Ethiopian TVET-System

Crop Production Level – II

Based on Version 3 March 2018 OS.

Training Module –Learning Guide 54-59

Unit of Competence: **Assist Multiplication of Improved Crop Seeds**

Module Title: **Assisting Multiplication of Improved Crop Seeds**

Module Code: **AGR CRP2 M13 0919V1**

October 2019

Module Title: Assisting Multiplication of Improved Crop Seeds

Module Code: AGR CRP2 M13 0919V1

This module includes the following Learning Guides

LG 54: Plan and prepare land for seed Multiplication

LG Code: AGR CRP2 M 13 LO1-LG54

LG 55: Sow the crop

LG Code: AGR CRP2 M 13 LO1-LG55

LG 56: Maintain the field

LG Code: AGR CRP2 M 13 LO1-LG56

LG 57: Control weeds, pests and diseases

LG Code: AGR CRP2 M 13 LO1-LG57

LG 58: Harvest the crop

LG Code: AGR CRP2 M 13 LO1-LG58

LG 59: Clean and treat the seed

LG Code: AGR CRP2 M 13 LO1-LG59

Instruction Sheet	Learning Guide #54

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

- Carry out and assess production site requirements for seed in terms of quantity, quality, ***client*** preferences and requirements.
- Schedule production and marketing activities
- Select appropriate seed multiplication site according to the requirement
- Select and prepare equipment required for tillage/plowing
- Prepare the site and cultivate the land according the *crop* requirement
- Require apply fertilizers, ameliorants, and/or other pre-planting treatments by the planting plan
- Clean and Complete tools and equipment, land preparation operation
- prepare machineries, equipment's and other farm inputs used for sowing

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

- Carrying out production requirements for seed and assessing production site
- Scheduling production and marketing activities
- Selecting appropriate seed multiplication site
- Selecting and preparing equipment's required for tillage/plowing
- Preparing site and cultivating the land
- Applying fertilizers, ameliorants, and/or other pre-planting treatments
- Cleaning tools and equipment and completing land preparation
- Preparing machineries, equipment's and other farm inputs for sowing.

Learning Instructions:

1 Read the specific objectives of this Learning Guide.
2 Follow the instructions described below 3 to 6.

3 Read the information written in the information “Sheet 1, Sheet 2, Sheet 1, Sheet 2,”. Sheet 1, Sheet 2,”.”.

4 Accomplish the “Self-check 1,” **in page -18, and 72,** respectively.

5 If you earned a satisfactory evaluation from the “Self-check1” proceed to “Operation Sheet 1, Operation Sheet 2 and ” **in page -16,and 19.**

6 Do the “LAP test” .

Information Sheet-1	Carrying out production requirements for seed and assessing production site

1.1 Production requirements for seed

A crop production operation requires careful planning. The producer should be able to make right choice in terms of selecting and managing the appropriate seed multiplication inputs. The goal of crop production is high profitability. Even in farming systems where production is primarily for domestic use (selling only when there is surplus), the producer still aims for high productivity. The crop producer is faced with critical decisions throughout the enterprise.

There are three categories of factors that the producer has to be concerned in planning and producing multiplied seeds. Some factors are within the producer's total control, other cab be manipulated for better results, while yet others are totally outside his or her control.

1.1.1. Factors within total control

a) Production site

The crop producer is responsible for selecting the site for the enterprise. This requires knowledge of the requirements of the crop plant of interest, in terms of adaptation, suitability of the soil type, and other growth requirements. The soil type needed for tuber and root crops production is differ from that for cereals.

b) Selecting crops and seeds

The producer has to select the best crop that can grow in the soil and find the best cultivar suited to the region. The cultivar should be high yielding, regarding the plant product interest of the producer, and should be adapted to cultural methods to be used.

c) Cultural practices

The producer also decides on the best cultural practice to adopt for high productivity. This includes time of planting, planting density, types and amounts of production inputs, pest control, time of harvesting and others.

1.1.2. Factors that can be manipulated

a) Site modification

Some factors in the production operation can be modified for best result. Sometimes, the best site cannot be found for a crop plant. Certain soil management may be required to improve soil physical and chemical conditions. This includes drainage, leveling, terracing, and liming.

b) Supply nutrient

Even if the soil conditions are adequate to start with, the producer may want to increase crop productivity by providing supplemental nutrients and other factors that promote growth and development (e.g. fertilizers and irrigation Sometimes, temperature can be manipulated within certain limits for early planting. This could be done using raised beds.

1.1.3. Factors outside the producer's control

● **Weather condition**

The weather factor is considered as the chance element in improved seed multiplication. The producer may select the best site and cultivar, and also adopt the best cultural practices and still be unsuccessful if the weather does not cooperate. Mild fluctuations in the weather are usually are not difficult to overcome or plan again (e.g. a brief drought period, or a mild unexpected cold spell). Supplemental irrigation or using drought resistance cultivars can rectify a mild drought. However, a severe and protected drought may make irrigation impractical, leading to heavy or total crop failure. Acts of nature such as strong winds, hail, and floods are usually devastating to an improved seed multiplication enterprise. Too much rain during the crop harvesting time may lead to significant field and even storage losses.

Self-Check -1	Written Test

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

1. List some factors to be considered in improved seed multiplication planning? (5 point)
2. Explain the factors which can be manipulated? (5point)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information Sheet-2	Scheduling production and marketing activities

2.1 MARKETING

Seed marketing is the final step in a seed programme; it takes the seed to farmers and gets them to buy it and plant it. Seed marketing is time-sensitive and sensitive to

factors affecting rural marketing. Seed must reach the farmer at the right time, at the right place, at the right price, in the right amount and must be of the highest quality. Because seed marketing is sensitive to many factors, it is often considered a high-risk business.

Seed marketing requires: convincing farmers that the seed quality is high and ensuring that only high-quality seed is sold; convincing farmers that the seed quality means a benefit to them that is worth the extra cost they must pay for the seed.

Seed marketing has the same requirements, problems and needs as the marketing of other crop seed. Farmers' variety and seed replacement is influenced by their perception of the yield gain of a new variety, the yield loss of an old variety and the risk in changing the variety

Most of the increase in agricultural production recently experienced came from an increase in land area sown to crops and not from a yield increase. A key strategy for the development of sustainable agriculture is an efficient and well functioning agricultural input market that makes use of the complementarities among fertilizer, improved seeds, and crop protection items. All farming depends on a continuous supply of good quality seeds and planting materials.

2.2 Seed pricing:

Price is defined as a value or sum of money at which a supplier of a product and a buyer agree to carry out an exchange and be paid for seeds. In other words, price is the value of seeds expressed in a monetary form. The transaction takes place at either in a fixed or a negotiable price.

