HORTICULTURAL CROPS PRODUCTION LEVEL -IV

BASED ON MARCH2019, VERSION 2. OCCUPATIONAL STANDARDS

MODULE TITLE: - SUPERVISING CROP ESTABLISHMENT AND MAINTENANCE

LG CODE: AGR HCP4 M09 1119 LO (1-7) LG (41-37)

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Contents

LG #41	LO #1- Source information for input to planting plan

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: ❖ Identifying documents detail the requirements of the production plan ❖ Reading information regarding activities ❖ Identifying the specific target area, or paddock, for planting ❖ Gathering Information regarding the trash levels and seedbed condition This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: ❖ Identify documents detail the requirements of the production plan ❖ Read information regarding activities ❖ Identify the specific target area, or paddock, for planting ❖ Gather Information regarding the trash levels and seedbed condition
Learning Instructions:
1. Read the specific objectives of this Learning Guide. **2.** Follow the instructions described below. **3.** Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them. **4.** Accomplish the “Self-checks” which are placed following all information sheets. **5.** Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks). **6.** If you earned a satisfactory evaluation proceed to “Operation sheets **7.** Perform “the Learning activity performance test” which is placed following “Operation sheets” , **8.** If your performance is satisfactory proceed to the next learning guide, **9.** If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Identifying documents detail the requirements of the production plan

The documents that outline the organizations production planning for specified period the policies and procedures in relation to material handling for organic horticulture production and occupational health and safety , as well as the way in which potential environmental impacts should be approached. A planting plan is a construction document that shows the location, quantity, and other characteristics of vegetation to be planted in the landscape. It should be easy to read and understand. The production is a set of procedures or activities conducted to create a goods and services, in any production process required a planning process. Production planning is planning about what products and how that will be produced by the company in question in a period to come. Production planning is part of operational planning within the company. In the preparation of production planning things to consider is the optimization of production so as to be able to achieve the lowest cost level for the implementation of the production process . The role of planning is merely intended to coordinate the activities of the sections that directly or indirectly in producing, planning, scheduling and controlling the production of the starting stages of raw materials, process, until the resulting output so that the company really can produce goods or services effectively and efficiently. Some of the goals of production planning, namely as a preliminary step to determine the activity of production, as a reference to more detailed planning, input of resource plans resource planning so that it can be developed to support production planning, production and labor stability against fluctuations in demand.

Self-Check 1	Written Test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Each has 5points

1) What is the advantages of identifying the production document?
2) What are the role of production plan for organic horticulture?

Note: **Satisfactory rating – 9points and above Unsatisfactory - below 9pts**

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

Information Sheet 2	Reading information regarding activities

2.1. Identifying and obtaining documents within the organization

The documents that outline the organizations production planning for specified period the policies and procedures in relation to chemical handling and occupational health and safety , as well as the way in which potential environmental impacts should be approached.

Some activities may be occurring at the same time to planting/sowing. Therefore it is important to gather information regarding the overlapping activities to adjust their sequence activities. This information may be gathered either through discussion with management or by reading the production plan and planting/sowing calendar of different agricultural crops.

2.2. Gathering information on similar time activities to planting information

Some activities may be occur at the same time to planting/sowing. Therefore it is important to gather information regarding the overlapping activities to adjust their sequence activities**.** This information **may** be gathered either through discussion with management or by reading the production plan and planting/sowing calendar of different agricultural crops.

For example, in areas of bimodal rain fall (**Belg** and **Meher**) production season in Ethiopia some activities like sowing/planting for **meher** season crops and harvesting that of the **belg** crops are overlap. In addition to this for some crop their planting /sowing calendar is occur at the same time . For example wheat and barley, maize and sorghum and some legumes and oil crops sometimes sown at the same time. In such condition it is necessary to make discussion in order to adjust their sowing/planting calendar

1.3. Gathering information of trash levels and seed bed condition

This is gathered by viewing the site and through discussion.

Seed bed condition:- Field crops are established by sowing seeds in the field. Proper tilth is important for better germination and establishment of the seedlings. The field is ploughed repeatedly and brought to a fine tilth. Organic manures such as well decomposed FYM or compost are added and incorporated into the soil at the time of ploughing. The methods of seed bed preparation and sowing differ with crops. Fine seed bed preparation is very much required for sowing of small seed bed crops like sesame. After ploughing, the field is converted into flat beds or ridges and furrows. Most of the field crops are sown in the beds. The size of the beds is varies with the soil type and irrigation availability .if production is by irrigation. If production is under irrigation, irrigation channels are provided around the beds. For crop like maize ,cotton ,sugarcane ,etc ridges are formed .Under this condition ,irrigation channels are normally formed across the furrows at the convenient length.

Self-Check 2	Written Test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Each has 5points

1) What is dis -advantages if we doesn't read the information regarding sowing or planting horticultural crops?

Note: **Satisfactory rating – 4points and above Unsatisfactory - below 4pts**

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

Information sheet 3.Identifying specific target area for planting

3. 1.Identifying specific target area for planting

Different agricultural crops require varied optimal climatic conditions for better growth and development . It is important to select the crop according to the climatic suitability , so that the yields will be high. Hence, specific target area for planting is identified for planting different agricultural crops taking in to consideration of climatic suitability.

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However, other factors also have some importance Where the crop to be grown has already been decided, some factors to consider in both location and site selection are the following:

- Soil, topographic, and climatic requirements of the crop.
- Biotic factors and the prevalence of pests and diseases.
- Cost of acquisition or lease and in preparing the land.

Self-Check 3	Written Test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

1. What are the advantages of selecting/ identifying good planting/sowing area?

Note: **Satisfactory rating – 4points and above Unsatisfactory - below 4pts**

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

Information sheet 4.Gathering information of trash levels and seed bed condition

This is gathered by viewing the site and through discussion.

Seed bed condition: - Horticultural crops are established by sowing seeds on the prepared bed. Proper tilth is important for better germination and establishment of the seedlings. The bed is digged/ploughed repeatedly and brought to a fine tilth. Organic manures such as well decomposed FYM or compost are added and incorporated into the soil at the time of ploughing. The methods of seed bed preparation and sowing differ with crops. Fine seed bed preparation is very much required for sowing of small seed bed crops like sesame. After ploughing, the field is converted into flat beds or ridges and furrows. Most of the field crops are sown in the beds. The size of the beds is varies with the soil type and irrigation availability .if production is by irrigation. If production is under irrigation, irrigation channels are provided around the beds. Under this condition, irrigation channels are normally formed across the furrows at the convenient length.

Self-Check 4	Written Test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Each has 5points

1. What is the importance of identifying specific target area for planting?
2. Why fine seed bed preparation is very much required for sowing of seeds?

Note: **Satisfactory rating – 9points and above Unsatisfactory - below 9pts**

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

Operation Sheet 1	*Preparing land/seed bed*

Preparing seed bed

Objectives

- To enable the trainees how to prepared seed bed.
- To enable the trainees to identify key activities under taken before sowing/planting.

Material required

1. Measuring tape
2. Meter
3. Spade
4. rope
5. pegs
6. Rack

Procedures

1. Marking the size of seed bed with the help of a measuring tape.
2. Fix the pegs on the four corners of seed bed.
3. Tie a rope on two ends (pegs) i.e. on one side and prepared straight bound with a height of 15-30cm.
4. Follows this procedure bound all four sides of the bed.
5. Open the tilth with the help of spade, axe or kudali and pulverize it and remove all stubbles, trashes etc.
6. Bring the soil to desired tilth by repeated working.
7. For flat bed mark row to row or plant to plant in recommended spacing.

LAP Test	***Practical Demonstration***

Name _____ID:……. Date: _____

Time started: _____ Time finished: _____

Instructions:

You are required to perform any of the following:

i. In the field you will be provided with materials, tools and equipments and then make sure whether you can operate those materials properly or not.

ii. Make sure you able to prepare the land following the steps of land preparation.

LG #42	LO #2- Prepare planting plan

Instruction sheet

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

- Determining the agricultural crop and method(s) of planting
- Assessing and calculating the resources required for the planting operations
- Setting t date and sequencing for planting
- selecting and organizing The chemical applications
- preparing plan
- identifying and assessing Occupational health & safety hazards
- identifying and obtaining Any approvals
- Determining Measurable indicators, specifications and targets

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

- Determine the agricultural crop and method(s) of planting
- Assess and calculating the resources required for the planting operations
- Set date and sequencing for planting
- Select and organizing The chemical applications
- preparing plan
- identify and assess Occupational health & safety hazards
- identify and obtain Any approvals
- Determine Measurable indicators, specifications and targets

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Information sheet 1.Determine the agricultural crop and methods of planting

1.1.Agricultural crops**:** -

Agricultural crops are a plant or plant product that can be grown and harvested extensively for profit or subsistence. In general agricultural crops in this are:

1) Horticultural crops :It is generally accepted by researchers and educators in horticultural science that horticultural crops include:
   - ✓ tree, bush and perennial vine fruits;
   - ✓ perennial bush and tree nuts;
   - ✓ vegetables (roots, tubers, shoots, stems, leaves, fruits and flowers of edible and mainly annual plants);
2) Cereal crops:- are grasses grown for their edible seeds. They include wheat , oats, barley, rye , rice ,teff, millet
3) Stalk crops: - are grown for their edible seeds. They include maize and sorghum
4) Legumes (pulses):-These includes field beans, field peas ,chick peas ,soybeans ,Lentils, etc.
5) Sugar crops: - are grown for their sweet juice from which sucrose is extracted and crystallized. e.g sugar cane are grown for their syrup production.
6) Oil crops: - They include flax, soybean, sunflower, safflower, sesame, castor bean, rape seed, etc.
7) Fiber crops:-The fiber crops include cotton, flax, kenaf, sisal, etc are grown for their brush fiber.

1.2.Methods of agricultural crop sowing / Planting

A.Broadcasting: In broadcast method the seeds are spread uniformly over well-prepared land. Broadcasting may be done by hand or mechanical spreader. Broadcasting is suitable for close-planted crops that do not require specific crop or plant geometry. It is used when the number of plants per unit area is more important than definite spacing from plant to plant. This is the usual method of sowing.

B.Drilling: drilling is the practice is of dropping seeds in rows or lines. Furrows at specified distance are made, and the seeds are dropped at definite depth and distance,

covered with soil and are compacted Fairley. Seed can be drilled with help of seed drills (bullock or tractor drawn) and seeding funnels attached with country plough. Seeds and fertilizers can be drilled simultaneously. Crops such as wheat, barley, mustard, carrot and sesame are sown by drilling.

C.Dibbling or planting: This method consists of putting or placing individual seed or seed material in a hole or pit, made at pre-determined depth and spacing by manual labor or with the use of mechanical dibbler or planter. Generally, the crops with bigger size seeds and those needing wider spacing and specific crop geometry for their canopy development are sown by this method. This method is suitable to plant crops like maize, cotton, sun flower, sugar cane, etc.

1.3. Planting machine /instrument

A wide range of crops are grown in the Ethiopia, all with various characteristics and requirements. There are a range of sowing and planting equipment available to satisfy the planting and sowing needs of all crops. These equipments can be categorized into three different types:

- Broadcasters
- Drills
- Planters

The equipment must have:

- Accurate metering to ensure the required plant population is achieved
- The ability to sow the seeds/plant into a range of soil conditions
- The ability to handle a range seed/plant sizes
- A range of easily adjustable sowing rates to suit a range of crops
- Uniform sowing/planting depth
- Sufficient hopper capacity to maintain output

1) Seed broadcasters

fig 1.seed broadcaster

Sows seeds evenly and quickly

This practical and inexpensive device lets you sow small seeds evenly and quickly. An adjustable outlet controls the flow, placing seeds exactly where you want them along the row. The transparent cover allows you to see the seeds inside.


Fig .2.Handy seed sower

2. Drills

A seed drill is a device used in agriculture that sows seeds for crops by positioning them in the soil and burying them to a specific depth. This ensures that seeds will be distributed evenly. The seed drill sows the seeds at the proper seeding rate and depth, ensuring that the seeds are covered by soil. Drills have the ability to sow a range of seed sizes from small grass seeds to large beans. They have been developed to satisfy the needs of different crops and soil types,

There are four main types of drills available:

- Drills that sow seeds only
- Drills that sow seeds and fertilizer
- Drills that sow seeds and fertilizer and also cultivate the soil
- Drills that sow seeds directly into uncultivated soil

The main components of a drill are:

- ❖ Seed hopper – where the seeds are carried on the machine
- ❖ Seed metering device – regulates where the seeds are placed
- ❖ Coulter – creates a groove to open the soil, places the seed and covers with soil

Seeds can be placed in the coulter to be sown either with gravity or by an air conveying system

Figure 3. *Pneumatic seed drill*

Ideally drills should plant all the seeds at the same depth and surround them with firm, moist, warm soil, the coulters are designed to do this. There are different types of coulters available to suit different soil type and conditions. When needed individual rows of the drill can be shut at the bottom of the hopper, this is especially useful when creating 'tramlines', which are tracks along the field without any plants, these tramlines are later used by sprayers and fertilizer applicators, they minimize plant damage and ensure accurate application.

MANUAL SEED DRILL: It is suitable for drilling seeds of soybean, wheat etc along with fertilizer.

fig 4, manual seed drill

LOW COST SEED DRILL: It is suitable or simultaneous drilling of seeds and fertilizer in two rows.

Fig 5.low cost seed drill

3. **Planter** (farm implement)

Like a grain drill a **planter** is an agricultural farm implement towed behind a tractor, used for sowing crops through a field. It is connected to the tractor with a draw-bar, or a three-point hitch. Planters lay the seed down in precise manner along rows.

Fig 6.planter

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 3 points)

Test I:

1. What is the definition of agricultural crops?
2. What Is the difference between horticultural crops and other crops ?
3. List the methods of seed sowing ?
4. List planting/sowing machine /equipments ?
5. What are the components of drill?

Note: **Satisfactory rating - 15points** **Unsatisfactory - below 15 points**

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

Information Sheet 2- Assessing and calculating the resources required for the planting operations.

