of the natural enemies of pests, thus supporting the growth of more resilient crops.

Agriculture retains soil and prevents erosion

Loss of soils is one of the biggest threats to our wellbeing, and intensive agriculture with monoculture fields is known to be one of its main contributors. Farmers, however, have the ability to reverse this damage.

In perennial systems, vegetation with deep roots helps to hold the soil together and prevent erosion. This is especially the case when farmers have constructed swales and other types of earthworks that help to stabilize steep slopes, or when applying techniques with low soil disturbance such as no-tillage.

Agriculture has a role in the water cycle

Plants and trees in agricultural systems help to retain and add water to underground aquifers. This process is most effective when the crops being grown are perennials that continue to grow every year and have deep, well-established root systems.

A successful strategy that has been applied, is to plant trees, bushes and grasses mixed together. By combining plants of different sizes, soils are evenly covered and can withstand torrential rains without being washed away. This improves soil structure and enables rainwater infiltration.

Once water enters the soil, it passes through different soil layers all the time getting rid of pollutants until it reaches groundwater reservoirs perfectly clean and safe for us to drink.

Agriculture can conserve water

Modern farming methods such as strip or no-till, dry farming and planting of cover crops significantly reduce the need to irrigate.

The higher the water content in the soil, the less irrigation is needed during dry spells to preserve crops, which saves significant amounts of water over the long term.

In certain forms of agriculture, properly processed sewage, wastewater, and sludge can be used on the landscape instead of disposing it as waste.

In these cases, wisely chosen vegetation acts as a “living filter”, getting rid of pollutants, while utilizing water for growing. This method saves farmers’ money, conserves water, and recycles nutrients.

Learning Unit 2 – Manipulate small farm tools and equipment

L.O.2.1 Identify small farm tools and equipment

Content /Topic 1. Types of small farm tools and equipment.

The type of Small farm tools and equipment are classified according to the farming operations or activities to be done.

1. **Field measurement:** Tape measure, pegs, ropes , GPS, Theodolite, dumpy level reading staff
2. **Land clearing:** Pick axe, Spade, Shovel, Rake, Hoe, Fork-hoe, Pangas, Slasher, Pick, wheelbarrow
3. **Topographic data collection**: Carpenter Level , Pangas, Rope , Theodolite, dumpy level reading staff , pegs , GPS, Computer , Tape measure, A-frame level, N-frame level, Automatic level, Pegs, Ranging poles, Compass, Clinometer
4. **Climatic data collection**: Thermometer, Rain gauge, balometer, anemometer, weather van.
5. **Soil erosion control**: Level, Pick axe, Spade, Shovel, Hoe, Fork-hoe, Pangas, Pick, wheelbarrow.
6. **Soil sampling**: Plastic sample buckets, shovel or spade, sample bags, markers for identifying samples on sample bags.
7. **Plant multiplication/plant macro propagation:** knives, plastic bag, secateurs
8. **Plant pruning**: secateurs, pruning saw, knaves
9. **Primary tillage**: Level ,Pick axe, Spade , Shovel, Rake, Hoe, Fork-hoe, Pangas, Slasher, Pick, Manure fork, wheelbarrow
10. **Secondary tillage**: Hoe , Rake, Spade , Shovel, Hand fork, watering can, , Panga, , Pick
11. **Sowing/planting/transplanting**: Shovel, Rake, Hoe, Fork-hoe, Pangas, Slasher, Pick, Manure fork, wheelbarrow
12. **Earthing up**: hoe, Garden hoe.

13. **Fertilizers making and application**: Balance , wheel barrow , baskets, Agro-chemical backpack or knapsack, Spray pump
14. **Weeding**: Secateur, sickles,panga, rake, spade, Weeding prong
15. **Watering/irrigation**: watering can , jercan, battle, clay pot, pipes, sprinkles
16. **Pest and diseases control**: Knapsack sprayer, balance, spoon, syringe,
17. **Harvesting**: Harvesting snips, Harvest knives, Secateurs, balance, picking crates, picking baskets Picking bins
18. **Post-harvest handling**: Containers, bins, food-packing material, dump tanks, and transport vehicles
19. **Transportation**: wheelbarrow, Transport vehicles, Tractor
20. **Storage**: sack, basket ,
21. **Farm electrification**: wire, Wire cutters,pliers
22. **Fire fighting**: extinguisher, Wire cutters and knives.

- Content/Topic 2. Tools and equipment selection criteria

Tools and equipment are selected according to the below criteria:

- **Activity to be done**

Farmers select tools differently depend on the agricultural to be done. Tools used in land clearing are different from tools used in first tillage and second tillage respectively. Likewise, tillage tools and equipment are different from those harvesting and handling.

- **Working conditions of tools and equipments**

During farming practices, tools and equipment with high speed are more likely than those of medium and low speed. Otherwise, tools and equipment with defects are not selected during farming activities.

- **Availability and accessibility**

In farming activities, farmers prefer to buy and use available locally farming tools. This selection also depends on their financial means to access on the tool and equipment.