Price-setting decisions have to be based on middlemen margins, allowances, discounts, freight payments, and geographical considerations.

Seed prices should be affordable and competitive with suppliers of competitive products and almost standardized.

Farmers usually compare the prices of seeds and grains (in the ratio of about 3:1). Sales discounts and commission can be used to further reduce prices. The price assessment of the business will be determined by the company’s effectiveness at

pricing its goods and services. It must be reasonable to satisfy the customers and meet the company's objectives of a realistic profitability. The objectives of pricing include profitability, market share, and competition.

Promotional and advertising activities:

Promotion is an essential activity within marketing. It creates awareness that stimulates interest in the product or brand.

Objectives and target of promotional activities may include the following.

- Building primary demand. Making an immediate sale.
- Giving information about a product's availability and price.
- Building brand recognition, preference, or insistence.
- Aiding salesmen by building awareness of a product.
- Increasing the market share.
- Creating a reputation for service, reliability, and research strength.
- Building up the general image of the company.
- Reaching new segments of the population within existing areas.

Constraints to market development

- Low demand for improved seeds.
- Inadequate arrangements for seed certification and seed control.
- Low funding of public sector institutions.
- Slow release of new varieties.
- Inadequate extension services.
- Inadequate funds on the part of the farmers to purchase improved seeds and
- Complementary products.
- Low level of education among dealers and farmers.
- Poor organization to coordinate the activities of the stakeholders

Development of a marketing network

The seed-marketing subsector has been relatively dominated by the private sector, although the public sector has been providing support in the area of regulating policies

and infrastructure. The market is inefficient and works fairly well but links in the chain are weak or completely separated

To facilitate sustainable access to seeds and supplementary inputs, the farmer's partnership between public and private stakeholders must be strengthened.

The preconditions for the provision of sustainable seed marketing are as follows.

- Create a conducive micro-policy environment.
- Build human capital for market development.
- Improve access to finance.
- Develop and implement a regulatory framework.
- Promote marketing transparency through information systems.
- Promote technology transfer activities.
- Strengthen research capacity for the private seed industry.

Marketing Strategy

A seed company sells seed. That may be a simple and obvious statement, but at the heart of the matter, that is what the marketing strategy of a seed company is all about—selling seed. Although simple,

The statement is nevertheless loaded with questions such as:

Sell seed to whom?

Sell seed where?

Sell how much seed?

Sell what kind of seed?

Sell seed in what pack size?

Sell seed at what price? ...

Thus, the marketing strategy determines:

What seed will be produced or procured for sale,

To whom, how, when and where will the seed be sold, and

What the sales' goals are in terms of volume and value.

The marketing strategy may be thought of as the key to the prosperity of the business, because without sales, there is no income, and without income there is no possibility of profit.

The marketing strategy includes everything that needs to be done to sell products and services to customers.

The two main components of this are:

1. **Match the customer and the product.** Farmers will only buy seed if it will be more productive and cost-effective than farm-saved seed, Likewise, retailers will only stock seed if they are confident that it will be sold and thus earn them a margin. Furthermore, the kind of seed that you sell, together with the pack-size, quality, characteristics and price will determine who will buy the seed. Thus, the marketing strategy links the products of your business with particular customers.
   Marketing is the means of bridging the gap between production and consumption. In the seed industry, a number of "gaps" exist between the business and the customer, such as:

   - Spatial gap: Farmers are dispersed over a large geographical area, while seed companies are usually located in towns and seed is often produced in particular locations that may be distant from customers.
   - Time gap: Farmers require seed for planting at particular times of the year, while seed is produced one or more seasons ahead of the selling period.

- Information gap: Customers have certain preferences and requirements regarding the seed they wish to plant, while seed companies have information about the varieties on their portfolio.
  - Value gap: The seed company values its seed in terms of price and attributes, where as customers value seed in terms of what benefits will be derived from the production arising from the seed. Setting seed prices at a value that will convince farmers to buy is therefore key to securing seed sales. The marketing strategy is largely about how to bridge these gaps, with the recognition that the customer determines the product and the product determines the customer.

2. **Understand and compete with the competition**. A seed company rarely exists alone in the market. And, even if it does, it faces competition from farm-saved seed
   Understanding the customer's buying criteria

A customer will buy a product only if it meets at least four criteria:

1. **The customer must need the product**

   In the case of seed, the potential genetic value contained in the seed and any other additional items associated with the seed supplied by a company must be of greater value to the customer than what is in farm-saved seed or in other accessible sources of seed.

2. **The customer must like the product.**

   Even if the product meets a need of the customer, the customer will not buy it if he or she does not like it. This has much to do with the aesthetic characteristics of the seed pack, seed appearance, growing plant and final grain product.

3. **The customer must be able to afford the product.**

   Even if the customer needs and likes the product, the price may determine whether the product is purchased or not. Setting the seed price therefore constitutes a significant part of the marketing strategy. Setting seed prices at a value that will convince farmers to buy is key to securing seed sales.

4. **The customer must have access to the product.**

   This is an aspect of the marketing strategy which is possibly the most difficult to define, since farmers are dispersed over a wide geographical area and as individuals, they purchase relatively small quantities of seed. Establishing a distribution network that provides farmers with easy access to seed is therefore critical to success. There may be businesses and organizations that have been over looked as potential distributors, such as supermarkets or service stations.

Seed price determination

Determining the seed price is a complex process since there are many internal and external factors to consider.

By definition, the price is the exchange value of a product or service.

On the side of the seed company, the price of a product is the primary determinant of production and the means of earning income,

while for the customer the price is the cost of acquiring value, benefit or utility, and determines the quantity purchased.

High or increasing prices means greater profits and opportunities for growth for the company, whereas for the customer, they may mean reduced purchases or alternative purchases

The price therefore acts to regulate company outputs and income, and consumer purchases.

The following are factors affecting seed price:

1. A product's price does not exist in isolation in the market, but is always relative to the price of substitute products. The relative price, and not so much the absolute price, of a product, determines customers' choices.
   When determining seed prices, one must bear in mind the relative price of products, with their various alternatives.

2. The supply and demand relationship is a major factor in price determination, particularly in a Competitive market economy. Demand is the "schedule of different quantities of a commodity that buyers will purchase at different prices at a given time and place." Simply put, the lower the price, the more the seed that will be purchased, and vice versa. With respect to supply, this is the "schedule of differing quantities that will be offered for sale at different prices at a given time and place". Thus, the higher the price, the more will be offered for sale, and vice versa.

There are basically four possible scenarios.

First, For a given supply, demand may increase, such that seed price may be increased without reducing sales.

Second, supply may increase for a given demand with the result that prices need to be reduced to Achieve the same sales quantity.

Third, demand decreases while supply increases, again necessitating reduction in price to achieve the same quantity of sales.