The resources require will be stated in terms of personnel (these might be temporary, permanent, or contracted workers), machinery and equipment, consumables, and leasing arrangements that to be used for crop harvest.

It is important to assess and predict:

- Lab our required
- Equipment availability
- Input requirements

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 3 pnts)

Test I: Short Answer Questions.

1.List the advantage of resource needed for planting operation?

2.What resource we have facilitate for sowing/planting?

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

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

Information Sheet 3	Setting date and sequencing/rotation for planting

3.1. Times of sowing

Sowing is a process of planting seeds into the soil. During this agricultural process, proper precautions should be taken, including the appropriate depth, proper distance maintained, and soil should be clean, healthy and free from disease and other pathogens including fungus. All these precautions are essential for **seed germination** – the process of seeds developing into new plants.

The sowing date affects the time to emergence and early seedling vigor. Different crops are sown in different season depending up on their **climatic** requirements .Sowing crops at appropriate time increase crop growth ,development and yields due to suitable environmental available to crop at its stage.

Sometimes due to unfavorable weather and soil condition, un availability seeds ,fertilizers ,tillage and sowing implements ,the sowing is either done earlier or delayed beyond optimum time . In both cases germination, development, growth, and yields affected adversely .Therefore; agricultural crops should be planted as soon as the soil warms to minimum recommended temperature.

In a home vegetable garden, crop rotation involves changing the planting location of vegetables within the garden each season. Crop rotation is used to reduce damage from insect pests, to limit the development of vegetable diseases, and to manage soil fertility. Crop rotations also tend to encourage healthy root systems which are effective at retrieving nutrients from the soil, thus minimizing leaching to ground water. Crops should be rotated on at least a three to four year cycle. They should be rotated every year.

3.2.Benefits of organic crop rotation include:

- Disease prevention
- Allows for alternation of heavy feeding crops and light feeding crops
- Fewer problems with insects and parasitic nematodes because it disrupts the life cycles of those organisms
- Less weeds

- Increased crop yields, especially when compared to a monoculture.
- Allows plants with different root systems to penetrate the soil at different depths. Consequently, the soil structure is improved.

3.3.Crop rotation in vegetables

Crop rotation is an important factor when planning the vegetable garden. Many disease organisms are soil-borne and may persist in the soil for several years. Disease problems often increase when the same crop is planted in the same area in successive years. Annually rotating your vegetables in the garden can help reduce the severity of diseases. Rotation may also help curb insect infestations. Insect populations and plant damage may increase when the same crop is planted in the same area over several years.

Vegetable crops in the same botanical family are often susceptible to the same diseases and insects. For crop rotation to be effective, gardeners should not plant vegetables belonging to the same plant family in the same location for two or three years.

3.3.1.Crop Rotation Ideas For An Organic Vegetable Garden

If you are growing an organic garden, prevention of diseases and pests is so important. We have several preventative tools to use. In last weeks post, I talked about the importance of cover crops in the home garden. The next step in maintaining a healthy garden is crop rotation. Crop Rotation means moving different crops around the garden in set time intervals. A common practice is to rotate crops yearly. However, if you have a long enough season to do some succession planting, rotating crops may happen more often.

To assist crop rotation efforts, the following list places the commonly grown vegetables in their proper botanical families.

- **Alliaceae (Onion Family). :**Onion, garlic, leek, shallot, chive
- Apiaceae (Carrot Family) :Carrot, parsnip, parsley, celery
- Asteraceae (Sunflower Family) :Lettuce, endive, salsify, Jerusalem artichoke

- Brassicaceae (Mustard Family) :Cabbage, broccoli, cauliflower, Brussels sprouts, kohlrabi, turnip, radish, Chinese cabbage, kale, collards, rutabaga
- Chenopodiaceae (Goosefoot Family) :Beet, Swiss chard, spinach
- Convolvulaceae (Bindweed Family) :Sweet potato
- Cucurbitaceae (Gourd Family) :Cucumber, muskmelon, watermelon, squash, pumpkin, gourd
- Fabaceae (Pea Family) :Garden pea, snap bean, lima bean, soybean
- Malvaceae (Mallow Family) :Okra
- Poaceae (Grass Family) :Sweet corn, popcorn, ornamental corn
- Solanaceae (Nightshade Family) :Tomato, pepper, eggplant, potato, husk tomato

Accordingly, it would be inadvisable to plant potatoes where tomatoes were grown the previous year. Foliar blights are common diseases of tomatoes and potatoes and can severely damage both crops. Snap beans, cabbages, and cucumbers (any vegetable not in the Solanaceae family) would be better choices.

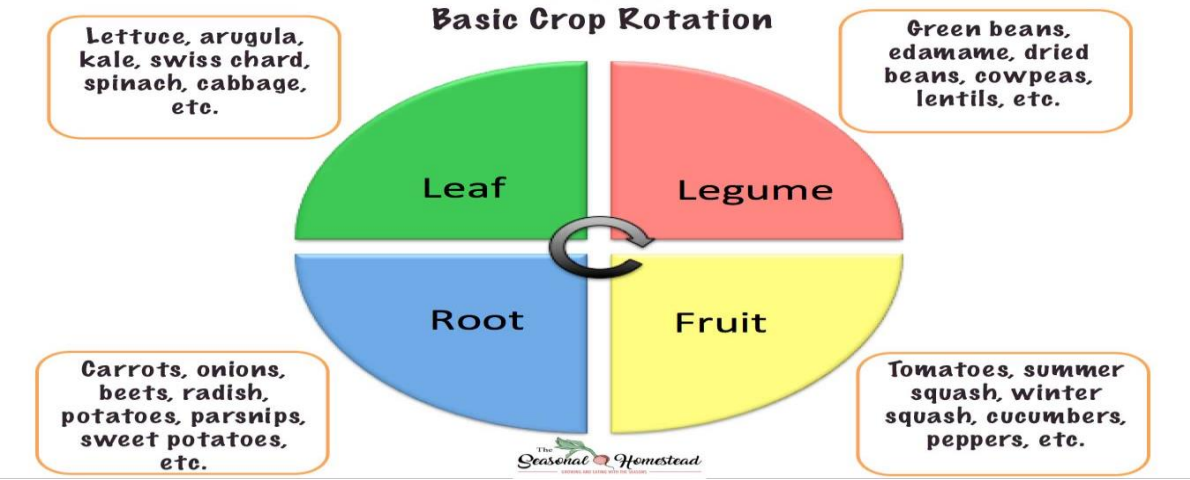


Fig 6.—fruits and vegetables rotation chart

Self-Check – 3	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions (each 3pnts)

1. What are the effects of untimely sowing seeds?
2. List the requirements of sowing horticultural seeds?
3. List the benefits of crop rotation?

Note: **Satisfactory rating - 9points** **Unsatisfactory - below 9 points**

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

Information Sheet 4	Selecting and organizing the chemical applications

4.1. Natural Organic Compounds for Application in Organic Farming

Chemical fertilizers, pesticides, and fungicides are widely used in agriculture to improve crop yields. Most of the compounds used are synthetic, and their overuse causes environmental pollution and human health problems. Currently, several countries are working to reduce the use of agrochemicals. Organic agriculture is now emerging as a sustainable alternative to traditional agriculture using environmentally friendly strategies such as the application of organic fertilizers from plant and animal waste and pesticides based on plant extracts and microbials. However, the availability of commercial biopesticides and organic fertilizers is very limited because there are certain barriers to the commercialization of biological products. These barriers include small available quantities of raw materials and strict registration laws requiring toxicological tests and other studies that are expensive and time consuming. Organic farming focuses details about the various organic fertilizers and pesticides that do not have the same disadvantages as synthetic compounds in terms of persistence and toxicity.

Self-Check – 4	Written test

Name…… ID…… Date…….
Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 3pnts

Test I: Short Answer Questions
1.What is the deffirence between organic and inorganic chemicals
2.list the benefits of organic chemical usage in horticulture?

Note: **Satisfactory rating -15points** **Unsatisfactory - below 15 points**

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

Information Sheet 5	preparing plan

5.1. planting plan

Is a drawing that specifies the plants that will be put into your garden. It shows the position, variety and quantity of plants for any given area. The success of your planting project will depend on good site preparation and planning. It's important that your new plantings can grow without competition from weeds and that they are protected from pests. Find out when to plant and how to prepare the ground. Check out our tips for planting and follow-up care.

Prepare your planting plan well before you intend to plant. This gives you plenty of time to grow or source the plants you need. What you plant will depend on your site and your goals. Find out more about planning your project

5.2.Steps of planting plan for horticulture:

1. Measure the border and transfer it onto a scaled drawing. ...
2. Draw up a shortlist of your favourite plants. ...
3. Choose your evergreen plants. ...
4. Draw your evergreen feature plants onto the border **plan**. ...
5. Number each **plant**. ...
6. **Create a planting** key.

Self-Check – 5	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions(each 5 pnts

1) What is planting plan?
2) List the importance of planting plan ?
3) List the steps of planting plan?

Note: Satisfactory rating - 15points Unsatisfactory - below 15points

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

Information Sheet 6	Identifying and assessing Occupational health & safety hazards

Agriculture is one of the riskiest occupations for human health and safety. People are always exposed to health risks and injuries because agricultural practices involve tools and equipments that may cut and create wounds and injure body and harmful chemicals such as pesticides. There are also harmful organisms in the field such as insects, snakes, weeds etc that may bite, sting causing physical trauma, pain, illness or even death. Intensive agriculture is critically dependent on pesticides for pest control which may also pollute the environment. Therefore, applying health and safety systems in agriculture is essential to prevent or minimize injury, ill-health, and death to those at work and those affected by work activities and furthermore, to reduce environmental pollution. It also helps to avoid the potential costs of interruptions to work-outputs from ill-health or injury. People should work in safe and comfortable working environment.

6.1.Occupational health and safety

It is a discipline with a broad scope involving many specialized fields. In its broadest sense, it should aim at:

- ✓ the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;
- ✓ The prevention among workers of adverse effects on health caused by their working conditions;
- ✓ The protection of workers in their employment from risks resulting from factors adverse to health;
- ✓ The placing and maintenance of workers in an occupational environment adapted to physical and mental needs;
- ✓ The adaptation of work to humans.

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

6.2.Safety Hazards

A safety hazard is anything that could cause a physical injury, such as a cut or fracture. Safety hazards cause harm when workplace hazard controls are not adequate. Remember to check the adequacy of controls during your inspections.

The hazard identification process requires that:

1. past incidents/accidents be examined to see what happened and whether the incident/accident could happen again
2. Employees be consulted to find out what they consider are safety issues, e.g. how could an employee be exposed to this hazard?
3. work areas or work sites be examined to find out what is happening now
4. Information about equipment (e.g. plant, operating instructions) and Material Safety Data Sheets be reviewed to see what is said about safety precautions.
5. Some creative thinking about what could go wrong takes place, i.e. what hazardous event could take place here?

Every day workers all over the world are faced with a multitude of health hazards, such as:

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

6.3.Costs of occupational injury/disease

Work-related accidents or diseases are very costly and can have many serious direct and indirect effects on the lives of workers and their families.

For workers some of the direct costs of an injury or illness are:

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

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

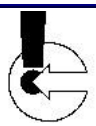
The costs to **employers** of occupational accidents or illnesses are also estimated to be enormous. For a small business, the cost of even one accident can be a financial disaster. For employers, some of the **direct costs** are:

- payment for work not performed;
- medical and compensation payments;
- repair or replacement of damaged machinery and equipment;
- reduction or a temporary halt in production;
- possible reduction in the quality of work;
- negative effect on morale in other workers.

Some of the indirect costs for employers are:

- the injured/ill worker has to be replaced;
- a new worker has to be trained and given time to adjust;
- increased training expenses and administration costs;
- it takes time before the new worker is producing at the rate of the original worker;
- time must be devoted to obligatory investigations, to the writing of reports and filling out of forms;
- accidents often arouse the concern of fellow workers and influence labour relations in a negative way;
- poor health and safety conditions in the workplace can also result in poor public relations.

Overall, the costs of most work-related accidents or illnesses to workers and their families and to employers are very high.

	**Points to remember**

1. Occupational health and safety encompasses the social, mental and physical well-being of workers in all occupations.
2. Poor working conditions have the potential to affect a worker's health and safety.
3. Unhealthy or unsafe working conditions can be found anywhere, whether the workplace is indoors or outdoors.
4. Poor working conditions can affect the environment workers live in. This means that workers, their families, other people in the community, and the physical environment around the workplace, can all be at risk from exposure to workplace hazards.
5. Employers have a moral and often legal responsibility to protect workers.
6. Work-related accidents and diseases are common in all parts of the world and often

have many direct and indirect negative consequences for workers and their families. A single accident or illness can mean enormous financial loss to both workers and employers.

7. Effective workplace health and safety programmes can help to save the lives of workers by reducing hazards and their consequences. Effective programmes can also have positive effects on both worker morale and productivity, and can save employers a great deal of money.

6.4. Types of Hazards that may occur in the Work Place

There are an unlimited number of hazards that can be found in almost any workplace. There are obvious unsafe working conditions, such as unguarded machinery, slippery floors or inadequate fire precautions, but there are also a number of categories of insidious hazards (that is, those hazards that are dangerous but which may not be obvious) including:

- chemical hazards, arising from liquids, solids, dusts, fumes, vapors and gases;
- physical hazards, such as noise, vibration, unsatisfactory lighting, radiation and extreme temperatures;
- biological hazards, such as bacteria, viruses, infectious waste and infestations;
- psychological hazards resulting from stress and strain;
- hazards associated with the non-application of ergonomic principles, for example badly designed machinery, mechanical devices and tools used by workers, improper seating and workstation design, or poorly designed work practices.