- **Cost**

The cheapest tools and equipment are more likely than the expensive tools and equipment. It means that the cost of the tools and equipment may incite farmers to buy it or not.

- **Tools and equipment efficiency**

Tools and equipment also may be selected depends on how well they perform a given agricultural activity. It may also be selected depends on how well it minimizes the farming cost. eg. Farming by using machine (tractor) works well the land (first tillage and second tillage) and minimizes cost compared to that of using work force (manpower).

- **Durability**

Tools and equipment with long lifespan are more preferable than those with low lifespan.

- **Maneuverability**

Tools and equipment that are easy to handle are more likely than those with difficulty to handle.

LO 2.2 Manipulate small farm tools and equipment

Topic 1.Adjustment of small tools and equipment

All tools can be handled correctly which enhances the functionality and safety of tools. Incorrect use impairs functionality, is detrimental to the tool and may be dangerous to the user and or other people. The adjustment of tools and equipment is focusing on:

- ✓ Handle fixing
- ✓ Sharpening
- ✓ Depth adjustment
- ✓ Spacing adjustment
- ✓ Fixing of screw

Topic 2. Types of farm operations

- ✓ **Land preparation**

Land preparation starts with removal of shrubs and stumps from rice fields. The land is then ploughed using hand hoes such as jembe/panga, oxen or tractors. Power and equipment are required for tillage in different soil types are varied. It is essential to plough when land is dry to reduce weeds. However in difficult soils such as virgin lands there may be need to wet the field before ploughing. It is generally recommended that two ploughs and one harrow or rotovation are sufficient for soil disturbance long before planting to establish a fine tilth. Fine tilth improves germination reduces seeding rate and improves seedling uptake in irrigated ecologies. Ensure soil surface is level to enhance water application by irrigation. The field requires adequate drainage system to allow rapid removal of excess water. However, land preparation will vary according to cropping system used.

- ✓ **Planting**

Planting can be the most rewarding and satisfying part of forestry. It involves site preparation, preparing, transporting, and planting the seedlings, and site maintenance and protection.

Site preparation and planting methods vary by site and project objectives. Some techniques, such as the even spacing of holes and rows, and the construction of fences and roads, are used for larger-scale projects on flat land. Other techniques such as contour planting, grading, and mulching are typical of upland agro forestry systems.

- ✓ **Crop Maintenance**

Farming is a complex activity, one in which every segment impacts the crop production. In order to achieve a successful crop production, a farmer needs to manage all segments properly. Therefore, after soil preparation and planting are completed, there is no time for a break. Farmers who want to achieve high yield and quality crops must practice crop maintenance regularly throughout the growing season.

Crop maintenance practices which are necessary for proper crop growth are as follows:

Weeding, Soil cultivation, Irrigation, Mowing, Insect pest and disease control, Removal of standing water, Pruning

Each of the aforementioned practices needs to be done in a timely manner. However, the right time for performing crop maintenance practices will depend on crop growth stage, soil, crop, and weather conditions.

- ✓ **Harvesting**

Harvesting is the act of removing a crop from where it was growing and moving it to a more secure location for processing, consumption, or storage. Some root crops and tree fruit can be left in the field or orchard and harvested as needed, but most crops reach a period of maximum quality—that is, they ripen or mature—and will deteriorate if left exposed to the elements. While the major factor determining the time of harvest is the maturity of the crop, other factors such as weather, availability of harvest equipment, pickers, packing and storage facilities, and transport are important considerations.

- ✓ **Farm soil erosion control**

Soil erosion control is the prevention or control of wind or water erosion that leads to the detachment, transportation and re-deposition of soil particles and the loss of soil fertility. Soil erosion control can be used on different land use types, such as cropland and forest/woodland. There are many approaches to reducing soil erosion, and most fall into one of three measures: 1) structural measures, such as bunds and stone walls; 2) vegetative measures, such as windbreaks and live hedges, and 3) combined or integrated measures, such as river bank stabilization.

- ✓ **Farm topographic data collection**

Topographical data are information about the distance, horizontal angles, slope and elevation measured on the earth surface. The information collected from the ground, will allow to the topographer to implement different structures use in agriculture practices.

- ✓ **Farm soil and plant sampling**

Soil sampling

Soil sampling is a method that can be used for exploration of geothermal resources that lack obvious surface manifestations. Soils that are above or adjacent to a “hidden” hydrothermal system will have a unique chemistry that can be indicative of a hydrothermal system at depth and a zone of relatively high permeability

Plant sampling

Plant aboveground sampling for quantifying weeds In general, most plant sampling techniques that are used for crops apply equally well to invasive species. However, the patchiness of weed infestations may sometimes require slightly different approaches to select representative samples

Farm produce handling

Assuring the safety of the products vendors sell at the farmers' market begins long before food is available for purchase. It is essential that growers work to reduce exposure to contaminants and minimize the potential for bacterial growth during production, harvest and handling steps. Manure management, water source and usage, and farm worker health and hygiene are the three major factors that can contribute to the risk of produce contamination on the farm. By addressing these components before planting, during production, and throughout harvest and post-harvest handling, the risk of contamination can be minimized. Risk for contamination after the farm may occur in retail stores, restaurants, or the home.