And, fourth, both demand and supply increase, such that prices remain unchanged but sales volumes increase.

3. The seed to grain price ratio and the productivity of farmers exerts an influence on seed purchasing. Thus, in order to set affordable seed prices, a marketing manager will need to know the current or expected grain prices for the crop to be planted, and the productivity of target farmers.

Setting the seed price

The turnover of a company is the product of the volume of seed sold and the unit price. But, as already indicated, price affects sales volume.

Consequently, in setting the seed price, one has to be clear on the overall objective.

If the objective is to increase profits, then it is necessary to set a price that will achieve the highest margin over total costs.

However, if the objective is to increase market share, then pricing will be more related to the prices of competitor products than margins

Setting the basic price of seed may be according to three methods, namely, Cost-oriented pricing, customer-oriented pricing and competitive pricing,

1. Cost-oriented pricing

In this method of calculating the price of seed, the cost of sales and operating expenses (sometimes called overheads) are taken into account.

The simplest method is to calculate a margin over the cost of sales which when accumulated will be sufficient to cover the operating expenses and provide for a net profit.

Cost plus margin pricing

In its simplest form, the price equals the cost of sales plus a margin.

The formula for this calculation is,

Price = Cost of Sales / (1 – Gross Margin)

For example, if the cost of sales of a hybrid is $720/t, and the required gross margin is 40 %, then the seed price is $1200/t, i.e., 720 / (1 – 0.4) = 1200.

2. Customer-oriented pricing

Setting seed prices with customers in mind, considers other factors apart from required internal margins. In principle, the price is determined by estimating what customers will be prepared to pay for particular products.

This method will therefore take into account the production costs and circumstances of farmers, together with the value of the seed in terms of quality and genetic potential.

Alternative methods of customer-oriented pricing may include:

- premium pricing for new varieties or for seed that bears unique traits (whether related to genetics, packaging or seed dressings);
- pricing seed based on the product mix available, for example, pack size.
- reduced pricing so as to attract new customers, especially where new markets are being explored or to gain market share.

3. Competitive pricing

The seed market is competitive. There are few instances where there are no alternatives to a company's products, either from other seed companies or farm-saved seed. Setting prices relative to the competition has to be done with careful fore thought, taking into account your relative product qualities and brand position.

This is related to the relative bargaining powers of the buyers and sellers, and the conditions of sale.

Self-Check -2	Written Test

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

3. What is marketing and seed pricing mean? (5points)
4. What are the Objectives and target of promotional activities?(5points)
5. Write the two components of marketing strategy and explain it briefly?(4points)

Note: **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

3_____

Information sheet 3	Selecting appropriate seed multiplication site

3.1. Selecting site for seed multiplication

One of the earliest decisions that must be taken is where to locate the farm. It means where in the country or region the farm should be located.

There are many factors to be considered when we select sites for multiplication of I improved field crops seeds. Factors to consider in the final decision of the farm site are:-

1. Climate:- the climatic requirement(temperature, rainfall, etc)
    - Temperature: - high temperature for rice, maize, sorghum, etc and relatively low temperature for wheat, barley etc.
    - Light: - long day plant (wheat, barley, flax etc.)
      -Short day plant (cotton, maize, soy bean, etc.)
    - Water: - it includes rainfall of the area, irrigation systems, and drainage systems.
2. Pests: - the presence or absence of particular diseases or pests that attack the proposed crops.
3. Market: - nearness to the markets or processing facilities, in market economic system, a crop with good market can get good price and good profits.
4. Soil: - good soil with the pH within acceptable range and fertile loam soil.
5. Slope: - the land should be flat or gently sloping.
6. Irrigation facilities: - irrigation water is needed for supplement water for the crops.
7. Access and availability of inputs:- inputs like improved seeds, fertilizing materials, labor should be assessable near production area.

3.2 Previous cropping

- The crop should be planted on a field with a known history to avoid contamination from volunteer plants, noxious weeds and soil-borne diseases that are potentially seed transmitted. The minimum number of years between the planting of two seed crops (or seed and grain crop) is prescribed by the national seed regulations.

- A wheat seed crop should never immediately follow wheat, unless the wheat crop in the previous season was of the same variety and of the same or higher generation.

For basic seed, it is often recommended that the field should not have been planted with wheat or other small grain crops for at least two consecutive years.

For certified seed, no wheat crop should have been grown in the previous year.

- A suitable crop rotation plays an important role in pure seed production.

Self-Check -3	Written Test

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

1. What are the factors to be considered while selecting site for seed multiplication?(3 points)
2. What should be the history of previous cropping?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 4	Selecting and preparing equipment's required for tillage/plowing

4.1 Conventional methods

- Preparation of the seedbed is one of the most important steps. Proper preparation will reduce weeds, facilitate planting, and provide a suitable bed for seed germination. A good seedbed will increase the success of planting while a poor seedbed will promote failure.
- Large plantings can utilize a disc to cultivate the soil. Final ground preparation immediately prior to planting can be done with a cult packer, a disc-like farm implement that cultivates only the upper few inches of soil.
- Deep cultivation exposes more weed seed, eliminates the firm under base which is necessary for successful establishment and may cause the plant seeds to be planted several inches deep, making it impossible for the seedling to reach the surface.

4.2. Equipment Used for Soil Preparation

- **Tractor** - a traction machine that provides mechanical, hydraulic, And /or electrical power to implements to perform a wide range of crop production and handling operations. Tractors are most often used to perform

drawbar work (pulling equipment through the field) and PTO (power take-off) (power to rotate equipment components) work.

Tractors can be equipped with rubber tires, rubber belts, or steel tracks. A modern farm tractor is almost always equipped with a diesel engine and tractor size is measured by the amount of power that the tractor can produce at the PTO. Tractor sizes range from those with less than 40 PTO horsepower to ones that produce more than 400 horse power.

Plow - an implement used to perform primary tillage. A number of types of plows are in common use including the moldboard plow, the chisel plow, and the disk plow.

moldboard plow has a large frame that is equipped with a series of "bottoms," each

of which consists of a steel coulter to slice through residue followed closely by a steel share that cuts the soil and an attached moldboard that is used to raise and turn over the cut "slice" of soil.

Disk plows work in a similar manner to laterally displace and invert soil through the use of concave steel disk blades.

Chisel plows use curved shanks to penetrate and "stir" the soil without inverting a soil layer. Chisel plows cause less residue disturbance than moldboard plows and are often used in conservation tillage systems.

Disk Harrows (or Disk) - are implements that uses steel blades to slice through crop residues and soil. Disk blades are mounted in groups or gangs that rotate as they move forward through the soil. Front gangs move soil toward the outside of the disk while rear gangs move soil back toward the center of the disk. A disk can be used for primary or secondary tillage.