6.5. Symptoms and Signs of Hazards

- **Bleeding**: a sign of cuts
- **Itching**: a sign of stings with insects, weeds, or a sign of chemical spills
- **Pain**: a sign of any injury or damage such as cut, sting, breakage, etc.
- **Coughing**: a sign of respiratory hazard due to inhalation of gases, dusts, vapors, etc.
- **Sneezing:**
- Unusual sound:

Self-Check – 6	*Written test*

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. List some direct and in direct cost of an accident or illness to employment? (5pts.)
2. List some the multitude of health hazards?(5 pts)
3. What is the difference between sign and symptom that may occur on occupation?5pnt
4. List the types of occupational hazards?5pnt

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**

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

Information Sheet 7	Identifying and obtaining any approvals

7.1.Environment (Protection) Act,

The **Environment** (**Protection**) **Act**, 1986 authorizes the central government to **protect** and improve **environmental** quality, control and reduce **pollution** from all sources, and prohibit or restrict the setting and /or operation of any industrial facility on **environmental** grounds.

The *Environment Protection Amendment Act 2018* provides the foundation for a transformation of Victoria's environment protection laws and Environment Protection Authority Victoria (EPA). It includes a new approach to environmental issues, focusing on preventing waste and pollution impacts rather than managing those impacts after they have occurred.

The legislation will enhance the protection of Victoria's environment and human health through a more proportionate, risk-based environment protection framework that includes:

- A preventative approach through a general environmental duty.
- A tiered system of EPA permissions to support risk based and proportionate regulatory oversight.
- Significant reforms to contaminated land and waste management.
- Increased maximum penalties.
- Requirements for more environmental information to be publicly available.
- Modernising and strengthening EPA's compliance and enforcement powers.

7.2. Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) was established in December 1970 by the executive order of President Richard Nixon. It is an agency of the United States federal government whose mission is to protect human and environmental health. Headquartered in Washington, D.C., the EPA is responsible for creating standards and laws promoting the health of individuals and the environment.

7.5.The Horticulture Code

The Horticulture Code of Conduct is a mandatory industry code prescribed under the ***Competition and Consumer Act 2010***. The Code aims to improve the clarity and transparency of trading arrangements between growers and traders in the horticulture sector.

The Code:

- ✓ prohibits trading in horticulture produce without a horticulture produce agreement
- ✓ specifies a number of record keeping requirements for parties to an agreement
- ✓ requires a payment period to be specified and traders to pay growers within the payment period
- ✓ introduces an obligation for all parties to act in good faith in their dealings with each other
- ✓ introduces financial penalties and infringement notices for breaches of certain provisions of the Code
- ✓ allows parties to accept horticulture produce agreements by electronic means including emails confirming an offer or acceptance
- ✓ allows traders to pool horticulture produce under an agreement with other produce provided it meets agreed quality standards
- ✓ allows merchants and growers to use a method or formula to price horticulture produce under an agreement, as opposed to only a fixed price
- ✓ requires horticulture produce agreements to specify the FreshSpecs Produce Specifications or other specifications that will be used to assess the quality of horticulture produce
- ✓ has a defined dispute resolution procedure
- ✓ allows for ACCC investigations & compliance checks.

The following table explains the difference between growers and traders.

Description	Example
Grower	John is a farmer who owns an orange orchard and produces fresh oranges. John is a grower.
Agent	John sells his oranges via Fruit Agents Pty Ltd, who takes them to the local fruit market and finds a buyer for John's oranges. Fruit Agents Pty Ltd is an agent who receives a commission or fee from John.
Merchant	Sometimes John sells his oranges directly to Orange Buyers Pty Ltd. Orange Buyers Pty Ltd buys directly from John and then sells the oranges on to Big Supermarket Pty Ltd. Orange Buyers Pty Ltd is a merchant who buys produce for the purpose of resale.

The Code **does not** apply to purchasers of horticulture produce who sell directly to consumers.

Horticulture produce is unprocessed fruit, vegetables (including mushrooms and other edible fungi), nuts, herbs and other edible plants, but excludes nursery products.

The Code doesn't define what 'unprocessed' is. Its meaning will vary from case to case. The ordinary meaning of 'unprocessed' is produce that has not been converted, altered or modified in some way for the purpose of making it into a new form. Simply washing, grading and packing produce so that it can be assessed and priced for the purpose of trading is unlikely to constitute processing.

Example

The Food Manufacturing Company Pty Ltd buys tomatoes from a grower that it then uses to make tomato soup. The Soup is then on sold to a wholesaler. The arrangement between the grower and the manufacturer would not be subject to the Code, because

the manufacturer is not selling horticulture produce, as the tomatoes have been processed.

7.6. General obligations in organic produce selling

The Code sets out a number of general obligations that the parties must comply with.

- traders and growers must deal with each other in good faith
- a trader cannot act as both an agent and a merchant under the one horticulture produce agreement
- traders must accept horticulture produce delivered under a horticulture produce agreement, except where the horticulture produce agreement permits them to reject it
- if a trader rejects horticulture produce, they must notify the grower that the produce has been rejected within 24 hours of rejecting the produce
- traders must exercise reasonable care and skill in handling and storing the growers horticulture produce that is under their control
- traders must give the grower payment for horticulture produce within the specified payment period
- agents must act in the best interests of the grower when selling horticulture produce and not sell a grower's horticulture produce, other than on 'an arm's length basis'
- traders must give a statement to growers setting out the details of transactions.

Exclusions

The Code does not apply to:

- nursery products – including trees, shrubs, plants, seeds, bulbs, cut flowers or foliage or propagating material and plant tissue cultures
- transactions between growers and:
    - retailers – businesses buying produce for retail sale
    - exporters – businesses buying the produce for export
    - processors – businesses buying the produce for processing.

However, if a grower sells horticulture produce through an agent to retailers, exporters, or processors, the agreement between the grower and the agent will be subject to the Code.

The Horticulture Code requires growers and traders to have a written contract, called a Horticulture Produce Agreement (HPA) before they can trade with each other.

7.7.Organic horticulture produce agreement

- Agreements (HPAs)
- Minimum requirements of an agreement
- Delivery of horticulture produce
- Quality and quantity specifications
- Rejecting horticulture produce
- Pooling
- Payment pricing/fees
- Cooling off
- Termination and variation
- Subscribe to the Agriculture Information Network
- More information

7.8.Payment pricing/fees

Pricing/commission must specify the period in which:

- an agent must pay to the grower the proceeds of sale of horticulture produce received by the agent
- a merchant must pay the grower for horticulture produce delivered by the grower.

A HPA between a grower and a merchant must specify whether the price merchants will pay growers for produce will be agreed before or upon delivery. In addition to fixed pricing, parties can now agree on a method or formula to determine the price merchants will pay. This provides parties with additional flexibility in the trading relationship and

better reflects the way merchants and growers do business. It is up to the parties to decide which pricing method or formula they will use in the HPA.

A HPA between a grower and an agent must specify:

- whether the agent will charge commission, fees or extra costs
- the amounts or rates of the commission, fees or extra costs, and
- whether charging the growers commission, fees or extra costs is contingent on the sale of the horticulture produce, or any other event or kind of event.

Self-Check – 7	*Written test*

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. Each 5 pnts

Test I: Short Answer Questions

1) What are the role of organic horticulture in environmental protection
2) What is the function of horticultural code
3) List the general obligation of grower and trader on horticultural production and selling process
4) Explain how to make pricing of organic production

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

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

Information Sheet 8	Determining Measurable indicators, specifications and targets

To estimate crop yield, producers usually count the amount of a given crop harvested in a sample area. Then the harvested crop is weighed, and the crop yield of the entire field is extrapolated from the sample. Measures of crop yield are important indicators of productivity and also provide a basis for assessing whether a landscape is supporting the livelihoods of the individuals who farm the land.

8.1.Measuring crop yield

Crop yield commonly is measured in kilograms per hectare (kg/ha). Often this standard weight per area measure is converted from a volumetric unit of measurement that is based on a commonly used container. Standard methods for measuring crop yield involve weighing a complete harvest or relying on expert judgement. These methods can be expensive however, requiring specialists and/or substantial labor and supervision.

The following two methods are more economical and provide a reasonably accurate assessment of crop yield:

Harvesting (crop cutting): A random sample of the crop in a particular field is cut and weighed. The total yield is calculated from the weight multiplied by the total acreage in production.

Farmer estimation: Farmers are asked for their estimation of the total crop harvested. This value is divided by how much land they planted in order to estimate yield. This method has been found to be reasonably accurate in determining annual or seasonal crop yields, but is not effective for continuous crops.

Evaluating Productivity

The Agricultural Productivity Indicators Measurement Guide by Patrick Diskin explores issues in crop measurement and interpretation of data, including choices in data collection methods and exogenous factors affecting crop yield. It describes in detail six indicators of agricultural crop production (e.g. harvested crop yield per hectare; percent

crop loss during storage, others). It also outlines a plan for data collection for these indicators and provides concrete information on calculating values for them.

8.2. Type of measurement unit used for organic crop production

Several methods to estimate production and yields have been proposed and tested during this survey. Yield estimation method is tailored according to the crop type. There was one common method proposed for all the crop types. It consisted of identifying the type of measurement unit used by the farmers to harvest and sell their crop and on estimating the production in term of number of measurement units harvested declared by the farmers. The calibration of each measurement unit using real data allows one to have an estimate of the production over the reference period.

Data on the exact date for the harvest was collected and could have been used to plan the calibration of the measurement units. This method can be applied to estimate vegetable crop production but precautions must be observed: - to collect accurate data on the number of measurement units harvested for each planting occurrence covering the period of reference; - to pay particular attention for the data collection for calibration of the measurement unit. Enough number of cases must be observed for each couple of crop-measurement unit and effective control of the quality of the data collected to compute accurate average weight of the measurement unit.

Table 16: Number of plots planted by type of crop and measurement unit used to report the harvest (District of Ada East)

Type of crop		Type of Measurement unit used for the harvest								Total
		Boxes	Sack	Basket	Bed	Cartload	Unit	Bucket	Others	
Potato	Number	0	0	0	0	26	0	0	0	26
	%	0%	0%	0%	0%	100.0%	0%	0%	0%	100.0 %
Cabbage	Number	0	26	51	0	0	0	0	0	77
	%	0%	33.8%	66.2%	0%	0%	0%	0%	0%	100.0 %
Lettuce	Number	0	26	26	0	0	0	0	0	52
	%	0%	50.0%	50.0%	0%	0%	0%	0%	0%	100.0 %
Tomato	Number	437	0	2107	0	0	26	0	0	2570
	%	17.0%	0%	82.0%	0%	0%	1.0%	0%	0%	100.0 %
Cauliflower	Number	0	77	0	0	0	0	0	0	77
	%	0%	100.0 %	0%	0%	0%	0%	0%	0%	100.0 %
Eggplant	Number	0	0	0	0	0	26	0	0	26
	%	0%	0%	0%	0%	0%	100.0 %	0%	0%	100.0 %
Pepper	Number	0	0	0	0	0	0	26	0	26
	%	0%	0%	0%	0%	0%	0%	100.0 %	0%	100.0 %
Onion dry	Number	0	231	0	0	0	0	77	0	308
	%	0%	75.0%	0%	0%	0%	0%	25.0%	0%	100.0 %

Self-Check – 8	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. What is the measurement indicator of crop yield?
2. Why we measure crop yield ?
3. List the types of measurements for horticulture crop yield?

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

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

LG #43	LO #3- . Determine scheduling and key responsibilities

Instruction sheet

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

- ❖ determining Key responsibilities for specific preparatory processes
- ❖ determining Key responsibilities for specific implementation processes
- ❖ determining and placing Recordkeeping requirements and procedure
- ❖ documenting the plan, scheduling and key responsibilities
- ❖ identifying plan's type, format, frequency and detail of any reporting

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

- ✓ determine Key responsibilities for specific preparatory processes
- ✓ determine Key responsibilities for specific implementation processes
- ✓ determine and place Recordkeeping requirements and procedure
- ✓ document the plan, schedule and key responsibilities
- ✓ identify plan's type, format, frequency and detail of any reporting

Learning Instructions**:**

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

Information Sheet 1- determining Scheduling for planting

1.1. Determining scheduling for planting

Schedule for planting and key responsibilities has to be properly planned to suit seasonal influences ,weather and weather for casts ,as well as the local geography and the organizations resourcing situation.

Points to be taken in to consideration during scheduling for planting are:

- Range of geographic
- Resourcing factors
- Operation that occur at the same time

A plant schedule may be included with the plan. The planting schedule is a table that lists elements useful to the planter and can be used to identify plants from the plan. Items that should be included are common name, botanical name, quantity, size of materials purchased, and sometimes mature spread and price. Comments about the specific plant are sometimes included. The plant symbol can be included in the plant schedule as well

1.2. Steps for Creating a Planting schedule

1. Create a base map showing existing structures, vegetation, utilities, slopes and drainage, and property lines
2. Create an overlay using tracing paper on the base map or plan that shows all of the desired spaces such as vegetable garden, patio, walkways, lawn and other areas
3. Work with different shapes to create the best spaces
4. Show all of the planting beds and their final shapes
5. Show all hardscape elements
6. Show existing vegetation to be saved and label as such
7. Draw plants where they will go on the base map, keeping in mind mature size

8. Clearly label the plant species by writing the names and quantities on the base map

9. Use a different symbol for each species

10. Use relative sizes for the symbols (for example, show trees larger than shrubs)

11. Show the symbol at mature plant size at the right scale

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (5points each)

1. What are the use of determining schedule for planting
2. List the Steps for Creating a Planting?

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

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

Information Sheet 2- determining Key responsibilities for specific preparatory processes

Before planting a crop the viability of the enterprise should be assessed as part of the overall business plan. It is important to assess and predict:

- Lab our
- Equipment
- Input requirements

Key activities under taken before planting may include:

- Equipment must be serviced to a reliable and operational standard
- Seed must be prepared and available
- Any Pre-planting chemicals must be applied and etc

Self-Check – 2	Written test

Name…… ID…… Date…….

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

1. **What are** Key activities under taken before planting?

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

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

Information Sheet 3	Determining Key responsibilities for specific implementation processes

The following are key activities for specific implementation.

- Land selection under taken
- Land/seed bed must be prepared
- Seed bed must be leveled to a fine depending on seed sizes
- Organic matters or plant debris are properly in cooperated in to the soil

Self-Check – 3	Written test

Name…… ID…… Date…….

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

1.What are the key activities for specific implementation crop establishment?.