LO 2.3 Fabricate specified small farm tools (rake maker, pegs, A frame, ranging pole, Poles, Handles)

Topic 1. Fabrication procedures

- ✓ Hand sketching

Rake maker

A rake is a simple tool in its structure – the skill lies in selecting suitable timber and knowing the best orientation of grain to make the strongest possible tools that will last for several seasons. The skill also lies in knowing what a rake user needs and the conditions and environment in which they work, paralleled with recognizing the best sources of wood and understanding the seasoning process.

A combination of hand tools and machines are used for batch production, including such items as a traditional tine maker, shave horse, and a rounding machine for producing handles more quickly.

Local forms

Variations in the use of local materials and deviations from the standard can help identify regional types. The most common designs are the split handle or 'swallow tail' rake and the larger and heavier 'bow' rake.

The design and materials varied across the country

Pegs

Pegs are used when certain points on the field require more permanent marking. Pegs are generally made of wood; sometimes pieces of tree-branches, properly sharpened, are good enough. The size of the pegs (40 to 60 cm) depends on the type of survey work they are used for and the type of soil they have to be driven in. The pegs should be driven vertically into the soil and the top should be clearly visible.

Poles

A long, slender, rounded piece of wood or metal, typically used with one end placed in the ground as a support for something.


Figure: poles used in different activities

Handles

Custom manufacturer of tool wooden handles for agricultural applications. Types include hoe, Hummer, pruning, rake, shovel and trowel handles.

Hoe handle **Hammer handle** **Mattock handle**

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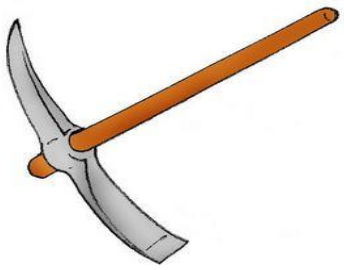

- **Ranging poles**

A **ranging pole** is a surveying instrument used for marking the position of stations, and for sightings of those stations, as well as for ranging straight lines. Initially these were made of light, thin and straight bamboo, or of well-seasoned wood such as teak, pine or deodar. They were shod with iron at the bottom and surmounted with a flag about 250 mm square in size. Nowadays they are made of wood, metal or fibreglass. The rods are usually about 30 mm in diameter and 2 m or 3 m long, painted with alternating bands, such as red and white, red and yellow, or black and white, in lengths of 200 mm, 500 mm, or one foot. These

colours are used so that the rod can be properly sighted in case of long distance or bad weather.

Ranging poles may never be curved.

Ranging poles are usually painted with alternate red-white or black-white bands. If possible, wooden ranging poles are reinforced at the bottom end by metal points

Figure: Ranging poles

The correct way to hold a ranging pole is to keep it loosely between thumb and index finger, about 10 cm above the soil.

When the observer indicates that the ranging pole is in the right position, the assistant loosens the pole. The sharp bottom point of the ranging pole leaves a mark on the soil exactly where the pole has to be placed. Once in place, it should be checked if the ranging pole is vertical, e.g. with a plumb bob, or a carpenter level.

A – Frame

The A Frame is an A shaped structure made from wooden poles or thin metal poles that can be easily constructed and used to peg flat or graded contours or water drains. These contours are mostly used as soil and water conservation structures. Where rainfall runoff is less, i.e. less than 600 mm of poorly distributed rains it is advisable to make flat contours whereas where there are chances of water-logging it is advisable to slightly grade the contour to allow water drainage.

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Figure: Utilisation of A - Frame

The justification

There are a number of reasons why one could choose to use the A Frame for pegging compared to pegging with a machine

The main advantage of the A-frame is that it can be constructed very easily using local materials and literacy is not essential for making and using it. When farmers are faced with a

developing gully or erosion in their field they often don't just look while the soil is being washed but rather improvise to save the situation. In that bid they often exacerbate the situation by digging down the slope or make ditches that are very graded. The A Frame at least assists the farmer to safely peg and construct contours that save the soil. In some countries those mandated to peg may not have adequate resources like transport and equipment to service farmers. It is extremely important that farmers know how to peg and dig contours because contours are very important as they form the first line of defense against erosion and they are the backbone for all other in field conservation works.