Field Cultivator -an implement used to perform secondary tillage operations such as seedbed preparation and weed eradication. Field cultivators are equipped with steel shanks that are typically spring mounted to permit the shank to move within the soil and shatter clods. Field cultivators are constructed similarly to chisel plows, but are more lightly built. Large chisel plows can exceed 50 feet in width in the field.

Self-Check -4	Written Test

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

1 write and discuss convectional tillage practices ?(6 points)

2 Write the equipments used in soil preparation? (8 points)

Note: **Satisfactory rating - 7points** **Unsatisfactory - below 7points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 5	Preparing site and cultivating the land

5.1 Cultivating the land

Soil cultivation includes all mechanical measures to loosen, turn or mix the soil, such as ploughing, tilling, digging, hoeing, harrowing etc. careful soil cultivation can improve the soil's capacity to retain water, its aeration, capacity of infiltration, warming up, evaporation etc. but soil cultivation can also harm the soil fertility as it accelerate erosion and decomposition of humus.

5.2 Soil tillage

Soil tillage, particularly primary tillage, is the foundation of any crop production system and is the biggest cost factor in maize production.

Effect of tillage practices on soil physical properties

Soil tillage in a farming system refers to the physical soil cultivation practices, changing the soil's structure, hydraulic properties and stability to such an extent that plants will grow and produce optimally.

Soil physical properties affected by tillage

Texture and structure

Texture refers to size of mineral soil particles and is the single most important physical property of soil. It involves a ratio of sand, silt and clay in a specific soil. This ratio determines the capacity and strength of structures that are formed, as well as ability to store water. The objective of soil tillage is to maintain the existing structure of soil or to improve the structure of poorly structured soil.

Effect of tillage on soil

1. Infiltration and evaporation
   The most important processes affected by soil tillage include infiltration and evaporation of water. Because water availability during the growing season is the single most important factor in crop production in South Africa, it is essential that soil tillage be aimed at optimizing infiltration and minimizing evaporation.

2. Germination and root growth
   Germination and root growth are affected by tillage methods in that the soil temperature can be manipulated and evaporation reduced.

3. Erosion
   The type of tillage affects vulnerability of the soi to either wind or water erosion. Finely-structured topsoil is susceptible to both types of erosion, while a coarse structure limits erosion.

Once the land is cleared out the critical activities are:

- **Ploughing**: -

The activity of making the area of land ready for seed bed preparation.

It is the activity of digging and turning over soil; especially before seeds are sown.

- **Pulverizing**: - the activity changing soil in to a fine powder.
- **Leveling**: - the activity of making the land level. It is the task of making the height difference equal using line level.
- **Ditching**: - it is the activity of making the sides of land to hold or to take away water. It is the activity under take to make along channel dug at the side of the fields

Self-Check -5	Written Test

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

1. Write effect of tillage on soils?(4points)

2. Write steps of land preparation?(5points)

Note: **Satisfactory rating – 4.5 points** **Unsatisfactory - below 4.5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 6	Applying fertilizers, ameliorants, and/or other pre-planting treatments

Fertilizing

Fertilizers are compounds given to plants to promote growth; they are usually applied either through the soil, for uptake by plant roots, or by foliar feeding, for uptake through leaves. Fertilizers can be organic (composed of organic matter), or inorganic (made of simple, inorganic chemicals or minerals). They can be naturally occurring compounds such as peat or mineral deposits, or manufactured through natural processes (such as composting) or chemical processes (such as the Haber process). Fertilizers typically provide, in varying proportions, the three major plant nutrients (nitrogen, phosphorus, and potassium), the secondary plant nutrients (calcium, sulfur, magnesium), and sometimes trace elements (or micronutrients) with a role in plant nutrition: boron, chlorine, manganese, iron, zinc, copper, and molybdenum.

Part of the fertilization programme starts at the time prior to transplanting, during the land preparation phase. At that stage, attention is to be given to the improvement of the soil which may have a direct influence on the utilization of certain nutrients which are necessary for plant growth.

Actions that precede this phase include the initial hole preparation, application of lime/gypsum/organic material, and a leaching programme in the case of saline soils.

Instead of opening the original hole again to apply the required fertilizers, only a smaller planting hole (± 60x60x60 cm) is prepared and the fertilizers are mixed with the soil from this hole before it is put back at transplanting.

The application rates for nitrogen and phosphorus are calculated by adding 50 % to the average loss of nutrients through fruits and pruned leaves. The amount of potassium is not increased due to the fact that most soils normally yield relatively high natural potassium content. If soil analysis shows a decrease in potassium content over a period of time, this figure should be increased.

Pre – planting requirements

Seedbed preparation is the same for a grain crop. Grain crop does not suppress weeds sufficiently and needs a clean, weed-free seed-bed for planting

Planting with an automatic drill is recommended but not essential. However, row-planting has an advantage over broad-casting, as it requires less seed and facilitates mechanized weed control, roguing and field inspection

Rouging lanes (empty rows at intervals) should be left, which could be used by the seed grower to walk through the field when rouging and inspecting the crop, as well as for spraying the crop.

Deep sowing delays emergence, resulting in weaker seedlings, reduced emergence and poor tillering and yield. Varieties with short coleoptiles length, particularly semi dwarf varieties, suffer most compared to varieties with longer coleoptiles length.

Self-Check -6	Written Test

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

1. Write types of fertilizer ?(5points)

Note: **Satisfactory rating – 2.5 points** **Unsatisfactory - below 2.5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 7	Cleaning tools and equipment and completing land preparation

7.1 Cleaning tools and equipment.

7.1.1 Cleanliness of machinery

Cleanliness of machinery upon planting is very important. Seed drills should be cleaned with compressed air when changing between varieties and other crops of similar seed characteristics. Vans and trailers used for transporting the seed should be completely clean to avoid contamination
Before starting to sow improved seed of field crops, all necessary tools and equipments should be gathered.

Cleaning in a working environment involves removing dirt, grime, scraps and grease from all surfaces, equipment, utensils, crockery, etc. This is considered an important part of a professional kitchen, and wherever else food is prepared for sale and consumption. The level of cleaning activity in a kitchen will depend on trading turnover and the size and layout of the kitchen. Cleaning is important not only from an appearance point of view, but also in the interests of hygiene to reduce the chances of bacterial growth and cross-contamination.