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

Information Sheet 4	determining and placing Recordkeeping requirements and procedure

Record keeping requirements are determined and procedures are put in place to insure compliance with the range of applicable regulation. Effective enterprise management should be based on effective recording of field characteristics, dates of operations and inputs. Optimize your recordkeeping time by using the forms in this workbook for both organic certification and crop insurance reporting. Both require tracking of activities and inputs: one to verify compliance to organic rules; the other to show documentation for a crop insurance claim. Both also require monitoring the health of the crop, and any pest and disease issues, including what was done to deal with these problems.

You can keep your records in any format that suits you. Records of use can be:

- hand written
- computer generated
- kept in record books
- recorded as part of a quality assurance program.

The only requirement is that the records:

- contain all the required information
- are clear and accurate
- are readily available to an authorised officer on request.

Records may be made by a third party (such as a supervisor or assistant) or through automated data logging, but it's up to the chemical user to make sure they are accurate and are kept for the required period.

A good sign that your record-keeping system is suitable is if another person can pick up your documentation and get a clear picture of exactly what you did, on any given day, without any assistance.

4.1.Why keep organic production records?

Keeping records meets the requirements of various state and federal regulations. Complete and accurate records help demonstrate your protection of soil, water and other environmental resources. Records will help you analyze the performance of your farm’s cropping system. Records may provide liability protection in the event of a complaint or lawsuit concerning your farming operation.

Complete records demonstrate conformance with Michigan Right-to-Farm guidelines and are needed for Michigan Agriculture Environmental Assurance Program (MAEAP) system verification.

4.2.Organic crop Record Keeping Methods:

In addition to the classic paper record keeping, there has been a recent trend for farmers to go digital with their record keeping, using spreadsheets, orchard management software, or farm management software to manage the extensive data collection they need.

Digital record keeping can range from simple excel spreadsheets and basic calculations to online data management tools.

Another popular trend in farm record keeping is the use of farm management apps. Farm management apps and other apps for farmers aim to make farm record keeping easier and more reliable using digital recording, with records often stored in the cloud for easy access from anywhere. Farm management apps range in complexity, from simple mobile farm record keeping spreadsheets to fully integrated recording systems stretching from planting to sale.

4.3.How record keeping helps farmer

Keeping accurate farm records is crucial to growers who want to measure their efficiency and progress throughout the year. With comprehensive records, time spent on administrative work such as payroll and audits can be drastically reduced.
Better records also mean a better understanding of the strengths, weaknesses, and productivity levels around the farm, and can provide insight into best practices going forward. Food safety and traceability, topics at the forefront of the consumer consciousness, can be enhanced exponentially with effective recording processes.

Organized record keeping can cut audits down from a few days to a few hours, and these audits can allow growers to achieve food safety certifications, which in turn expand market access.

Table 1. Crop Information

Year	Crop	Hybrid/ Variety	Yield Goal	Actual Yield	Planting Date	Pop. Planted	Actual Pop.	Planter Settings	Tillage Practices and Dates	Crop Residue*	Harvest Date

Self-Check – 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (5pnts each)

1. **What are the advantages of record keeping?**
2. **Why we make organic crop production record keeping?**
3. **List the methods of crop production record keeping ?**

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

Note: **Satisfactory rating - 15 points** **Unsatisfactory – below w 15points**

Information Sheet 5	documenting the plan, scheduling and key responsibilities

Crop planning and documentation is the basis for the successful management of your farm. In this way, operating processes are optimized and legal requirements are met. A field card index with GIS is the perfect assistant for the quick, safe and easy creation of all operational documentation. With a closed-loop system you can plan and document cultivation, crop tending tasks and harvesting. Whether mobile or on a PC – keep track of your operation in no time at all.

In the agricultural crop production all activities involved during the process from starting up to the end relevant data has to be documented.

The following activities may be documented in planting plan:

- ✓ Planting plan: it includes the objectives of the plan, specification and the targets
- ✓ Planting schedule: exact time of sowing different agricultural crops for each paddock
- ✓ Key responsibilities: all activities under taken for preparatory and implementation processes

5.1.Organic System Crop Production Overview documentation format

1. List all crops (or types of crops if your operation is highly diversified) you grow or harvest for which you are seeking organic certification. Include food and feed crops, pasture/forage, and wild-crops.

   _____

   _____

   _____

2. Check the box that describes your operation's production systems:
   - ☐ all organic production
   - ☐ organic and non-organic production

3. Do you grow crops in soil?
   - ☐ No
   - ☐ Yes; please submit the following Crop OSP forms: Crop Rotation and Soil Management; Pest, Disease and Weed Management; Prevention of Contamination and Commingling; Recordkeeping, Labeling and Audit Trail.
     - ☐ Attached (4 forms)

4. Do you plant seeds, seedlings, or planting stock of any kind?
   - ☐ No
   - ☐ Yes; please submit the Seeds and Planting Stock form. ☐ Attached

5. Do you use any off-farm input materials?
   - ☐ No
   - ☐ Yes; please submit the Materials List form. ☐ Attached

6. Do you produce seedlings or crops in containers with planting medium, or grow crops in a greenhouse, coldframe or hoophouse?
   - ☐ No
   - ☐ Yes; please submit the Greenhouse Crop form. ☐ Attached

7. Do you produce compost or use purchased compost?
   - ☐ No
   - ☐ Yes

8. Do you use manure?
   - ☐ No
   - ☐ Yes

Self-Check – 5	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (3pnts each)

Test I:

1. **What is the deffirence between documenting plan and scheduling plan?**
2. **List the activities to be documented in organic crop production?**
3. **List some overview of documentation format on crop production ?**

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

Note: **Satisfactory rating - 9 points** **Unsatisfactory - below 9.points**

Information Sheet 6	Identifying plan's type, format, frequency and detail of any reporting

To ensure smooth work flow operations report must be submitted to both managers and operators or any concerned body. Therefore this is achieved by documenting production plan including the types of plan, format, frequency and detail of any reporting required concerned body are completed and clearly documented.

Production planning involves scheduling, estimating, and forecasting the future demands for products. This takes into account customer orders, production capacities and capabilities, forecasting of future trends, and inventory levels. Once that is done, there are five main types of production planning: Job, Method, Flow, Process and Mass Production methods. Each is based on different principles and assumptions. Each has their own merits and demerits.

Job Method

Under this method, the complete task of manufacturing a product is handled either by a single worker or by a group. The type of jobs using this method could be small scale or complex. This method is usually incorporated when customer specifications are essential in the production. Tailors, cooks, and hairdressers are all examples of professionals who use the Job method of production planning. Small scale jobs are those for which production is relatively easy, as the worker has the required skill-set for the job. Also relatively little specialized equipment is usually needed in such tasks. Due to those considerations, the customer's specific requirements can easily be included at anytime during the progression of the job. Complex jobs involve the use of high technology, making project control and management essential. Construction businesses, for example, are complex operations that still use the Job method of production planning.

Batch Method

As crop production grow, and their production volumes grow with them, the Batch method of production planning becomes more common. It requires the division of work into parts. For a part of work to proceed it is essential that the previous part gets

completed. Electronic parts manufacturing businesses use the batch method. The Batch method requires specialization of labor for each division.

Flow Method

This method is similar to the batch method. Here the aim is to improve material and work flow, reduce labor and labor costs and finish the work faster. Unlike the batch method, where one batch is completed after another, in this method, work progresses as a flow. Assembly lines that make televisions typically use this method. The product is manufactured by a number of interconnected operations in which the material moves one stage to the second without time lags and interruptions.

Process Method

Here the product is produced using a uniform and standardized sequence. Highly sophisticated machinery is used here. The production is continuous.

Mass Production Method

In this method, goods are produced using standardized techniques like balanced production and product-wise layout.

Self-Check – 6	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (3each)

Test I:

1. List the advantages of Identifying plan's type, format, frequency and detail of any reporting organic production
2. What are the key responsibilities under taken before Planting?
3. What are the types of crop production plan?

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

LG #44	LO #4- Monitor and adjust the planting plan

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics: determining Scheduling for planting ➢ Adhering Monitoring points outlined in the implementation plan ➢ Following occupational health & safety requirements ➢ Following the site environmental requirements ➢ Communicating Operational staff and any contractors ➢ Completing Checks ➢ Initiating and taking corrective action or amendment to the planting plan This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, **upon completion of this learning guide, you will be able to**: ✓ Adhere Monitoring points outlined in the implementation plan ✓ Follow occupational health & safety requirements ✓ Follow the site environmental requirements ✓ Communicate Operational staff and any contractors ✓ Complete Checks ✓ Initiate and taking corrective action or amendment to the planting
Learning Instructions:

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

Information Sheet 1- Adhering Monitoring points outlined in the implementation plan

Monitoring the points out lined in the implementation plan are adhered to. The points that may out lined in the plan may include:

- Objective of the plan-the plan must have an objective
- Target of the plan
- Specification of the plan
- Methods to be used is also out lined
- Seed availabilities and etc

Self-Check – 1	Written test

Name…… ID…… Date…….

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

1.what are the points to be included in adhering plan?

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**
You can ask you teacher for the copy of the correct answers.

Information Sheet 2.	Following occupational health & safety requirements

Occupational health and safety (OHS) standards mandate reduction, removal or replacement of job site hazards. OHS programs also help minimize the effects of such hazards. **Occupational health and safety** considerably benefits the company, as healthy employees are guaranteed to be more productive. he whole objective of **Occupational Safety** and **Health is** to prevent diseases, injuries, and deaths that **are** due to working conditions; no one **should have** to su er a job related injury or disease because of their employment. Significant changes **are** constantly occurring in the **workplace** for example

Occupational health and safety requirements are being followed by action that will reduce the occupational health and safety risk are the selection ,use and maintenance of personnel protective equipment ,the appropriate and responsible servicing of equipment and vehicles ,the use of safe manual handling systems ,and the protection from noise and dust.

Although it may seem confusing to begin with, Occupational Health and Safety (OH&S) is extremely valuable and is rightly being incorporated into more and more workplaces around the world. For that reason, it's important to break it down and begin to understand exactly what Occupational Health and Safety is, and why it's so important. In today's article, we'll explain exactly what EH&S is, how everybody can benefit from it, and why some of the safety courses offered by our Safety & Access team can be beneficial to all.

Occupational Health and Safety is designed to create a safe, healthy work environment. It can generally be considered as two separate entities.

Occupational Safety covers the risk factor in your workplace, and potential safety hazards that could possibly cause injury. Occupational Health, on the other hand, looks at potential health concerns and wellbeing. Think of Safety as an employee's physical well-being, and Health as everything else, including mental health.

Whether you're stacking shelves, studying a PhD, working from an office, or using heavy machinery, there are health and safety risks. That being the case, your employer has a responsibility to minimize those risks and reduce the likelihood of any workplace accident or mistreatment. And, as we're about to explain, it's in more than just their legal interest to look after you.

2.1. Importance of Occupational Health and Safety

Mental Health and Well-Being

Your employer must consider the conditions you work in. OH&S puts a care of duty upon every employer to make sure that their staff work in reasonable conditions, and that their mental health is a top priority.

Long hours, few breaks, little recognition, and impossible demands will quickly leave staff fatigued, stressed, and suffering from poor mental health. At best, workers will suffer slight mental health problems and only require a break from work. At worst, this could lead to life-changing and long-term mental health problems.

Companies want to make sure that their staff are mentally healthy and contributing to the business. OH&S makes sure that staff health is looked after.

Increased Awareness and Safe Working Culture

You don't spend thousands upon thousands of pounds putting your staff on mandatory training courses just for the sake of it. OH&S training courses, all the way from Working at Height to Supply Chain Management, are all designed to create awareness of workplace surroundings and create a safe working culture.

This sounds good on paper, but it's even better in practice. Once they've completed the relevant OH&S training courses, staff will work in a much safer way, and will understand how to minimise workplace risk. As they learn to avoid hazards and raise concerns about potentially dangerous tasks, workplace-related injuries will reduce.

This keeps workers safe and improves trust throughout industry.

Increase in Productivity

Healthy staff are productive staff. When OH&S is implemented correctly, staff should feel protected, and loyal to their work. They know that they're being looked after while they're at work, and that they won't be putting their safety or their health at risk.

This is also significant because when staff speak up and raise concerns about a potentially hazardous task, they do so in the knowledge that their opinion will be listened to and considered. Colleagues trust one another and, with a positive mindset, will work efficiently. Fail to protect your staff with the appropriate OH&S measures, and you'll only see your staff retention rate decrease.

Correct Training and Use of Tools

Particularly on some of our Scaffolding Training Courses, our experts explain that shortcuts will always create workplace risks. This is true in just about every industry, but when heavy machinery is involved, the risk is much more significant.

When OH&S training is carried out correctly, staff know how to use the tools that are required for their job. Injuries are less likely to occur, and the work will be carried out to a higher standard as well. You'll have highly trained staff and a reduction in man-hours lost to injury and illness.

New Opportunities

OH&S will also create new opportunities in your workplace. Staff that have been trained can take on the responsibility of becoming mental health ambassadors, setting a good example and serving as a point-of-contact for their colleagues.

For others, OH&S also creates the opportunity to share success stories and examples of best practice. Staff can also be recognised for fine examples of OH&S in the workplace, and by highlighting examples of best practice, the culture of health and safety at work will only improve

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 5pnts)

Test I:

1. What is occupational health and safety mean?
2. List the importance occupational health and safety in organic crop production?

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

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

Information Sheet 3.- following the site environmental requirements

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Self-Check – 3	Written test

Name…… ID…… Date…….

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

Test I:

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

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

Information Sheet 4	communicating Operational staff and any contractors

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Self-Check – 5	**Written test**

Name…… ID…… Date…….

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

Test I:

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

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

Information Sheet 5	completing Checks

All activities that under taken in agricultural crop planting /sowing including the plan and the scheduling for planting must be documented and this data may be required by the organization or other regulating bodies . Hence as an expert you are able to give the document that is completed clearly and accurately during the progress of the planting process**.**

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Self-Check – 5	Written test

Name…… ID…… Date…….