The A Frame making

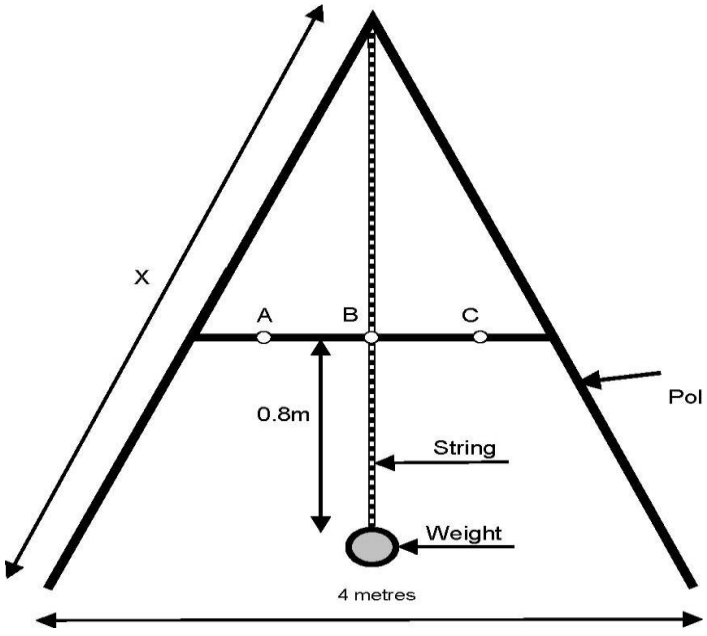


Figure: A-FRAME

Figure 2: The A frame layout

A = 1st graduation mark

B = 2nd graduation mark

C =Approved frame centre = Centre of distance between A to B.

Construction procedure

• Nail together the top of the 3 metre poles so that there is an inverted V form. These poles should be thin, at most 3 cm in diameter.

• Open the base of the V until its 4 metres.

• From the pivot of the V measure 2.2 metres going down and mark on 3 m sides or 0.8m from the bottom.

• Nail the 1.5m rail across the 2 legs on these marks.

• From the apex suspend a string at whose end there should be a stone or half brick knotted on. This is called a bob.

• You may add an extra strength by putting 2 or 3 rounds of tying wire over the nail positions.

• The A Frame is now complete

- ✓ **Select raw materials Type of raw materials**
  - Woody materials

People have used wood for thousands of years for many purposes, including as a fuel or as a construction material for making houses, tools, weapons, furniture, packaging, and paper. Known constructions using wood date back ten thousand years. Buildings like the European Neolithic long house were made primarily of wood

  - Metal materials

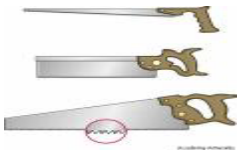
The earliest tools were made of wood, flint, metal, tin, and bone. However, the development of metal working, first in copper and later in iron and steel, enabled the

manufacture of more durable tools. Industrial metalworking enabled the manufacture of efficient cutting tools including pruning shears grass shears, and loppers.

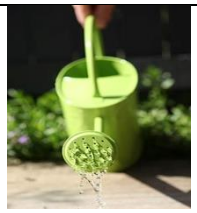
- **Selection criteria of raw materials**
  - ✓ Availability and accessibility of raw material
  - ✓ Cost of raw material
  - ✓ Durability of tool needed
  - ✓ Type of farm tools to be manufactured
- **Utilisation of small farm tools and equipment**

Tools and equipment	Sketch	description and function or utilization
Spirit-levels		Use it against smooth surfaces such as walls or while building to ensure that surfaces are straight and corners are at a 90° angle.
Pick axes and mattocks		**1.** Picks and mattocks are used to work soil that is hard, rocky or root filled. **2.** A pick has a pointed tip on one end and a chisel like tip on the other. **3.** Mattocks are used for loosening soil that is root filled. **4.** Mattocks have an axe-head on one side and a flat hoe like head on the other.
Spades		• Spades are useful for cutting and digging heavy soil, digging straight-sided, flat-bottomed trenches, or removing a layer of sod.
Shovels		• Shovels are used for digging and lifting loose soil or other substances. • Useful tools to be used if you have a large amount of lightweight material to move is a wide scoop shovel

Rakes		• There are two main types of rake - a steel rake and a plastics or rubber lawn rake. • Steel garden rakes are used to level and prepare seedbeds for sowing. They are not meant for use in lawned areas. Garden rakes damage the turf as their tines become plugged with debris. • Lawn rakes handle lawn debris such as grass clippings and leaves. They are best used with a drawn sweeping motion like you would draw a broom.
Hoes		• Hoes are used for cultivation and weeding. • There are many types of hoe available. ✓ Triangular shaped hoes are good for breaking into hardened soil, weeding, and cultivation in tight spots. ✓ The blade of the hoe rests on the ground and is moved back and forth to remove weeds just below the soil surface.
Garden forks and pitch forks		• Garden forks have thick tines and are used for turning soil and breaking up soil clods. • Pitchforks have longer tines and are useful for moving light, loose material e.g. Hay or Lucerne
Panga or machete		Panga's or machetes are used to cut down stubborn weeds, reeds, tree saplings and can also be used to harvest grain.
Pesticide backpack sprayers and hand held spray pumps		• Pesticide applicators are used to apply to small areas. • The applicators can also be used to apply foliar fertilizers • A number of specialized low and ultra-low volume applicators are also available.