Self-Check -7	Written Test

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

1. What is the important for cleaning tools and equipments ?(6points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 8	Preparing machineries, equipment's and other farm inputs for sowing

8.1 Selecting and preparing machinery, equipments and tools

Before starting to sow improved seed of field crops, all necessary tools and equipments should be gathered. These should include:

1. Simple hand tools:- maresha, spade, shovel, rake, fork, axe, etc
2. Tractor with its accessory

   -Plowing: - mold board, disk, chisel plow etc

   -Harrow

   -Cultivators

   -Ridge makers

Self-Check -8	Written Test

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

1. What types of tools and equipments prepare and select before to saw improved field crop seeds ?(6 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Instruction Sheet	Learning Guide #56

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

- Carry out and assess production site requirements for seed in terms of quantity, quality, ***client*** preferences and requirements.
- Schedule production and marketing activities
- Select appropriate seed multiplication site according to the requirement
- Select and prepare equipment required for tillage/plowing
- Prepare the site and cultivate the land according the *crop* requirement
- Require apply fertilizers, ameliorants, and/or other pre-planting treatments by the planting plan
- Clean and Complete tools and equipment, land preparation operation
- prepare machineries, equipment's and other farm inputs used for sowing

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

- Carrying out production requirements for seed and assessing production site
- Scheduling production and marketing activities
- Selecting appropriate seed multiplication site
- Selecting and preparing equipment's required for tillage/plowing
- Preparing site and cultivating the land
- Applying fertilizers, ameliorants, and/or other pre-planting treatments
- Cleaning tools and equipment and completing land preparation
- Preparing machineries, equipment's and other farm inputs for sowing.

Learning Instructions:

1 Read the specific objectives of this Learning Guide.
2 Follow the instructions described below 3 to 6.
3 Read the information written in the information "Sheet 1, Sheet 2,".
4 Accomplish the "Self-check 1," **in page -18, and 72,** respectively.
5 If you earned a satisfactory evaluation from the "Self-check1" proceed to "Operation Sheet 1, Operation Sheet 2 and " **in page -16,and 19.**
6 Do the "LAP test" in page – 72.

1.1 Factors affecting crops distribution

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. Climatic factors

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 most important factors in climate from the standpoint of plant response are:-

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.

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

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)

Some soils contain such as an excess of soluble salts that they interfere with crop growth. At times the excessive may be leached out or corrected by the addition gypsum or sulfur. It often may happen in some area that soil acidity is so great lime must be applied before satisfactory crop production is achieved

Self-Check -1	Written Test

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

1. What are the factors that to affect crop distribution?(5 points)
2. Write the *effects of high temperature on plant growth* ?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 2	Conducting appropriate pre-seeding treatment and carrying out viability or germination and purity tests

SEED TREATMENT

Seed treatment is the process of applying physical, chemical or biological treatment to the seed to keep it viable and health.

Seed health is an important attribute of quality, and seed used for planting should be free from pests. Seed infection may lead to low germination, reduced field establishment, severe yield loss or a total crop failure.

fungi, bacteria, and nematodes, are the most important seed-borne diseases due to their worldwide distribution and losses they incur in crop production.

Types of seed treatment

1. Physical treatment
2. Biological treatment
3. Chemical treatment

1. ***Physical seed treatment***

- It includes subjecting seeds to solar exposure, immersion in conditioned water etc.
- To induce higher germination, the seeds may be soaked in water before sowing or may be exposed to warm temperature. Early rooting may be induced by treating seeds wit IBA or GA solutions.
- To induce or facilitates sowing and better germination in cotton seed treated with sulphuric acid (H_2SO_4).

2. ***Biological Seed treatment***

It includes the treatment of seeds with microbial cultivars such as that of Rhizobium to inoculate the seeds with microbial cultivars, to fix atmospheric nitrogen and release to the soil.

3. ***Chemical seed treatment***

Chemical seed treatment is one of the efficient and economic plant protection practices and can be used to control both external and internal seed infection.

It protects young seedlings or adult plants against attack from seed-borne, soil-borne or airborne pests.

It disinfects seed from pathogen, checks spread of harmful organisms, promotes seedling establishment,

Maintains and improves seed quality or minimizes yield losses

Types of chemical used for seed treatment

1. Insecticides:- Parathion, phorate, chlorphriphos, furadan, dimethoate etc
2. Fungicides:- Thiram , thiophante(topsin), carbendazim, vitavax, dexon etc

. Selecting planting materials

Seeds are the ***pre-operational*** unit of flowering species and the economic part of grain crops, consists miniature plant called ***embryo***. To produce high quality and quantity of field crops selection of good seeds are very important. ***Good seeds have the following characteri***stics: -

- ⌘ Pure(true to type)
- ⌘ Viability/good germination capacity
- ⌘ Matured, well developed, uniform size, shape, color , texture etc
- ⌘ Health, clean, and free from inert matter
- ⌘ Free from other crop seeds
- ⌘ Free from any pest and seeds borne diseases
- ⌘ Should be whole, not broken, crushed, shriveled, rotten etc
- ⌘ Should contain the required amount of moisture
- ⌘ Fitting within the usual period of the raining season
- ⌘ High and stable yield
- ⌘ Resistance to insect pests and diseases
- ⌘ Uniform heading and fruiting
- ⌘ High oil, protein or starch content

Seed damage may be caused by mechanical injury, insects, fungi, and bacteria. The quality of seed is governed by its purity, viability, germination capacity, seed health (pathogens) test, genetic purity test etc. If seed lacks in any of the characteristics it may becomes unfit for sowing.

a. Seed purity test (Physical purity test)*:* -Seed purity is the percentage of pure seed (only the seed of the desired kind without contaminants) in the sample tested. The contaminants includes:-

1. Seed of others: - like wheat seed may be found in barley seeds.
2. Weed seed
3. Inert materials: - includes materials (foreign matter) such as small stones, pieces of wood, and other plant materials.

b. Seed viability test*:* - Seed ***viability i***s the capacity of seeds to ***germinate.*** A viable seed is one capable of germinating to produce a health, normal seedlings. It is not enough to tissues in the seed to be viable; the seed must able to grow to produce seedlings.

c. Seed germination test: - See germination is the sequence of events in a viable seed starting with the absorption of water that leads to growth of the embryo and development of seedlings. When the seeds are placed in ***proper conditions of moisture***, ***temperature*** and ***oxygen***, the growth of embryo or germination commence. The degree to which germination has been completed is usually expressed in ***percentage***, normally determined at time intervals of germination period in terms of germination power and germination capacity.

$$\textbf{\textit{Germination \%}} = \frac{\text{Numbers of germinated seeds}}{\text{Numbers of planted seeds}} \times 100\%$$

Self-Check -2	Written Test

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

1. Define the word germination, purity and viability ?(5 points)
2. Write the good seed characteristics ?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 3	Carrying out seeding and fertilizer applications

1.1 Seed rates

The optimum seed rates vary with variety, location and method of planting. For seed production fields, a lower seed rate may be recommended because lower seed rates lead to higher multiplication factors but to lower yield per unit area.

Higher multiplication factors lead to rapid seed increase (more seed harvested per kilogram of seed planted), and farmers will benefit from the improved variety earlier.