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

Test I:

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

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

Information sheet 6. . initiating and taking corrective action or amendment to the planting Plan

Where any corrective action or amendment to the planting plan is required, the action is initiated and taken. For example, let say you are **DA** working in the woreda“ **X**” and that woreda has 11 Keble. Therefore, as a rule the production plan is from down to top so that the data for the production plan is collected from those 11 Keble and forms the woreda’s production plan. In such case there may be that woreda wants to take corrective action to planting plan. Therefore the action is initiated and taken with the participation of **DA** of those 11 Keble’s.

Self-Check – 6	Written test

Name…… ID…… Date…….

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

Test I:
1.When and why planting plan can needed to take corrective action_

***Note*: Satisfactory rating - 3 points Unsatisfactory - below 3 points**
You can ask you teacher for the copy of the correct answers.

Operation Sheet 1-

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……..

LAP TEST	Performance Test

Name……. ID……..
Date…….

Time started: _____ Time finished: _____

Instructions: …….
Task-1 ……..

LG #45	LO #5- Determine condition of agricultural crops

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics: determining Scheduling for planting ➢ Undertaking Measurement and assessment of soil moisture ➢ Calculating Water requirements ➢ Assessing Nutrient requirements for crops ➢ Identifying Nutrient requirements deficiencies ➢ Identifying Factors affecting crop capacity ➢ Implementing Sustainable land management This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, **upon completion of this learning guide, you will be able to**: ✓ Undertake Measuring and assessing of soil moisture ✓ Calculate Water requirements ✓ Assess Nutrient requirements for crops ✓ Identify Nutrient requirements deficiencies ✓ Identify Factors affecting crop capacity ✓ Implement Sustainable land management
Learning Instructions**:**

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

Information Sheet 1	Undertaking Measurement and assessment of soil moisture

1.1.Soil Moisture Concepts and Terms

Soil moisture levels can be expressed in terms of soil water content or soil water potential (tension).

Soil water content most commonly is expressed as percent water by weight, percent water by volume, or inches of water per foot of soil. Other units such as inches of water per inch of soil also are used.

Water content by weight is determined by dividing the weight of water in the soil by the dry weight of the soil. It can be converted to percent by multiplying by 100%.

Water content by volume is obtained by multiplying the water content by weight by the bulk density of the soil. Bulk density of the soil is the relative weight of the dry soil to the weight of an equal volume of water. Bulk density for typical soils usually varies between 1.5 and 1.6.

Inches of water per foot of soil is obtained by multiplying the water content by volume by 12 inches per foot. It also can be expressed as inches of water per inch of soil which is equivalent to the water content by volume. By determining this value for each layer of soil, the total water in the soil profile can be estimated.

Soil water potential describes how tightly the water is held in the soil. Soil tension is another term used to describe soil water potential. It is an indicator of how hard a plant must work to get water from the soil The drier the soil, the greater the soil water potential and the harder it is to extract water from the soil. To convert from soil water content to soil water potential requires information on soil water versus soil tension that is available for many soils.

Water in the soil is classed as available or unavailable water.

Available water is defined as the water held in the soil between field capacity and wilting point.

Field capacity is the point at which the gravitational or easily drained water has drained from the soil. Traditionally, it has been considered as 1/3 bar tension. However, field capacity for many irrigated soils is approximately 1/10 bar tension.

Wilting point is the soil moisture content where most plants would experience permanent wilting and is considered to occur at 15 bars tension. Table 1 gives common ranges of available water for soil types.

Readily available water is that portion of the available water that is relatively easy for a plant to use. It is common to consider about 50% of the available water as readily available water.

Even though all of the available water can be used by the plant, the closer the soil is to the wilting point, the harder it is for the plant to use the water. Plant stress and yield loss are possible after the readily available water has been

1.2.Methods of Measuring Soil Moisture

Soil moisture can be measures or estimated in a variety of ways ranging from the simple, low cost feel method to more accurate, expensive neutron probe units. For most irrigation water management applications, one of the several resistance-block types or tensiometers is recommended.

Electrical Resistance Blocks—a meter is used to read the electrical resistance of moisture blocks installed in the ground.

Tensiometers—this is a sealed, water-filled tube with a vacuum gauge on the upper end and a porous ceramic tip on the lower end. The tensiometer is filled with water and the porous tip is buried in the soil to the desired depth (Figure 3). Tensiometers have been called mechanical roots since they provide an indication of how hard it is for the plant to get water from the soil.

Tensiometers measure soil water potential or tension. Water in the tensiometer will come to equilibrium with water in the soil.

Readings are an indication of the availability of water in the soil. Readings are in centibars (1/100 of a bar). A reading of 100 is equal to 1 bar of tension.

Tensiometers generally are effective only at less than 85 centi bars of tension, because the gauge will malfunction when air enters the ceramic tip or the water in the tube separates. The usable range from 0 to 85 centibars, however, is the most important range for irrigation management.

Properly installed and maintained, the tensiometer provides an accurate measurement of soil tension. It is not suitable where soil tension routinely exceeds 85 centibars. Even

though portable units are available, tensiometers are normally planted or installed at one location for the duration of the irrigation season.

Tensiometers do not directly give readings of soil water content.

To obtain soil water content, a moisture release curve (water content versus soil tension) is needed

Feel Method—a soil probe is used to sample the soil profile. Soil moisture is evaluated by feeling the soil. Then a chart is used to judge relative moisture levels. It is important to sample numerous locations throughout the field as well as several depths in the soil profile.

This method is only an estimate and lacks scientific basis. Accurate measurement is not possible, but rather the method is an art developed over time with extensive use. Another measurement method such as tensiometers or resistance blocks is really needed as a reference, especially during the learning period.

The feel method requires no investment other than a soil probe. Effective use, however, does require more time and judgment than other, more quantitative methods. Do not use the feel method as an excuse to avoid using tensiometers or resistance blocks.

Portable Measuring Devices—several types are available for estimating soil moisture. Most have electronic meters and use either resistance or capacitance technology. Some use the same principle as a tensiometer.

Portable soil moisture probes serve much the same purpose as the feel method. They provide the flexibility of being able to sample many locations throughout the field. They may be most useful in providing relative readings of moisture within or between fields rather than providing an accurate measurement of soil moisture. Another method such as tensiometers or resistance blocks is needed as a reference to calibrate the instruments

1.3.Irrigation methods

Irrigation methods vary in different parts of the world and on different farms in the same area because of differences in soil, topography, water supply, crops and customs. There are four methods of irrigation:

- Surface irrigation (flooding, check basin method, border strip method, furrow method and corrugated method).

- Overhead irrigation (sprinkler irrigation).
- Sub-surface irrigation.
- Drip irrigation

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.(each 5pnts)

1) **1.What is soil moisture concept?**
2) **List and explain the methods ofmeasuring soil moisture?**
3) **What are irrigation methods?**

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**
You can ask you teacher for the copy of the correct answers

Operation Sheet 1	Soil moisture determination

Title: Soil moisture determination (Direct Method)

Objectives:

To know soil moisture determination methods

Gravimetric Method:

- It is the commonly used method of soil moisture measurement wherein loss of moisture is determined.
- Weight of wet samples and oven-dried samples are recorded.
- This gives the Wt. Of moisture in the soil and expressed as a percentage on dry soil.

Procedure:

- A level spot is selected in the middle of the field.
- In the cropped field, sampling should be done in between 2 plants in a row.
- The screw auger is driven to the desired depth and the soil sample is drawn.(depth 0-15& 15-30).
- A composite sample of not less than 100 g is taken in a moisture box.
- The lid is covered immediately to avoid moisture loss.
- The sample is weighed with an accuracy of 2 decimals (Ww).
- The sample is dried in an oven at a constant temperature of 105^0C for about 48-78 hrs. To get a constant dry weight.
- After drying, the samples are weighed (WD).

Soil moisture content on dry weight basis (%)

$$\frac{\text{Wt.of moist sample (Ww)} - \text{Wt.of oven dry sample (Wd)}}{\text{Weight of oven dry sample (Wd)}} \times 100$$

For Example: A fresh soil sample weighs 100 g and after oven drying, it weighs 80 g. Calculate the moisture content of the soil? Moisture content (%) $\frac{Ww-Wd}{Wd} \times 100 = \frac{100-80}{80} \times 100 =$ **25%**

Information Sheet 2	Calculating Water requirements

The water requirement (WR) of a crop may be defined as the quantity of water, regardless of its source, required by a crop in a given period for its normal growth and development under field conditions at a specific place. Water requirement includes the losses due to evapo transpiration (ET) or consumptive use (CU) plus the losses during the application of irrigation water and the amount required for special operations such as land preparation, transplanting, leaching, etc. it may thus be formulated as follows: WR = ET or CU + application losses + special needs.

Water supply is the most important factor in determining the distribution of a crop plant. Although total annual precipitation is important, its distribution plays an essential role in crop production. In case of plant growth for their seed, the most critical period or the period of greatest need for moisture, is when fertilization of the flowers is taking place. Crop plants differ in their water requirements, even though they are almost all require an average amount of water.

2.1. Soil water requirement

Soil water status must be monitored for effective irrigation water management. The soil act as a bank store water for the crop. Adequate soil water in the crop root zone provides for optimum plant growth. If the water in the soil is depleted below a given level, crop yields can be decreased. Soil water measurement is useful in determining:

- How much water is available for crop use
- When to irrigate
- How much irrigation water to apply

Soil water measurement must be integral parts of any irrigation scheduling program. Soil water monitoring can help to conserve water, conserve energy and produce optimum crop yield.

Soil water content can be expressed quantitatively as:

Mass bases- which refer to the mass of water per unit mass of soil is calculated as:

$$\text{Gravimetric water content} = \frac{\text{mass of wet soil} - \text{mass of oven dry soil}}{\text{Mass of oven dried soil}}$$

Volume basis- which refers to the volume of water per unit volume of soil can be calculated as follows:

$$\text{Volumetric water content} = \frac{\text{volume of water}}{\text{Total soil volume}}$$

2.2. Irrigation requirement

The field irrigation requirement (IR) of a crop, therefore, refers to the water requirement of the crop, excluding effective rainfall and the contribution from soil profile, and may be formulated as: IR =WR – (ER+S).

A farm irrigation requirement depends on the irrigation needs of the individual crops, their area and losses in the farm water distribution systems, mainly by seepage

2.2.1.Net Irrigation Requirement

This is the amount of irrigation water required to bring the soil moisture level in the effective root zone to field capacity. Thus it is the difference between field capacity and the soil moisture content in the root zone before starting irrigation.

2.2.2.Gross Irrigation Requirement

This is the total amount of water applied through irrigation. In other words, it is the net irrigation requirement plus losses in water application and other losses. Gross irrigation requirement can be determined for a field, a farm, an outlet command area, or an irrigation project, depending on the need, by considering the appropriate losses at various stages of the crop growth.

Gross irrigation requirement in field = net irrigation requirement divided by irrigation efficiency. For example, if the net amount of irrigation is 10 cm and the irrigation efficiency is 70%, the gross amount of water to be applied to the field is 10 cm divided by 0.70 = 14.29 cm

.Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.(each 5 pnts)

1) Deffirentiate between the following terms:-

a) Crop water requirements?

b) Soil water requrments?

c) Irrigarion water requirements?

You can ask you teacher for the copy of the correct answers.
Note: **Satisfactory rating - 15points** **Unsatisfactory - below 15 points**

Information Sheet 3	Assessing Nutrient requirements for crops

Crop nutrients. Nitrogen (N), phosphorous (P), and potassium (K) are the three main nutrients that are conventionally supplied by inorganic fertilizers. Nutrients may also be supplied by other products and processes such as organic manures, plants residues, and biological nitrogen fixation

3.1.Selecting types of organic fertilizers

Fertilizer, natural or synthetic chemical substance or mixture used to enrich soil so as to promote plant growth. Plants do not require complex chemical compounds analogous to the vitamins and amino acids required for human nutrition, because plants are able to synthesize whatever compounds they need.

3.2.Essential elements

Essential can be expressed as:

a) Required for normal growth and completion of the life cycle
b) Not replaceable under normal growth condition
c) Have a demonstrated biological role in the plant – structural or physiological

There are sixteen (16) essential elements that are requires by most plants. Excluding C, H_2, and O_2 obtained from the air and are the most abundant elements in the plants.

Elements obtained from the soil

1. Macro-nutrient (Major elements):- N,P, K are fertilizer elements.
2. Secondary nutrients: - Ca, Mg, S, are lime elements.
3. Micronutrients(Trace or minor elements) :- Bo, Cl, Cu, Fe, Mn, Mo, Zn
4. Others: - Co, Na, Va, Ni, Si.

Self-Check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 3pnts)

Test I:

1. What is crop /plant nutrient mean?
2. List the essential elements?
3. What we mean by plant nutrients deficiency?

Note: **Satisfactory rating - 12 points** **Unsatisfactory - below 12 points**
You can ask you teacher for the copy of the correct answers.

Information Sheet 4	Identifying Nutrient requirements deficiencies

3.3.Plant nutrient deficiency assessment methods

To determine nutrient deficiencies, most growers rely primarily on visual symptoms, plant tissue analysis and soil analysis. Plant analysis and soil testing go hand in hand. A soil test provides an index of the nutrient that is potentially available for the crop. Deficiency symptoms may shows New foliage, buds and roots have stunted growth. Younger leaves curl downwards with browning of leaf edges and leaf tips, also known as tip burn. In some plants, they may also show abnormally green foliage. Roots become short and stubby.