Hammers		• Hammers are used nail nails or hooks into walls or wood (small hammers). • Rubber hammers are used to level tiles. • If you want to break down walls and concrete structures you need a sledge hammers. • It is essential to use the correct hammer for the specific job. • Small carpentry hammers are provided with an end that can remove nails. The use of the claw to remove nails is however discouraged purpose because it often damages or breaks the head and can cause injury. It is better to use a purpose made claw-like nail remover, or specialized pliers.
Saws		• Generally handsaws are used to saw through wood. • There are specialized saws available that are operated by two people that were designed for cutting down trees. • Bow saws are used to trim trees or cut down branches
Secateurs		• Secateurs are used to cut through plant shoots during summer or winter pruning or during plant manipulation. • Different designs and strengths of secateurs are available. The different designs are designed to cut through branches and shoots of different thickness.
Paintbrushes		• Paintbrushes are used to apply paint to walls or oil to moving machinery parts. • Different widths and grades of paintbrushes are available, designed to be used for specific painting

		purposes and types of paint. • Paintbrushes are often used to apply herbicides to cut surfaces of invader species.
Harvesting snips and knives		Used to pick fruit from trees and vines during harvest.
Spanners		Various bolts can be fastened or loosened using the spanner of the correct size.
Screw drivers		• Tighten or loosen screws of different sizes. • Flat ended screwdrivers are used to tighten or loosen flat head screws, whilst Philips screwdrivers (“star”) are used for star head screws. • Some screwdrivers are magnetic and will hold the screw to the tip of the screwdriver.
tape measure		A **tape measure** or *measuring tape* is a flexible ruler. It consists of a ribbon of cloth, plastic, fibre glass, or metal strip with linear-measurement markings. The tape is used to measure the surface or the field in general.
wheelbarrow		A **wheelbarrow** is a small hand-propelled vehicle, usually with just one wheel, designed to be pushed and guided by a single person using two handles to the rear. Use of wheelbarrows is common in the construction industry and in gardening. This is used in transporting of tools and equipment and materials used in agriculture.

watering can		A **watering can** (or **watering pot**) is a portable container, usually with a handle and a spout, used to water plants by hand.

2.4: Keep record as required by supervisor

Importance of farm records keeping

Farming is a business and good **farm record-keeping** helps the **farmer** plan and do realistic forecasting. **Record-keeping** provides valuable information on which methods work. The **farmer** can better predict price changes of inputs and produce from expenditures and sales **records** kept from previous years. The records provides all information of tools and equipment in all time in working and in off season

Content of record form

- ✓ Names of tools or equipment: ……..
- ✓ Date: ……..
- ✓ Activity performed: ……..
- ✓ Quantity of tools: ……..
- ✓ Tools and equipment condition or status: ……..

Methods of recording keeping

- ✓ Written recording(hard copy of a document written by hand or written by computer and be printed in to have this hard copy document)
- ✓ Soft record on computer(this is document obtained in computer as soft copy only without printing it)

Learning Unit .3. Maintain small farm tools and equipment

LO 3.1 Clean small farm tools and equipment store according to their types and us

Purpose of small farm tools and equipment cleaning

- ✓ All tools and equipment should be thoroughly cleaned with a high-pressure washer to remove dirt and trash residue. Accumulated trash and dirt can create fire hazards, malfunctions, corrosion and rust of equipment, which may result in breakdowns next season.
- ✓ Once equipment is clean, farmers should thoroughly service and lubricate the equipment. Also check for worn belts, loose bolts, oil leaks and the condition of all hoses, in addition to operational/ performance checks.
- ✓ Off-season is the time to make those necessary repairs and adjustments to avoid undue downtime during the next busy season.
- ✓ This also is a good time to apply touch-up paint to scratched or corroded areas. Many operators follow a good cleanup with a wax job to help protect the equipment from the elements, such as corrosion and oxidation.
- ✓ Most importantly, when equipment is checked carefully, small problems can be identified and corrected before they cause down- time next season.

- **Content/Topic 1. Cleaning products and materials**

Products

Cleaning Products Sanitizing can be done with a number of products. Many companies, such as EcoLab, have hydrogen peroxide- based products that are formulated specifically for cleaning hard surfaces.

Bleach solution (50 ppm is about 1. 5 tablespoons of household chlorine bleach per five gallons of water) is an inexpensive and commonly used sanitizing solution.

Whatever cleaner you use, you will need to monitor the concentration to make sure that it is the correct strength. In the case of chlorine bleach, use test strips to make sure the solution is at the needed strength.

Other cleaners will have different recommended concentrations. Follow all some detergents and cleaners are dangerous to use, so protecting workers and farmers is important; read the labels.

Materials:

Hose with nozzle, Putty knife, Old towels, Working gloves (optional), Steel wool, Household oil Soft rag, Scrub brush, Soap, PPE

Categories of small farm tools and equipment based on raw material

- ✓ Metal working farm tools and equipment
- ✓ Woodworking farm tools and equipment
- ✓ Plastic farm tools and equipment
- ✓ Hand spinning tools

- **Categories of small farm tools and equipment according to the size**
  - ✓ Large tools and equipment which are power tools or equipment
  - ✓ Medium tools and equipment which are not power tools and equipment and not small tools
  - ✓ Small tools which are not large and medium tools.