Low seed rates do not only increase the multiplication factor, but also often improve seed quality because a lower number of plants per unit of land receive better nutrition, thus producing better quality seed.

3.2 Seed size

seed size is positively correlated with seed vigour: larger seeds tend to produce more vigorous seedlings.

3.3. Soil fertilization

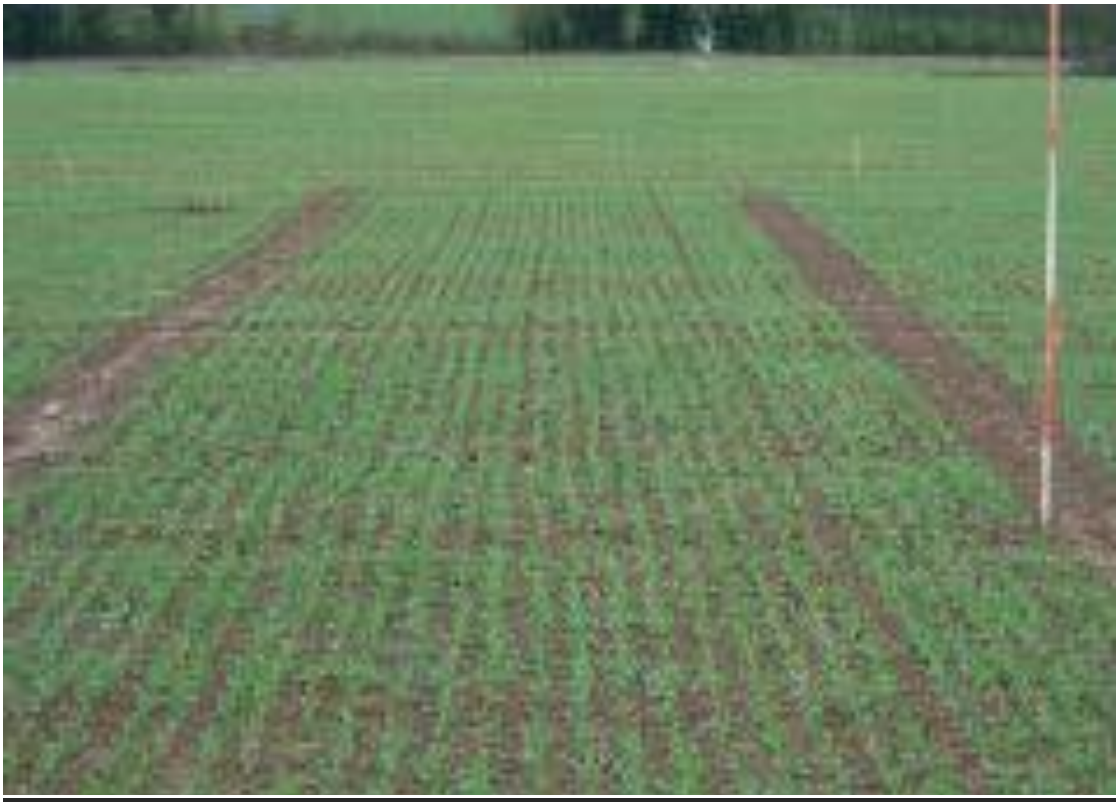
How to Determine Fertilizer Needs

To determine fertilizer needs for crops and soils in your locality you must know two things:

- The status of nutrients in the soil
- How much of each nutrient is needed to get the highest or most profitable (optimum) yield?

There are several approaches to finding the answers to these questions

- Fertilizer recommendation of crops.
- Nutrient hunger signs on growing crops (deficiency symptoms).
- Soil tests or analyses to determine the fertilizer nutrients and amount needed.
- Plant or plant tissue test in the field.
- Fertilizer field trials



3.4. Time of Fertilizer application

Time of fertilizer application depends on the type of crop cultivated, its growth stage, nutrient requirements, soil conditions and nature of fertilizer.

1. **Application before sowing:** Amendments should be applied well in advance to sowing. Some of the water insoluble P fertilizer such as rock phosphate and basic slag should be applied about 2-4 weeks before sowing. This enables conversion of water insoluble form of P to soluble form for efficient crop utilization.
2. **Application at sowing:** Application of fertilizers at the time of sowing or just before sowing is called “basal application.” Mostly phosphatic and potash fertilizers are basally applied. A part of recommended N is also applied as basal dose. Micronutrient fertilizers should be applied at the time of sowing on the soil and should not be incorporated into the soil.
3. **Application after sowing:** Application of fertilizers after the crop establishment is called top dressing. Usually a portion of N is applied as top dressing depending on the stage of the crop. In light textured soils, potash is also recommended for top dressing.
4. **Split application of N:** split applications increase the nitrogen use efficiency by supplying nitrogen at the critical stages when the crop requirement is high. This also

avoids large amounts of basally applied N being subjected to various losses. It is the most convenient and easily adaptable technique. Factors such as total amount of nitrogen to be applied, soil texture, crop duration, critical stages of growth, crop season and water management practices largely govern the number of splits. In irrigated crops N is generally applied in 2-3 splits. In dry land condition, the entire N is applied at sowing as it is difficult to apply N at later stages in the absence of adequate soil moisture. N application is recommended at tillering and panicle initiation stages for rice. Basal application is sufficient for pulses. Split application of N at 30, 60 and 90 days after planting are recommended for sugarcane.

3.5.Method of fertilizer application

Broadcasting: Fertilizers are applied on the open field at the time of sowing or spread in the standing crop. Broadcasting is mostly done manually or with fertilizer spreaders. Broadcast fertilizers should be incorporated into the soil. Fertilizers that are applied in large quantities are normally broadcast applied.

***Placement**: Whenever small quantity fertilizers are applied, placement is practiced. This method is practiced in wide spaced crops and the soils having low fertility. Placement of fertilizer is done in different ways: drilling band application and spot placement.*

Drilling: is one of the methods to place fertilizers simultaneously at the time of sowing by the use of seed cum fertilizer drill.

Band application: is generally practiced in the standing crops. If the fertilizer is placed in bands to one or either sides of crop rows, it is called side dressing. Fertilizer application to fruit trees is adopted by circular band (ring placement) away from the base of plants.

Application of fertilizer nearer to each plant is called as spot placement. This method is practiced for vegetable crops. Urea super granules are deep placed in lowland rice.