Common Nutrient deficiency symptoms observed in plants

Element/nutrient	deficiency symptoms
	Symptoms in older leaves first
N	Stunted growth; pale green, yellow, or brown leaves, slender stems; anthocyanin accumulation
K	Mottled or chlorotic leaves(faded green/yellow) with died spots (necrosis);curling or crinkling
P	Stunted growth; dark green leaves with died spots(necrosis) some anthocyanin accumulation
Mg	Mottled or chlorotic leaves(interveinal); tips and edges of leaves curl up ward
	Symptoms in younger leaves first
Ca	Young leaves at bud hooked, then die back at edges, stalk dies at bud
B	Young leaves of the terminal bud light green, leaves twisted, stalk dies at bud
S	Chlorosis, Young leaves light green; some anthocyanin accumulation
Fe	Young leaves chlorotic (interveinal)
Cu	Young leaves wilted, wilted terminal bud, dark green leaves w/necrosis
Mn	Chlorosis (interveinal), necrosis
Zn	Rosette growth, leaves small, puckered(makes less auxin)
Mo	Chlorosis (interveinal), necrosis;poor flowering; can cause N deficiency
Cl	Wilting at leaf tips; general chlorosis and necrosis, bronzing, stunted

Self-Check – 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 5pnts)

1. How we assess/identify plant nutrients deficiency in horticulture production?
2. List some plant nutrients with their deficiency symptoms?

Note: **Satisfactory rating – 10.points Unsatisfactory - below 10. points**
You can ask you teacher for the copy of the correct answers.
.

Information Sheet 5	Identifying Factors affecting crop capacity

The three groups of factors that largely determine whether certain crops can be economically produced in given region, and therefore, determine their distribution, are climate, soil and social conditions.

A. Climate condition

Climate largely determines the type of vegetation that grows naturally in any part of the world and the kinds of agriculture that are possible. The three most important factors in climate from the standpoint of plant response are temperature, water supply/precipitation/ and light.

There are also other factors like humidity, solar radiation, wind and atmospheric gases but generally they are of less influence than the three mentioned.

I. Temperature

Temperature is often the factor limiting the growth and distribution of plants. It influences the rate of growth, development and number of flower that produce seeds. The ranges of maximum growth of the plant are 15-32 ^{o}C.

Effects of high temperature on plant growth

- Dropping off flowers
- Growth rates and flower formation is affected
- Desiccation of the plant parts

When temperature is below 15 ^{o}C frost or pale-yellow color of the plant parts occur.

II. Water supply/precipitation/

Precipitation includes all forms of water like rainfall, snow, hail. Precipitation or water supply is the most important factor in determining the distribution of a crop plant. Although total annual precipitation is important, its distribution plays an essential role in crop production. In case of plant growth for their seed, the most critical period or the period of greatest need for moisture, is when fertilization of the flowers is taking place.

Crop plants differ in their water requirements, even though they are almost all require an average amount of water.

Importance of water for plants

- About 80-90% of actively growing plant tissue is water

- It is the medium through which the soil nutrients move into plants
- It is essential in the photosynthetic nutrient, manufacturing process.

Over a very large part of the earth's surface the relative scarcity or abundance of water is the most important factor in determining whether plants can grow, or what kids of plants will survive.

III. Light

Light affects the development of crop plants mainly through affecting:-

1. Their structural development
2. Their food production
3. The time required for certain species or varieties to produce seeds

Seeds of most grasses are light sensitive, and light are necessary for their germination. Light is necessary for photosynthesis and, therefore, is required by green plants for the manufacture of food.

IV. Evaporation and transpiration

The evaporation of moisture from the soil and transpiration by plants must be taken into accounts in considering precipitation in relation to crops responses.

B. Soil Factors

Soil factors are nutrients and water, moisture, soil temperature, soil reaction, micro-organism, and anchorage (firming).

i. Soil moisture

The amount of soil moisture has impact on performance of individual plants. If soil pores are completely filled with water, water logging condition is happen. Then water logging resulting in shortage of oxygen, leaching of plant nutrients, poor germination or nil, stunted growth, failure of seed formation, yellowing of leaves etc.

ii. Soil temperature

It is another soil factor that determining the growth of plants. It influences the rates of absorption of water and solutes, germination of seeds, growth of seeds, growth of roots, and decomposition of organic matter.

iii. Soil air

Under normal growing conditions there is a concentration of carbon-dioxides in the soil and low concentration of oxygen. Carbon-dioxides content of the soil air remains relatively uniform, where as the oxygen content may vary widely.

iv. Soil reaction (soil acidity or soil alkalinity)

Soil alkalinity

Lack/shortage of rainfall in drier regions results in an accumulation of salts (cations like $Ca^{++,}$ Mg^{++}, Na^{+}, etc). When such accumulation exists the production of crops may be uncertain, or even impossible, over relatively large areas.

Plants are varying in their tolerance of alkaline soil. Among the tolerant crops are sugar cane, sugar beet, cotton, rye and many of the grasses. Grasses or cereals seem to be more tolerant than the legume crops.

Effects of soil alkalinity

- Soil compaction:- because high NaOH in the soil dissolves organic matter in soil.
- Poor water infiltration
- Restriction of root growth etc

Soil acidity

In high altitudes which characterized by high amount of rainfall leaching of cation ($Ca^{++,}$ Mg^{++}, Na^{+}, etc) to the lower subsoil will be occurred but the amounts of Aluminum and hydrogen is higher.

Many crops are tolerant to acidic soil conditions and often make satisfactory growth. Some of these crops are tobacco, cow pea etc.

Most legume crops differ greatly in their adaptation to acid soil most grow well on slightly or moderately acidic soil. Small grains, maize, some legume are broadly tolerant, growing well within the pH ranges 5.8 to 7 or slightly or above.

Impact of acid soil on crop production

- Toxic to plant due to the high accumulation of Al^{+++} and Mn^{++}
- Nutrient phosphorous is fixed
- The activities of soil organism is poor

C. Altitude/Elevation

The choice of a crop to be cultivated in a given locality is determined by its altitude.

Classification of altitude/in Ethiopian condition/

1. Wurch:- greater than 3500m a.s.l.
2. High land (Dega):- 2500-3500m a.s.l.
3. Medium land(Woynadega):- 1500-2500m a.s.l.
4. Low land (kola):- 500-1500m a.s.l.
5. Desert (harrur):- less than 500m a.s.l.

Self-Check 1	Written Test

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.(each 3pnt)

1. List some climatic factors that affect the crop capacity?
2. Assume that soil sample was collected from the field for water content determination and the following data were recorded:

   Mass of wet soil = 100g **calculate**

   Mass after oven drying = 80g a) gravimetric water content

   Total soil volume = 70cm^3 b) volumetric water content
3. How soil alkalinity affect crop production?
4. Explain how altitude affects crop distribution or production?

Note: **Satisfactory rating - 14 points** **Unsatisfactory - below 14 points**

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

Information Sheet 6	Implementing Sustainable land management

6.1. Sustainable land management (SLM)

It comprises measures and practices adapted to biophysical and socio-economic conditions aimed at the **protection**, conservation and **sustainable** use of resources (**soil**, water and biodiversity) and the restoration of degraded natural resources and their ecosystem functions. **Sustainable agriculture** approaches, therefore focus on optimizing production while minimizing negative environmental impacts and promoting actions for the protection, conservation, enhancement and efficient use of natural resources.

6.2. Some methods of soil erosion protection on crop land for sustainable land management

1. **Reduce Tillage**

Reducing tillage allows crops to remain in the soil rather than being plowed at the end of a season. The benefit of no till farming is uninterruption to the soil structure, which leaves more residue on the surface to stand up against harsh water and wind conditions. This also allows crops to naturally breakdown within the soil. Soil remains secured in place, nutrient depletion is held to a minimum, and fertile topsoil is greater protected against erosion.

2. Contour Farming

With contour farming, instead of planting crops in straight lines, crops are planted based on the contour lines of the field to create reservoirs that conserve rainwater and reduce top-level soil erosion. The practice of contour farming has been around for centuries, but its widespread adoption in the U.S. did not come about until the 1930s.

3. Cover Crops

Cover crops are implemented into crop rotations between planting seasons to maintain and enrich the soil with a full range of macronutrients and micronutrients and to shield the top soil against harmful weather conditions. Some common types of Florida cover

crops include rye, ryegrass, wheat, and oats. For northern areas of Florida, cereal rye is commonly used as a cover crop because of its effective use as a windbreak.

4. Windbreaks

Windbreaks are barriers created out of different natural material, such as trees and high shrubs. Windbreaks assist in slowing down and limiting the path of strong winds. In turn, this decreases the rate of wind erosion. Windbreaks are typically found in multiple perpendicular rows running adjacent to crop fields.

Self-Check – 6	Written test

Name…… ID……. Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 5 pnts)

1. What is sustainable land management means?
2. List some erosion control methods for implementing sustainable land management?

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

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

Operation Sheet 1-

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……..

LAP TEST	Performance Test

Name……. ID……..
Date…….

Time started: _____ Time finished: _____

Instructions: …….
Task-1 ……..

LG #46	LO #6- Determine pest control

Instruction sheet

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

- Assessing Evidence of pests and disease
- Determining control measures appropriate to type and species of infestation
- Identifying and eradicating Areas of weed infestation
- Selecting Control methods
- Scheduling Control methods
- Maintaining Severity of infestations and records of treatments

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

- Determine control measures appropriate to type and species of infestation
- Identify and eradicating Areas of weed infestation
- Select Control methods
- Schedule Control methods
- Maintaine Severity of infestations and records of treatments

Learning Instructions:

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

Information Sheet 1	Assessing Evidence of pests and disease

1.1.Definition of pest, insects and disease

Pests: - are any organisms which interfere with human activities. They are reducing quality and quantity of crops.

Insects: - are small animals which belong to Anthropoid phylum. Their body is divided into three sections, head, thorax and abdomen. Most adult insects have three pairs of legs and one or two pair of functional wings.

Disease:- is an abnormal deviation in physiological , biochemical processed in plant.

- It results in retardation of development of the plant.
- Reduction In quality and quantity.
- Expressed in the reactions of the plants.

2.2.Diagnosis of the pest problem in organic farming

Correct identification of the pest specifies present in the agro ecosystem is the most important aspect of pest management. If identification is incorrect, then the choice of tactic is often wrong. Incorrect pest identification may occur when one known species is confused with another known species. These types of error can usually be corrected by consultation with expert. The major steps are as follows:

1. The pest species must be correctly identified
2. Determining the pest and crop biological parameters, including pest population size, pest distribution, stage pest development and etc
3. Evaluate the potential damage sustained by the crop relative to the pest density.
4. Review all the tactic that are available to manage the target pest.
5. Consider the possible interactions among the target pest and other pests and beneficial those are present in the agro ecosystem.
6. Finally make decision.

2.3.Resources required for assessment

The Pest Control Technician is a specialist in the mixing, spraying and application of chemical solutions to control weeds, pests, insects and plant and tree diseases. The classification is distinguished from the Maintenance Worker in that the incumbent does not routinely perform construction, maintenance or landscape work. The classification is distinguished from the Lead Maintenance Worker in that the incumbent does not oversee a crew engaged in the performance of construction, maintenance or landscape work..

2.3.1Minimum Qualification Guidelines

Knowledge of

- Tools and techniques for the proper use and application of organic chemicals used to control weeds, diseases, insects and other pests;
- Pertinent local, State and Federal rules, regulations, laws and reporting requirements;
- Proper maintenance of spray equipment;
- Safe work practices and procedures related to use of chemical sprays;
- Treatment for pesticide poisoning and basic first aid.

Ability to

- Safely perform skilled work in the preparation and application of chemical solutions to control weeds, diseases, insects and other pests;
- Work independently in the absence of immediate supervision;
- Communicate effectively, orally and in writing;

- Maintain accurate records; and prepare reports in a timely and accurate manner;
- Safely and skillfully operate tools and equipment related to work assignments;
- Maintain and make minor repairs to spray apparatus;
- Read and comprehend pertinent rules, laws and regulations and specialized materials such as technical manuals, written instructions, and mixing formulas;
- Understand and follow work safety procedures and practices;
- Establish and maintain effective work relationships with the general public, co-workers, and those contacted during the course of work.

2.3.2Special Requirements

Physical Requirements: On a daily basis, the essential duties of this classification require the ability to stoop, kneel, and crouch, to reach, to stand for long periods of time to walk; to lift, push, pull and carry objects weighing up to 20 pounds; to use finger dexterity and hand strength to operate and grasp tools and equipment; the repetitive use of feet and hands to operate vehicles and/or equipment; to feel attributes of objects by touch; to verbally exchange ideas and information; to hear to receive verbal detailed information and instruction; to see from one to twenty feet with a good field of vision and the ability to distinguish basic colors and shades of color; and to maintain body equilibrium to prevent falling when walking, standing or crouching on narrow, slippery or moving surfaces.

Self-Check – 1	Written test

Name…… ID…… Date…….

Test 1.

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.(each 3pnts)

1. What is diagnosis?
2. Mention steps in diagnosis of pest problem?
3. Describe the importance of diagnosise?

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

Information Sheet 2	Determining control measures appropriate to type and species of infestation

Achievement of the desired level of pest suppression requires the use of specific weed management practices. Although these are discussed as separate strategies, it is important to remember that the most effective and economical weed control plan will always employ several approaches. Each component contributes to the overall level of weed control. Omitting or reducing the control achieved from one or more components increases the level of control needed from the remaining weed control practices. Integration of weed control practices is discussed at the end of this chapter.

The six main areas of weed control tactics are

(1) Scouting,

(2) Prevention,

(3) Mechanical practices,

(4) Cultural practices,

(5) Biological control, and (6) chemical control.

1.SCOUTING

Scouting involves knowing specifically what weeds are present in a given field, an estimation of their number (density), their location, and, over time, whether shifts in location or weed types are occurring. The techniques used for scouting include walking fields, drive-bys, and, field mapping using on-site sampling coupled with global positioning systems (GPS) and geographic information systems (GIS). Scouting begins before the cropping season but must continue throughout the entire season. Information gathered prior to and during a cropping cycle can allow a farmer to plan an appropriate management scheme to minimize weed interference and then use the best tools available for weed management. In addition to scouting, it is important to maintain good records of the management tools used and their effectiveness both in managing weeds and in reducing weed seed return to the soil.