Malfunctions, faults, wears and damages to Small Farm Tools and Equipment

a) Causes of farm tools and equipment malfunctions, faults, wears and damages

- ✓ Lack of proper lubrication
- ✓ Breakage due to operators not handling the tools and equipment properly and according to instructions
- ✓ Leaks due to rough handling of equipment or improper assembling or mounting
- ✓ Corrosion due to improper washing and cleaning methods (use of wrong detergents or too high concentrations and/or temperatures).

b) Type of the soil

c) Period of work

d) Type of steel

Cleaning process

1. This should be done outside.
2. Scrap off any caked on mud or dirt using a putty knife.
3. Using the hose with nozzle set on its most powerful stream; rinse the tools off thoroughly, removing all dirt, mud and other debris.
4. Wipe the tools down thoroughly with the old towels.
5. If there is any rust on the metal parts of your tools, rub the rust off briskly with the steel wool, rinse and dry again. You may want to wear working gloves for this as steel wool can be rough on your hands.
6. If you are storing your tool for the season or for an extended length of time, pour a small amount of household oil (i.e. WD-40, 3-in-1 Household Oil, etc.) on a soft rag and rub over all exposed metal parts on your tools to apply a thin coat. This will help prevent rust and is generally a good idea to do once every six months even if you are not storing your tools.

- **Cleaning harvest containers, tools and food contact surfaces**

Cleaning Procedure

1. Clean harvest containers, tools and food contact surfaces before sanitizing. Sanitizers are more effective if the surfaces are clean and free of soil and other debris.
2. Rinse surface of container to remove soil and debris.
3. Wash surface of container with detergent and water. For harvest containers, use a high-pressure sprayer hose.
4. Rinse with clean potable water.

Any detergent can be used for the wash step on hard surfaces. Only detergents soaps that come in contact with food need to be labelled as safe for food. Read the label and make sure you follow the instructions on the label.

Sanitizing harvest containers, tools and food contact surfaces

- ✓ Apply a fine mist of sanitizer solution to surfaces using a sprayer.
- ✓ Let containers, tools and surfaces air dry. Do not dry with towels

LO 3.2 Store small farm tools and equipment

Farm workshop facilities

A workshop provides a focal point at the farmstead for the repair and maintenance of machines, implements and structures. It also provides a place where tools can be stored in an orderly manner, a store for supplies and spare parts, and a shelter where work can be carried out during inclement weather. A facility of this type should be available on every farm. The size and design of a workshop, however, should be commensurate with the size of the farm and the work to be done in the shop.

The small holder may be adequately served with a tool storage cupboard that can be locked for security and a workbench with a simple homemade vice for holding tools while they are being sharpened or fitted with new handles. From this simple beginning a more complete facility may gradually evolve as the farm operation grows and more equipment is required. Since repair tools and supplies represent a considerable investment, most farmers will want to store them in a secure place. Many small scale farmers will not require a separate store for this purpose, but if stored together with hand tools and small implements, the number of items may motivate the farmer to build a storeroom by enclosing part of the workshop with solid walls

At the other extreme, a large ranch or commercial farm may need a separate building with extensive equipment for maintaining the farm machinery, tractors and vehicles. A farmer may also use his workshop to do routine repairs and preventive maintenance during the off season, to build or modify some of the equipment used on the farm and to prefabricate building elements to be used in construction projects.

The workshop facilities should be cost effective. That is, enough savings should be realized from timely maintenance, repairs and construction projects to pay for the cost of the building and the necessary tools and equipment. Although it is difficult to put a monetary value on timeliness, there is no question that being able to make emergency repairs is important. Some farm operations (planting, spraying, and milking) are more sensitive than others to prolonged interruptions, and having facilities to complete repairs on the farm can reduce delays to a minimum.

Other factors, apart from the farm size, which will influence the extent of the workshop facilities are the number and diversity of machines, the availability of service from dealers, and the interest and mechanical skill exhibited by the farmer and farm laborers. If necessary, a skilled mechanic may be employed. Without qualified personnel to use the shop it becomes questionable in value and may even contribute to more frequent breakdowns and additional expense due to careless work.

The workshop should be located close to the work center of the farm and convenient to the farm home on ground that is well drained and sufficiently level to allow easy maneuvering of equipment. Where electric power is available, proximity to the power source should be considered.

The following additional features are important for a safe and efficient shop:

1. Sufficient room for the largest machine that may need repair, including workspace around it. If the machine is large, truss roof construction may be needed to provide the required space without intermediate supports.

2. An entrance that is both wide enough and high enough for the largest equipment that the shop has been designed to accommodate. If the building is enclosed with either solid walls or wire netting, a second door is essential for safety in case of fire.

3. Some means of lifting and supporting heavy loads. When the roof span is 3m or less, a timber beam is often adequate. For larger spans or very heavy loads a truss will be required. Alternatively, a portable hoist can be used.