Advantages of placement

Surface broadcasting of nitrogen is the commonly used practice. It results in higher ammonia volatilization losses. These loses can be considerably reduced by deep placement. The efficiency of the Phosphorus depends on the method of application. Except in the case of lowland rice, placement of water-soluble phosphates increases its effectiveness. The

localized placement of water-soluble P fertilizer helps in minimizing soil fixation. Placement of P gives additional yield advantage of 6-7 Q/ha over broadcasting in wheat

Foliar application: Fertilizer nutrient that are soluble in water are applied on the foliage as a solution or suspension. Low concentration (less than 1-2 %) is prepared to supply one plant nutrient or combination of nutrients. In general, N and micronutrients are applied as foliar sprays. Among the N fertilizers, Urea is suitable for foliar application. DAP spraying is recommended for pulses and cotton. Of late, water-soluble specialty fertilizers have come into the market. These are highly suitable for foliar application since they do not leave any residues on dissolution.

Compatible insecticide also be mixed with the fertilizers and applied as foliar spray. Micronutrients are applied in small quantities and hence foliar spray is an effective method. Soluble inorganic salts are used for foliar spray. Generally high volume sprayers are used for foliar application.

Self-Check -3	Written Test

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

1. What is seed rate ?(3 points)
2. Write methods of fertilizer application?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 4	Ensuring production of true-to-type F1 hybrid and pure line (certified) seeds

4.1 Keeping appropriate isolation distance and detasseling

4.1.1. Production of breeders' seed of open-pollinated varieties in open-pollinated fields.

4.1.2. Isolation

Growing a seed crop separate from all sources of contamination (genetic, physical and pathological), is one of the fundamental seed production techniques. In practice, such contamination can be reduced by not planting a seed crop in the vicinity of a similar crop that may contaminate it.

The minimum distance required for a particular crop is usually prescribed by the national seed regulations and depends on the seed class. Minimum isolation distances are larger for the early than for the later generations.

Restricting the number of varieties grown for seed multiplication per farm will reduce the chances of contamination.

Where the breeders' seed is produced in open-pollinated fields, it is essential that the crop is sufficiently isolated from potential contaminant crops to ensure that the breeders' seed is pure.

Two methods of isolation may be employed.

The first is to isolate by distance from a contaminant crop.

In this case the distance between the breeders' seed plot and other contaminant crops should be at least equal to the requirements for basic seed Production

The second method is to isolate by time,

in which case the breeders' seed plot is planted in close proximity to, but either earlier or later than the contaminant crop by a time gap sufficient to avoid overlap of the flowering periods of the two crops.

Off-type variant and diseased plants are removed under supervision of the breeder prior to the flowering of the crop.

The plot may be laid out in two ways:

- Male and female rows may be identified, with the female plants de-tasseled prior to flowering to ensure cross-pollination from the male rows. The seed from the female rows is carefully selected from typical plants and desirable ears, with seed from at least 400 plants bulked for breeders' seed. The seed from the male rows may be discarded or used as basic seed.
- The plot is grown as an open-pollinated field, with no separation into male and female rows.

At least 600 plants that are typical of the variety are selected from within the field, and the seed from the central portion of the cobs is bulked for breeders' seed. After shelling, a portion of the seed is kept for future breeders' seed production, while the remainder is passed onto the Production Department for Pre-Basic or Basic Seed production.

Self-Check -4	**Written Test**

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

1. Define isolation in relation to seed multiplication?(3points)
2. Indicate the two methods of isolation?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 5	Cleaning, machinery and equipment and completing seeding operation

5.1 Cleaning machinery and equipments.

5.1.1 Maintaining and Storing Tools & Equipment

An important aspect of any business is the maintenance and storage of tools and equipment. The investment in tools and equipment is a significant part of the overhead expenses in any operation.

Hand tools:

- Clean dirt and debris from tools after each use.
- Oil metal parts to prevent rust.
- Lightly sand rough wooden handles and apply linseed oil.
- Repair loose handles.
- Sharpen blades of cutting tools.
- Store tools in a clean dry storage area.
- Protect surfaces of cutting tools in storage.

Power tools:

- Read and follow the maintenance schedule in the owner's manual for each piece of
- Power equipment.
- Change the oil.
- Clean the air filter.
- Lubricate moving parts.
- Sharpen dull blades or replace worn blades according to the owner's manual.
- Replace spark plugs.
- Drain oil and gasoline before long-term storage.
- Check electric cords and connections on electric-powered tools.
- Store tools in a clean dry storage area.

Equipment:

- Store equipment in a clean dry storage area.
- Rinse and clean spray equipment after each use.
- Clean spreaders and check wheel-driven gears.
- Clean carts and wheelbarrows after use.

Self-Check -5	Written Test

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

1. Write hand tools and power operated equipments ?(6 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Operation Sheet 1	Seed quality testing

Seed purity test (physical purity test)

2. Prepare the working sample.
3. Separate the working sample in to three components. i.e.

   Pure seed: - only the seed of the desired kind without contaminants

   Other seed: seeds other than pure seed like weed seed and other crop seeds

   Inert materials: - includes materials (foreign matter) such as small stones, pieces of wood, and other plant materials.
4. Weigh each component and accumulate their percentage

Operation Sheet 2	Germination testing

To enable students know the germination rate of seed

Materials required:-

- 10 Petridish
- Soft paper
- 100 barley seed (in No.) for each petridish
- Watering device
- Colored marker

Procedures:-

1. Preparing, sample seeds, petridish, and soft paper.
2. Write the sowing date and group No.at the back of the petridish by colored marker
3. Counting 100 seeds (free of impurities) for each petridish
4. Prepare the soft paper to the size of the petridish
5. Put the soft paper on the petridish
6. Wet the soft paper by watering device.
7. Put the seeds in the petridish, distribute them evenly.
8. Follow up the progress daily and pour drops of water if it gets dry
9. After a week (for small cereals) count the germinated and not germinated seeds.
10. Calculate the germination percent

LAP Test	Practical Demonstration

Name _____ Date: _____

Time started: _____ Time finished: _____

Instructions:

1. In the plant science laboratory room you will be provided with different field crop seeds and then undertake seed purity test and seed germination test.
2. If the dry weight of a seed is 200 gram and the weight after oven dry becomes 90 gram calculate the percentage moisture content in wet method and dry method. Show the steps
3. 3000 pure seeds are tested for germination percent and 200 of them are affected by fungus in the germination media 300 seeds do not germinate due to other reasons calculate the germination percentage of the given amount of seeds.