Many new weed management tools such as HERB use scouting information to design the most appropriate IWM program for a crop. WeedCast 2.0 is a program that forecasts three aspects of weed phenology, weed emergence potential, emergence timing, and seedling height. This information can then be used by the weed manager to make informed decisions for the cropping

2.PREVENTION

Prevention means stopping a new weed from invading an area or limiting weed buildup in a field. Prevention is practiced by

(1) not planting crop seed contaminated with weed seed,

(2) not carrying weed seeds or vegetative propagules into an area with machinery, contaminated manure, irrigation water, transplants or nursery stock, or growth media or soil,

(3) not allowing weeds to go to seed and recharge the soil seed bank,

(4) eliminating weeds from fencerows and other areas adjacent to fields, and

(5) stopping the spread of vegetatively reproducing perennial weeds.

Good scouting aids in all these measures, especially in early detection of localized infestations of perennial weeds and of weeds that escape herbicide control and may be

the beginning of a herbicide-resistant population. Prevention, when faithfully employed, can be a cost-effective and practical way to control weeds. This is particularly true for discouraging outbreaks of new problem weeds. Unfortunately, perfect (100%) weed control is needed to prevent seed production by a general weed population in a field. This can be very difficult and uneconomical to achieve, even in extremely high-value crops. Limiting weed seed production is a desirable goal, but totally preventing it is usually practiced only for isolated occurrences of new weeds.

prevention is the important first tool to stop the import and establishment of alien plant species, which can become serious weed problems in our ecosystems. There are numerous federal Federal Noxious Weed state, and local noxious weed and seed laws governing control, movement, and distribution of contaminated crop seed and importation and movement of noxious and alien species. These laws were written and are enforced to prevent weed problems.

3.MECHANICAL PRACTICES

Tillage, hand weeding, mowing, mulching burning, and **flooding** are considered mechanical weed control methods.

3.1.Tillage

It is the mechanical disturbance of the soil involving soil preparation, followed by planting, cropping, harvest, and post-harvest soil management. Primary tillage is the initial ground breaking in preparation for crop production, and secondary tillage is additional soil movement to smooth and level the ground prior to planting. Many specialized tillage implements are used during the crop sequence as a weed management tool. There are a number of types of tillage used in agriculture today, ranging from conventional tillage to conservation tillage. Categories can be defined by the type of primary tillage performed, the amount of plant residue left on the soil surface, and the ultimate objective for the system, which involves minimizing soil erosion.

3.2.Row Crop Cultivation

The primary objective of cultivation is to control weeds, and primary and secondary tillage are aimed at preparing a suitable crop seedbed. The main purpose of growing crops such as corn and soybeans in rows is to allow mechanical weed control between

the rows, and the original row widths were designed to allow the passage of draft animals without damaging the crop. Herbicides and machine cultivation has allowed a decrease in row widths. Annual weeds are buried or uprooted, and a great variety of mechanical devices kill weeds by these methods.

3.3.Hand Weeding

Pulling out unwanted weeds by hand or by hoeing is the oldest method of selective weed control; it remains a very safe and effective method against most weeds in most crops. The major disadvantages are the expense and increased potential for crop injury if such methods are performed carelessly. Arguably, a major social benefit of modern weed control methods is the release of workers from the drudgery of manual weed control. Hand labor is used as part of an IWM system in high-value crops to bring the level of weed control to 100% after most weeds have been killed by less expensive methods. However, the high cost of labor makes hand weeding economically unattractive and, in many cases, impossible for most farmers.

3.4.Mowing

Mowing can effectively prevent seed formation on tall annual and perennial weeds, deplete food reserves of the vegetative reproductive organs of perennial weeds, and favor competitive crops adapted to mowing. Unfortunately, mowing can also favor weeds that grow and reproduce below the cutting height. Repeated mowing can cause a shift in the dominant biotype of a weed species, from an upright growing form to a more prostrate form.

3.5.Mulches

Mulches stop weed growth by restricting the penetration of sunlight to the soil surface, and in the case of surface mulches of cover crops have the potential to release inhibitory (allelopathic) chemicals into the soil environment that inhibit weed seedling growth. Many weed seeds require light to stimulate germination, so mulches reduce the germination of such seeds. Seedlings that do not require light can germinate, but if light is restricted the seedlings emerging from the soil are killed through starvation by lack of photosynthesis or, if allelopathic mulches are present, may die because of chemical

inhibition of growth. Perennial weeds are not well controlled by most types of mulches as they have sufficient plant reserves to begin growth and to emerge through the mulch in the absence of light and in the presence of most allelochemicals.

Figure 3-4. Comparison of a rye cover crop mulch versus no cover on weed control in tomatoes. *Left*: Numerous weeds and low-vigor tomatoes with no rye mulch; *Right*: No weeds present with a rye mulch and vigorous tomatoes.

3.6.Burning

Fire can be used to remove undesirable plants from ditch banks, roadsides, and other waste areas, to remove undesirable underbrush and broadleaf species in conifer forests, and for annual weed control in some row crops. Burning must be repeated at frequent intervals if it is to control most perennial weeds. In alfalfa and western mint, burning can control weeds, diseases, and some insects. Environmental air quality laws may restrict burning as a weed control tactic in the future.

3.7.Flooding

Flooding is used to control weeds in rice fields, as water-saturated soil limits oxygen availability, which prevents many seeds from germinating but does not inhibit rice seed germination. Aquatic plants can tolerate the flooded conditions and are not controlled by this technique.

4.CULTURAL PRACTICES

Crop selection, rotation, variety selection, planting date, plant population and spacing, plus fertility and irrigation are all cultural practices that affect weed management. Farmers should keep in mind that cultural practices will impact weed interference and should always consider how effectively the methods employed can minimize weeds.

4.1.Crop Selection

Selection of a crop determines strategies for the subsequent battle with weeds. Crop selection will determine the level of weed control needed for efficient crop production and, in many cases, which weeds will be most competitive. Some crops by nature are not competitive, such as many vegetables, whereas others tend to be more competitive, such as small grains. Weeds are opportunistic and occupy ecological niches not utilized by the crop (Cardina et al., 1999); the farmer's practices must reduce unused niches.

4.2. **Planting Date**

The trend in crop production is for earlier planting to increase yields. The resulting longer exposure to sunlight is primarily responsible for the higher yields associated with this practice. Early planting can establish adapted crops before weeds emerge and provide the crop with a competitive edge.

There are some disadvantages to early planting for weed control. Early planting means soil-applied herbicides may have to persist longer in the environment for the most effective weed control. It also eliminates the cultivation done just before later planting, which often destroys the first flush of germinating weed seedlings.

4.3.**Fertility and Irrigation**

Crops and weeds generally require and will compete for the same nutrients. Changes in soil fertility levels have a great influence on the competitive interactions between weeds

and crops. Weeds respond in a positive manner to increasing nutrient levels, which allow them to better compete with the crop for other necessary growth factors.

5.BIOLOGICAL CONTROL

Biological control may be more practical and effective in areas such as:

- **.** Inaccessible areas such as timbered, rocky and steep locations;
- **.** Low-priority areas for control;
- **.** Situations where biocontrol is the only option, for instance salvinia in sensitive aquatic areas;
- **.** Where chemical control may be too expensive or not effective.

Biological control of weeds involves the use of any organism, or management practice using an organism, to reduce or eliminate the potential detrimental effects of weed populations. Classical biological control is associated with the use of insects, pathogens, herbivores, or parasites that naturally attack weeds; however, it can be expanded to include the previously mentioned uses of competitive crops, cover crops, living mulches, green manures, and any organisms associated with these practices that can reduce weed growth.

Self-Check – 2	Written test

Name…… ID…… Date…….

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

Test I:

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

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

Information Sheet 3	Identifying and eradicating Areas of weed infestation

Weeds affect the growth of plants surrounding them by competing for nutrients, soil, water, and space. In cases of younger or smaller plants, some weeds even overpower their young plant parts. Weeds not only affect the plants around them, but they can bring unnecessary trouble to the entire farm. For one, some types of weeds block drainage pipes, while some weeds, if left unchecked may obstruct the function of farm machinery that is used for cultivation. Matter of fact, weeds can cause more manual labor for farmers.

3.1.Classification of weeds

3.1.1.Bases on classification

1. Life cycle:-

a. Annual: - complete their life cycle within one season or year.

In tropical climate the life cycle is undetermined because continuous germination of seed throughout the year.

They do not produce shoot after cutting except in few species, cutting underground is important to control this species. Example, Digitaria spp, Avana fatva(wild oat)

b. Biennale weeds:-they have two growing seasons.

They are not com mon in agricultural fields as annual weeds because cultivating the land is continue within a year they do not stay up to the second year.

Example, Sweet clove, wild carrot, etc

c. Perennial weeds: - they can stay in the field for more than 3 years.

Most common reproduction is vegetative reproduction, seed production in most weed are not totally viable. They are difficult to control.

Example, *Cynodon dactylon*, *Cyperus spp* etc.

1. Leaf form: - classified into to two groups.

A. Grasses(monocots) weeds

B. Broad leaves(Decocts) weeds

Their control method (measures) is mainly depending on the leaf form.

2. Habitat or situation:- is place of occurrence, they are 9 in groups.

I. Crop land weeds
II. Fallow lands weeds
III. Grass land(pasture land) weeds
IV. Non- crop land(weeds
V. Aquatic weeds
VI. Forest and wood land weeds
VII. Garden weeds
VIII. Orchard or vine yard weeds
IX. Weeds of plantation

3. Ease of control

a. Simple weeds:- are easy to control,

- Are reproduced by seeds.

b. Noxious weeds:- are difficult to control, reproduced by vegetative means, such as Parasitic weeds

4. According to growth habit:-

- Parasitic weeds:- take foods from the other
- Non-parasitic weeds:- take food from the soil.

3.2.General categories of weed control methods.

Control methods (cultural, biological, physical and chemical methods) and ***prevention methods*** (using clean seeds, well decomposed organic matter, clear farm land, cleaning irrigation channels, burning the straw in the field and plant quarantine law). Effective weed control can be classified as physical, biological, cultural, chemical & IWM.

3.2.1. Preventive Methods of Weed Control

In weed management, prevention is crucial. A weed infestation that has gone array and has increased over time may require more expensive control methods. Any method that

prevents the establishment of weeds in a pasture or across a farm is considered preventive weed control.

3.2.2. Cultural Methods to Control Weed Growth

Weeds are considered opportunistic and invasive; that is why cultural control or the establishment of acompetitive and desired vegetation helps prevent or at least slow down the growth of weeds. Cultural control is considered highly effective in weed management.

Weeding with hand tools is an effective method if sufficient labor is available. It is common, however, for small farmers who rely on this method to fall behind in weeding and crop yields often suffer, it is better to use some cultural weed control methods like: -

- Tillage: - It is necessary in the case of weeds that spread by underground roots stocks. Existing weeds are killed during land preparation
- Time of sowing: - Time of sowing affects the time to emergence and early seedling vigor. Maize, soy bean and sorghum germinate and emerge in warm, moist soils.
- Use of crop rotation: - The life cycle of weeds common to fields can be ended before maturing when the crop is changed to one with different growing season.

3.2.3. Organic Chemical Methods of Weed Growth Control

The use or application of chemicals (herbicide) to weeds or soil to control weed growth is called chemical weed control. Herbicides are considered the most effective and time-efficient method of weed control. Some herbicides are formulated so as not to cause harm to the surrounding plants of the weed. Chemical control is an effective way of controlling weeds. Currently, there are many chemical products available on the market for this control. N.B. These method doesn't use in organic farming principle

3.2.4. Biological Methods to Control Weed Growth

Any technique involving the use of living agents that are natural suppressors of weed growth is known as biological weed control. Living agents, such as grazing animals, insects, fungi, or bacteria, are being used not only to eradicate weeds but also to control the germination of its seeds. Insects are often utilised in biological weed control, with

some naming this practice as insect bio-control or integrated pest management (IPM). Among many insects used in IPM, are a cinnabar moth, tansy flea beetle, and chrysolira beetle.

3.2.5. Manual/Mechanical/Physical Methods of Weed Growth Control

Physical disruption with the use of farm equipment or through physical actions is under mechanical weed control. The success of methods under this category varies depending on the life cycle of the target weed species.

- ✓ Hand weeding :- it is physical removal or pulling of weeds by hand
- ✓ Weeding with hand held implements: - including, shovel, hoes and other hand tools. Weeding with hand tools may bring many underground roots to the surface, where they may be killed as they dried out by the sun or frozen.
- ✓ Mechanical tillage
- ✓ Mowing or chapping: - mowing or chopping cut off the weeds above the ground, providing them from growing, maturing and producing viable seeds.
- ✓ Mulching the soil surface with a 5-10 cm layer of crop residues, dead weeds or grass can give very effective weed control and provide a number of other benefits.
- ✓ Burning: when land is cleared by burning, standing annual weeds are killed along with weed seeds very near the soil surface. However, burning will not kill weed seeds or reproductive underground parts of perennial weeds if they are deeper than 4-5 cm.
- ✓ Flooding in rice crops
- ✓ Shading (the row crop principle): - arranging crops in rows facilitates hand weeding, but also makes possible mechanical cultivation (weeding) with tractor or animal drawn equipment. In addition, the rows permit the crop to exert better shade competition against the weeds.

3.2.6. Integrated weed management/System approach

It is where more than one method of weed control in a coordinate program is considered to most practical approach to weed control. For example, for maize or sorghum:

- Time of sowing + fertilizer (N-fertilizer) higher dose for striga control + pre-emergence herbicide hand weeding at 30-35 days.
- Pre-emergence herbicide + hand weeding at 25-30 days
- Intercropping with soybean (with maize) and cowpea (with sorghum) + pre-emergence herbicide even though herbicide is not needed in the organic farming

Self-Check – 3	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.(each 3pnts)

Test I:

1. What is weed?
2. How can you control weeds from your crops?
3. What are the effects of insects and diseases on field crop production?
4. Mention some methods which can be used to control weeds from organic crops?

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

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

Information Sheet 4	Selecting Control methods

"Organic" control refers to non-chemical methods in general, including the application of homemade "natural" sprays made from garlic, pepper, onions, soap, salt, etc. and the use of materials like beer to kill slugs and wood ashes to deter cutworms and other insects. Some of these "alternative" insecticides are slightly too fairly effective on small areas like home gardens and where insect populations are relatively low.