4. Electric lighting and electrical service for power tools.

5. A water supply for both convenience and safety.

6. One or more fire extinguishers of a type suitable for fuel fires. Two or three buckets of dry sand are a possible substitute or supplement for a fire extinguisher.

7. Storage cabinets for tools, supplies and spare parts. Sturdy doors can be locked for security and also provide space to hang tools and display small supplies for easy access.

8. A heavy workbench attached to the wall or otherwise firmly supported. It should be 1 m high, up to 800mm deep and at least 3m long and equipped with a large vice. There must be sufficient clear space around it to maneuver work pieces and, if attached to a solid wall, ample window openings above it to provide light.

Equipment needed in the workshop will depend on the type and extent of work to be done. Generally this means those tools required to perform day-to-day maintenance on machines and to carry out general repair work and small construction jobs required on farm buildings and equipment. However, any shop, regardless of size, will need some simple woodworking tools, some means of sharpening field tools, and wrenches (spanners) of various types and sizes. If the shop equipment includes a welder, it should be located, in the interest of safety, away from the woodworking area and preferably near the main door where it can conveniently be used inside or outside the building.

- **Categories of small farm tools and equipment based on raw material**
  - ✓ Metalworking farm tools and equipment.
  - ✓ Woodworking farm tools and equipment
  - ✓ Plastic farm tools and equipment
  - ✓ Hand spinning tools.
- **Categories of small farm tools and equipment according to the size**
  - ✓ Large tools and equipment which are power tools or equipment
  - ✓ Medium tools and equipment which are not power tools and equipment and not small tools
  - ✓ Small tools which are not large and medium tools and equipment.
- **Storage conditions**

✓ **Keep your tools in a dry place**. It seems obvious, but garages and basements and other enclosed spaces can have humidity issues, especially if they are not heated or air-conditioned. If you keep your tools in a location like this, especially if you keep them out on shelves or pegboards; consider investing in a dehumidifier to keep the dampness down. They're not terribly expensive, especially compared to your investment in your tools, and most let you set a humidity level so the dehumidifier turns on only when it needs to.

- ✓ **Hang your garden tools**. Even if you keep your garden tools inside the garage or your shed, hang them so that they don't rest on the floor. Moisture can easily creep up from concrete floors.
- ✓ **Store power tools in their original cases**. Unless you have a climate-controlled workshop, your best bet for storing power tools in the hard plastic cases they usually come with. Not only are they better-protected from humidity, they're just better-protected in general.
- ✓ **Use silica gel packs or rust collector**. The silica gel packs that come in lots of packaging are great at keeping moisture at bay. Toss them in drawers or toolboxes and they can help keep rust away. You can also buy rust inhibitors for the same purpose and even anti-rust liners for drawers and shelves

- **Arrangement of small farm tools and equipment**

Storing smaller and larger items

Many store rooms have untapped potential that can be utilized to make room for more storage. Shelving is vital – inexpensive shelves can be purchased from most co-operatives or more expensive custom-designed cabinets can be installed. Keeping things in containers not only lets you get them off the workbench or the floor but also keeps them clean and dust free. Always label opaque containers so you know what is inside them.

Allocate space for hand tools separately from other equipment such as tractors, spray pumps, mowers and weed trimmers. Decide which items you need to use often, such as hand tools, and store these near the door.

Sanitation practices

- ✓ Ventilation
- ✓ Temperature
- ✓ Lighting

LO 3.3 <u>Repair small farm tools and equipment referring their wear and faults</u>

- **Content/Topics 1.Wear and Faults of small farm tools**

- ✓ **Blunt tools**

When we need to repair a damaged cutting edge/ periphery/ border. This problem could come about from dropping the chisel/ notch, burning the steel from incorrect grinding /

crushing , or any number of crises. During heat the farmer correct the periphery of blunt tools in order to remove the problem of the tools.

Blocked sprayers

The operation of a pump spray bottle depends on a spring-loaded plastic piston operated either by a trigger or a vertical pump mechanism. When you pull the trigger or press the pump, the piston forcibly ejects the fluid in the piston chamber through the nozzle, which is usually fitted with a screw-on adjustment cap. The piston automatically retracts after each spray, creating a vacuum in the chamber that sucks more fluid from the bottle though the tube. If your sprayer doesn't work, it's either because the nozzle is blocked, the piston seal is damaged or the inner tube isn't immersed in fluid.

Unblocking the Nozzle

If your spray bottle contains oil or anything else that can harden, such as hairspray, you may have to periodically clear the nozzle. Before you do this, unscrew the nozzle cap by turning it counter clockwise a quarter turn and try spraying it again. If the nozzle was too tight, your sprayer may now be working. If not, unscrew and remove the cap and hold it under hot, running water or immerse it in vinegar, then use a pin to poke a hole in any blockage in the nozzle itself. If your bottle contains hairspray, soak the nozzle in alcohol. You may have to unscrew the entire sprayer from the bottle and soak it in vinegar or alcohol if the blockage is severe.

Lengthening the Tube

The plastic tube connected to the sprayer is designed to reach to the bottom of the bottle, but it often curls up, and the end protrudes from the liquid in the bottle when the level is low.

Handle other problems of pump

When you pump the piston and it doesn't retract, the cause is usually a broken or missing spring, but sometimes the spring just pops out of position. The spring isn't always accessible, but if it is, you can usually find a replacement at a hardware store. If the spring isn't accessible or the piston seals fail, you need to replace the sprayer. When the seals fail

and the trigger works, but the sprayer delivers very little fluid, you may be able to improve the sprayer performance by spraying vegetable oil through it.

Lost Screws and bolts

When we lose screws and bolts we have to replace them in to put in working condition of tools and equipment

• Content /Topic 2. Repairing tips

All tools require regular maintenance to work properly.

- Clean all tools after each use with water and treat with a penetrating oil to prevent rust.
- Tools that require a sharp edge must be sharpened regularly as sharp tools are safer and more efficient to use. Various sharpening methods are used depending upon the tool. It is important to become familiar with the methods relevant to the tools you use.
- Check tools regularly for loose nuts and screws and tighten as needed.
- Sand rough handles and repair cracks as soon as they are noticed to prevent injury.
- Removing of rust and making the lubrication and greasing if necessary
- Check handle regularly and make the handle re-fixing if necessary
- Store tools in a dry area out of the elements.
- Hanging tools against a wall is an ideal way to organize the store tools in a shed
- Re- fixing of screw in the tools and equipment contain these screw or bolts
- Cleaning nozzles of sprayers and other equipment or tool

Procedures/steps of repairing a farm tool and equipment

Every farm has a different maintenance schedule and it is important that you are familiar with the schedule implemented on the farm where you work.

There will usually be a routine schedule for particular tools that states how often maintenance checks have to be performed. These will also specify the checks that have to be performed. Some tools may require daily checks and maintenance after use. Other tools,

such as power tools, usually must be checked once in 6 months or so. More complicated power tools would need to be serviced on a regular interval; refer to the operation manual.
A maintenance schedule assigns a specific date to specific maintenance tasks in such way we have different steps of repairing farm tools and equipment.

1. **Clean your tools.** Cleaning the tools regularly is essential to their proper functioning. After a day of work, your tools will be covered with some amount of dirt. It's important to clean them after you're finished using them. Although a thorough cleaning is not required on a daily basis, make sure you clean your tools regularly. When cleaning your tools, don't use chemicals that are extremely harsh. Follow the manufacturer's guidelines for proper cleaning and maintenance

2. **Protect electrical cords.** Airlines and electrical cords are prone to heavy damage since they are generally in the way of construction vehicles, and foot traffic. Other machinery like forklifts, drills, etc. can easily cut through wires. To keep the wires and airlines from getting damaged, it is important to protect them. You can cover the electrical cords with industrial strength casings or purpose-built ramps

3. **Lubricate tools.** Whether you work with pneumatic or regular tools, it is important to lubricate them regularly. Lubricating tools helps them to perform better and reduces wear and tear of components. Lubrication is even more important when working with air or pneumatic tools. Pneumatic tools need to be lubricated once a day before use. When moisture or condensation enters the interiors of pneumatic tools, it can cause corrosion. Corrosion can decrease the life of an instrument. Corroded parts are difficult to repair and replace. Hence, the internal components of pneumatic tools should be coated with special air-tool oil. This oil prevents corrosion by displacing any moisture that enters the interior of the equipment

4. **Inspect tools regularly.** Regularly inspect your tools for signs of damage and faulty functioning. Inspections should take place at the end of each construction job. Ensure that you repair them immediately if there is any damage.

5. **Store tools with care.** Storing tools properly is of prime importance. Although tools are designed for rough use, it is important to store them properly. Cover up your tools to keep dirt and rain away from the machine. If the tools aren't used for a long time, inspect them regularly for signs of damage, wear and tear, corrosion.

LO.3.4. Keep records

Content /Topic 2... Content of record form

- ✓ Names of tools or equipment:……
- ✓ Date: ……
- ✓ Activity performed: ……
- ✓ Quantity of tools: ……
- ✓ Tools and equipment condition: ……
- ✓ Repairing activities: ……

Content /Topic 2.Record of small farm tools and equipment state

Procedures of filling a technical card

There will usually be a routine schedule for particular tools that states how often maintenance checks have to be performed. These will also specify the checks that have to be performed. Some tools may require daily checks and maintenance after use. Other tools, such as power tools, usually must be checked once in 6 months or so. More complicated power tools would need to be serviced on a regular interval; refer to the operation manual here is an example of checklist which contains the information of tools and equipment state.

An example of a checklist is given below:

Date	Tools	Maintenance check point	signature	Maintenance required	signature	Maintenance performed	Date	Signature

Methods of recording keeping

- ✓ Written recording(hard copy of a document written by hand or written by computer and be printed in to have this hard copy document)
- ✓ Soft record on computer(this is document obtained in computer as soft copy only without printing it)

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