In horticultural terms, *organic* is defined as a method of growing or maintaining ornamental or food plants (ornamental or food) without the aid or application of (human-made) synthetic chemicals (fertilizers, pesticides, hormones, etc.). The term, “organic gardening”, is of fairly recent origin. The word, organic, was first used to describe the natural method of gardening and farming in 1942. The term “organic farming” was first used in a 1940 publication. “Organic” gardening or farming is a philosophy, and components of it have been practiced for centuries (from Gates, J.P. 1989

Chemicals are either natural or synthetic. Natural chemicals exist in the environment, often produced by plants (e.g., botanical insecticides like pyrethrins) or fermentation products from mico-organisms (e.g., spinosad), or “near organic insecticides” that do not contain carbon (e.g., silica dioxide in diatomaceous earth or D.E.). Synthetic chemicals are made using chemical reactions and introduced by humans. Insecticidal soap is made from a reaction of potassium with long-chained fatty acid or carbon molecules), both of natural origin (as is petroleum) but synthesised from a chemical reaction. Many people mistakenly assume that “natural, organic chemicals” are less toxic than synthetic chemicals. Not true, since there are many poisons that come from naturally existing plants and animals that are more toxic than some synthetic chemicals (e.g., nicotine sulfate). So, chemical toxicity is not an accurate measure of “organic.”

The chief reason for employing organic practices in horticulture is perceived positive impact on the environment. Organic substances (those with carbon atoms) can be broken down by micro-organisms (as in composting), reactions with other chemicals, or by light. Many inorganic substances such as boric acid cannot be broken down by other living things. Many naturally occurring organic pesticides, like pyrethrins, biodegrade faster rapidly in the environment.

4.1.Organic Practices and IPM

Integrated pest management (IPM) is a philosophy that urges a systems approach to manipulate pest densities. Programs based on this philosophy rely on field scouting or monitoring efforts and historical information upon which to make management decisions. All methods for manipulating pest populations are considered, and management programs use a combination of non-chemical (cultural, physical and mechanical), biological, and chemical methods over time to achieve management objectives. These programs strive to be 1) the least environmentally destructive, 2) the most effective for manipulating pest densities, and 3) the most cost effective.

Methods defined as “organic” certainly are valid options for implementation, and some are “least-toxic” options. However, IPM programs do not eliminate the potential for using methods and materials not defined as organic. Infact, for serious pest outbreaks, having powerful insecticide products in our arsenal is a necessity.

4.1.1.Organic Pest Control Garden Spray Recipe

Makes one gallon

- 1 medium onion
- 4 cloves garlic
- 2 cups mint leaves OR 20 drops peppermint essential oil
- 2 tablespoons cayenne pepper
- 2 tablespoons liquid castile soap (or biodegradable liquid dish soap)
- Water

Place the onion, garlic, peppermint, and cayenne in a blender, and pulverize it.

Allow the mixture to soak/steep for a couple hours (optional, but do it if you can), then strain with a fine mesh strainer.

Add the onion/garlic mixture to a one-gallon contain (an old milk jug or vinegar jug will work), add the soap, and enough water to make one gallon.

Pour into a spray bottle and spritz on any plants being attacked by bugs.

Spray 1-2 times per week, or after a heavy rain

4.2. Pest control in organic farming

It is the regulation or management of a species defined as a pest, a member of the animal kingdom that impacts adversely on human activities. The human response depends on the importance of the damage done and will range from tolerance, through deterrence and management, to attempts to completely eradicate the pest. Pest control measures may be performed as part of an integrated pest management strategy.

In agriculture, pests are kept at bay by cultural, chemical and biological means. Ploughing and cultivation of the soil before sowing mitigate the pest burden and there is a modern trend to limit the use of pesticides as far as possible. This can be achieved by monitoring the crop, only applying insecticides when necessary, and by growing varieties and crops which are resistant to pests.

Where possible, biological means are used, encouraging the natural enemies of the pests and introducing suitable predators or parasites.In homes and urban environments, the pests are the rodents, birds, insects and other organisms that share the habitat with humans, and that feed on and spoil possessions. Control of these pests is attempted through exclusion, repulsion, physical removal or chemical means. Alternatively, various methods of biological control can be used including sterilization programmes.

4.2.1.Biological pest control

It is a method of controlling pests such as insects and mites by using other organisms. It relies on predation, parasitism, herbivore or other natural mechanisms, but typically also

involves an active human management role. Classical biological control involves the introduction of natural enemies of the pest that are bred in the laboratory and released into the environment. An alternative approach is to augment the natural enemies that occur in a particular area by releasing more, either in small, repeated batches, or in a single large-scale release. Ideally, the released organism will breed and survive, and provide long-term control. Biological control can be an important component of an integrated pest management programme. For example: mosquitoes are often controlled by putting *Bt Bacillus thuringiensis* ssp. *israelensis*, a bacterium that infects and kills mosquito larvae, in local water sources

4.2.2.Cultural control

Cultivation by ploughing exposes insect pests to predators such as black-headed gulls. Spruce budworm (adult and pupa shown), a serious pest of forests, can be monitored using pheromone traps.

4.2.3.Mechanical pest control

Is the use of hands-on techniques as well as simple equipment and devices, that provides a protective barrier between plants and insects. This is referred to as tillage and is one of the oldest methods of weed control as well as being useful for pest control; wireworms, the larvae of the common click beetle, are very destructive pests of newly ploughed grassland, and repeated cultivation exposes them to the birds and other predators that feed on them.

4.2.4.Crop rotation

Can help to control pests by depriving them of their host plants. It is a major tactic in the control of corn rootworm, and has reduced early season incidence of Colorado potato beetle by as much as 95%.

4.2.5.Trap cropping

A trap crop is a crop of a plant that attracts pests, diverting them from nearby crops. Pests aggregated on the trap crop can be more easily controlled using pesticides or other methods. However, trap-cropping, on its own, has often failed to cost effectively reduce pest densities on large commercial scales, without the use of pesticides, possibly due to the pests' ability to disperse back into the main field.

4.2.6.Hunting

Pest control can also be achieved via culling the pest animals. Generally small- to medium-sized wild or feral mammals or birds that inhabit the ecological niches near farms, pastures or other human settlements .by employing human hunters or trappers to physically track down, kill and remove them from the area. The culled animals, known as vermin, may be targeted because they are deemed harmful to agricultural crops, livestock or facilities; serve as hosts or vectors that transmit pathogens across species or to humans; or for population control as a mean of protecting other vulnerable species and ecosystems.

Pest control via hunting, like all forms of harvest, has imposed an artificial selective pressure on the organisms being targeted. While varmint hunting is potentially selecting for desired behavioral and demographic changes (e.g. animals avoiding human populated areas, crops and livestock), it can also result in unpredicted outcomes such as the targeted animal adapting for faster reproductive cycles.

Self-Check – 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 3pnts)

1.How we can determine pest control methods?

2.List organic practices of controlling pests?

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

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

Information Sheet 5	Scheduling Control methods

……

Self-Check – 5	Written test

Name…… ID…… Date…….

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

Test I:

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

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

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Information Sheet 6	Maintaining Severity of infestations and records of treatments

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Self-Check – 6	Written test

Name…… ID…… Date…….

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

Test I:

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

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

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Operation Sheet 1-

Operation Sheet 2	Controlling insects and diseases

Before start to implement insect and disease control activities, prepare materials, tools and equipments to be required. Next to this select suitable organic control methods and then apply according to the following procedures:

1. Collect and maintain identification guidelines or manuals and descriptors for infestation and injury levels determination.
2. Assess the field for the presence of any insects or diseases
3. Identify the insect or disease pest found on the plant
4. If insects count the number of insects per leave, stem etc.
5. Using the descriptors provided by your trainer determine the level of infestation and injury
6. Based on your findings draw graphs showing whether tresh hold economic injury level reached or not.
7. If this is reached, select suitable controlling measures based on the identified insect or disease pests
8. If the selected measure is chemical or pesticide spray, then calculate the rate of a.i and water
9. Prepare the spray solution
10. Spray pesticides according to procedures and guidelines
11. After spraying has been completed, then clean and store tools and equipments properly
12. Monitor the controlling effects of pesticides spray

13. Record all activities and report to your trainer

LAP TEST	Performance Test

Name……. ID……..
Date…….

Time started: _____ Time finished: _____

Instructions: …….
Task-1 ……..

LG #47	LO #7- Manage crop health

Instruction sheet

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

- Assessing Evidence of pests and disease
- Planning and monitoring crops for water and nutritional requirements
- Monitoring Weed and pest levels
- Modifying control measures
- Assessing and documenting Benefits from fertilization methods
- Monitoring and documenting cropping program

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

- Assess evidence of pests and disease
- Plan and monitor crops for water and nutritional requirements
- Monitor Weed and pest levels
- Modify control measures
- Assess and documenting Benefits from fertilization methods
- Monitor and documenting cropping program

Learning Instructions:

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

Information Sheet 1	Planning and monitoring crops for water and nutritional requirements

1.1. Maintaining nutrient requirement of the crop

1.1.1Selecting required types of fertilizers and applying to crops

Fertilizer, natural or synthetic chemical substance or mixture used to enrich soil so as to promote plant growth. Plants do not require complex chemical compounds analogous to the vitamins and amino acids required for human nutrition, because plants are able to synthesize whatever compounds they need. They do require more than a dozen different chemical elements and these elements must be present in such forms as to allow an adequate availability for plant use. Within this restriction, nitrogen, for example, can be supplied with equal effectiveness in the form of urea, nitrates, ammonium compounds, or pure ammonia

Objective of fertilizer application

- To promote greater plant growth or better crop quality
- To maintain soil fertility , indirectly reduce soil erosion

Importance of organic fertilizer application

- Soil is the cheapest and only ample source of nutrient elements. But it is impossible for soil to supply enough nutrients for crops growth without any compensation, so correct, proper, rational application of fertilizer is necessary.
- It compensates some elements to the soil.

Types of fertilizing materials

1. Natural (organic fertilizer)

2. Synthetic(Inorganic materials)

1. Natural organic fertilizer

Natural organic matters that are commonly used to maintain and improve soil fertility may be classified as:-

A. Bulky organic manure

These are animal wastes or green manures, which are added to the soil mainly to improve the physical condition of the soil.

They replenish and keep soil humus that improves:-

- Water holding capacity of the soil
- Supply small amount of plant nutrients, etc.

Bulky organic matter divided into:-

1. Farmyard manure(FYM)
2. Compost
3. Green manure

B. Concentrate organic manure

These organic materials supply relatively higher amount of nutrients than the bulky organic manures.

It consist higher amount of one or more nutrient elements and hence the handling cost is less than that of bulky organic manures. Examples, Oil cakes, urine, bone meal, and blood etc.

Self-Check – 1	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (3pnts each)

1. List the types of fertilizer with their function?
2. Why we use organic fertilizer?

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

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

Information Sheet 2	Monitoring Weed and pest levels

Monitoring is a constant process of control with the aim of maintaining the quality of the crop to be produced. A brief visual inspection is by no means sufficient; rather it is important that a systematic search for possible sources of damage, amount of weed

and disease infestation, presence of insect pest are performed. Such sources should be identified, measures must be taken and the success of these measures then examined. Monitoring comprises regular inspection of the field as well as continuously sampling of the plant.

2.1 Monitoring and identifying side effect of control methods

Monitoring is the systematic ***collection, recording and analysis of observations over*** time. It provides a way of checking if the intended outcome of a management program is being achieved. Information such as *100 hectares of a particular weed was treated with herbicide*, or *$20,000 was spent on weed management at a high value biodiversity site*, tells us little about the success of weed control or the response of native species.

Monitoring activity should focus on:

- ❖ Changes in the extent of weed populations, i.e. is more or less area covered
- ❖ Changes in the density of weed cover
- ❖ Occurrences of other weed species
- ❖ Unexpected impacts of weed control activity, e.g. off target damage, erosion or invasion by other species
- ❖ Changes in the extent and condition of native vegetation or other desirable vegetation
- ❖ Changes in any conditions which will impact on site restoration work.

2.2. Assessing effectiveness of control measure

- ➢ Assessing the effectiveness of control measure is important to identify which type of treatments to be taken to avoid the impact of weeds to our environment as well as to our crop land.
- ➢ The selected control measure be selected based on the principle of cost benefit analysis.
- ➢ And the selected control measure should be applied with disturbing the environment and non target organisms.

Self-Check – 2	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers. (each 5pnts)

1) What is monitoring weed mean?
2) Explain the importance of monitoring?
3) What activities you should monitor to control weeds from crop ?

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**

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

Information Sheet 3	Modifying control measures

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Self-Check – 3	**Written test**

Name…… ID…… Date…….

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

Test I:

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

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

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Information Sheet 4	Assessing and documenting Benefits from fertilization methods

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Self-Check – 4	**Written test**

Name…… ID…… Date…….

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

Test I:

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

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

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Information Sheet 5	Monitoring and documenting cropping program

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Self-Check – 5	**Written test**

Name…… ID…… Date…….

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

Test I:

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

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

Information Sheet 6	Documenting Relevant data

All required work place records should be completed accurately and promptly in accordance with enterprise requirements. Recording and documenting your work activities in an area serves you for several purposes simultaneously. It helps you in evaluating and learning from past fi crop maintenance efforts. It also helps you to organize your own work for the future and allows you more closely monitor your activities.

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Self-Check – 6	**Written test**

Name…… ID…… Date…….

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

Test I:

1. What is the importance of monitoring the crop? (4 point)
2. What is the purpose of recording and documenting maintenance activities? (3point)
3. Explain the importance of organic fertilizer? (3point)

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Note: **Satisfactory rating - 3 points Unsatisfactory - below 3 points**
You can ask you teacher for the copy of the correct answers.

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Operation Sheet 1-

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LAP TEST	**Performance Test**

Name……. ID……..
Date…….

Time started: _____ Time finished: _____

Instructions: ……
Task-1 ……..

Referance Book:

- ……
- ……
- ……

WEB ADDRESSES

- ……..
- ……..

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This Teaching, Training and Learning Materials (TTLM) was developed on April 2017 at Adama, Dire International Hotel.

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