Instruction Sheet	Learning Guide #57

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

- Monitor crop condition and growth requirements
- Assess soil pH and fertility condition and apply fertilizers as per the crop requirement and the nature of fertilizer, according to the plant growing cycle and the enterprise fertilizer calendar
- Assess and identify common nutrient deficiency and toxicity problems in plants
- Monitor soil moisture content and apply water/irrigation as per the crop requirement
- Monitor and maintain field drainage

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

- Monitoring crop condition and growth requirements
- Assessing soil pH and fertility condition and applying fertilizers
- Assessing and identifying common nutrient deficiency and toxicity problems
- Monitoring soil moisture content and applying water/irrigation
- Monitoring and maintaining field drainage

Learning Instructions:

7 Read the specific objectives of this Learning Guide.

8 Follow the instructions described below 3 to 6.

9 Read the information written in the information “Sheet 1, Sheet 2,”.

10 Accomplish the “Self-check 1,” **in page -18, and 72,** respectively.

11 If you earned a satisfactory evaluation from the “Self-check1” proceed to “Operation Sheet 1, Operation Sheet 2 and ” **in page -16,and 19.**

12 Do the “LAP test” **after each LG**

Information sheet 1	Monitoring crop condition and growth requirements

1.1. Maintaining the field

1.1.1 Cultural management of a seed production field

Cultural management practices are crucial to the success of any crop. For better aeration and retention of moisture, land preparation becomes necessary. Large-scale commercial farmers use tractors to plow, harrow, and ridge their farms. Seeds are sown as soon as the rains are established to ensure sufficient soil moisture for proper germination.

On large-scale production fields, however, recommended pre emergence herbicides, could be applied as recommended. Insect pests should be effectively controlled using recommended insecticides. diseases, such as downy mildew, stalk and ear rot, streak disease, rust, leaf spots, or smut, should be effectively controlled. Planting disease resistant varieties is the cheapest control method.

Crop rotation and burning crop residues are other effective pest and disease control measures. Recommended fertilizers should be applied at recommended dosages and times, and with the right methods of application. The actual rates and types of fertilizer should be based on the nutrient status of the soils, which can be determined through soil tests.

In drier areas, irrigation may be required before planting and at intervals up to physiological maturity. In general, light-textured soils need more frequent irrigation than heavy soils.

Prepare the soil in your field at least 2 weeks before planting. If there are any seeds from previous crops left in the soil, they may germinate in these 2 weeks and you should remove them when you sow your seed crop. Choose a plant density that is recommended for your area. Planting in straight rows will facilitate crop management and seed production operations. Apply fertilizer and remove weeds in time.

1.1.2 Eliminating undesirable plants

Carefully examine your seed crop as it grows. You may find plants that look very different or flower much earlier or later than most other plants in the field. These plants are called off-types and they should be removed—a process known as rouging—before pollen shedding starts. Most farmers do not like to remove any maize plants from their field, but rouging is critical in maintaining varietal purity.

1.1.3 Quality control in seed production

The production and distribution of quality seeds require diligent efforts both during field production and in postharvest handling. Field inspections are commonly conducted at different stages of crop development to ensure quality.

A planting inspection is commonly conducted to determine that the seeds planted are genetically pure, of known origin, and an appropriate variety for the area.

If a mechanical planter is used, it should be checked to ensure that it is clean and free of seeds of other types and properly calibrated to achieve the recommended seeding densities. The field should be inspected to verify that it is properly isolated and free of volunteer plants.

A second field inspection may be made during the vegetative growth phase. Isolation should be checked, along with the presence of disease, insect pests, or weed infestations. At this stage, off-type and diseased plants may be rouged.

The most important field inspections are made just before and during flowering. At this time, the seed field is most susceptible to genetic contamination from wind-blown pollen coming from off-type plants within the field or from other maize varieties in surrounding fields. Therefore, it is essential during the pre-flowering inspection to confirm that the maize seed field has been properly rouged and is sufficiently isolated. Plants that are off-type or diseased, along with harmful weeds, should be removed at this time. A pre harvest or harvest inspection may be conducted as the crop reaches maturity and the maize has lost a significant portion of its moisture content. Off-type plants, such as those that are still green when most of the other plants are dry, may be removed at this stage. Various standard tests for moisture content, germination, and physical purity can be conducted to evaluate the quality of the seeds. This is usually carried out on samples collected from the field during inspection visits or drawn from seed stocks before the beginning of sales. The most common evaluation is the germination test, designed to determine the seeds' capacity to germinate and produce normal plants when sown under appropriate conditions.

Self-Check -1	Written Test

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

1. Write cultural management to maintain field ?(3 points)

2. Write quality control in seed production?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 2	Assessing soil pH and fertility condition and applying fertilizers

2.1 Source of Soil Acidity

Acidity in soils comes from H^+ and Al^{3+} ions in the soil solution and sorbed to soil surfaces. While pH is the measure of H^+ in solution, Al^{3+} is important in acid soils because between pH 4 and 6, Al^{3+} reacts with water (H_2O) forming $AlOH^{2+}$, and $Al(OH)_2^+$, releasing extra H^+ ions.

Every Al^{3+} ion can create 3 H^+ ions. Many other processes contribute to the formation of acid soils including rainfall, fertilizer use, plant root activity and the weathering of primary and secondary soil minerals. Acid soils can also be caused by pollutants such as acid rain and mine spoiling.

A. Rainfall:

Acid soils are most often found in areas of high rainfall. Excess rainfall leaches base cation from the soil, increasing the percentage of Al^{3+} and H^+ relative to other cations. Additionally, rainwater has a slightly acidic pH of 5.7 due to a reaction with CO_2 in the atmosphere that forms carbonic acid.

B. Fertilizer use:

Ammonium (NH_4^+) fertilizers react in the soil in a process called nitrification to form nitrate (NO_3^-), and in the process release H^+ ions.

C. Plant root activity:

Plants take up nutrients in the form of ions (NO_3^-, NH_4^+, Ca^{2+}, $H_2PO_4^-$, etc.), and often, they take up more cations than anions. However plants must maintain a neutral charge in their roots. In order to compensate for the extra positive charge, they will release H^+ ions from the root.

D. Weathering of minerals:

Both primary and secondary minerals that compose soil contain Al. As these minerals weather, some components such as Mg, Ca, and K, are taken up by plants, others such as Si are leached from the soil, but due to chemical properties, Fe and Al remain in the soil profile. Highly weathered soils are often characterized by having high concentrations of Fe and Al oxides.

E. Acid Rain:

When atmospheric water reacts with sulfur and nitrogen compounds that result from industrial processes, the result can be the formation of sulfuric and nitric acid in rainwater.

2.2 Sources of Basicity

Basic soils have a high saturation of base cations (K^+, Ca^{2+}, Mg^{2+} and Na+). This is due to an accumulation of soluble salts are classified as either saline soil, sodic soil, saline-sodic soil or alkaline soil.

All saline and sodic soils have high salt concentrations, with saline soils being dominated by Ca and Mg salts and sodic soils being dominated by Na. Alkaline soils are characterized by the presence of carbonates.

Fertilizers are categorized into one of two groups: acid-residue or alkaline-residue. The fertilizers themselves are not acidic or alkaline, but they react with microorganisms in the media and plant roots to affect media solution pH. Fertilizers with ample ammonium or urea tend to acidify the media, i.e., lower the pH. Fertilizers with ample nitrates tend to raise the pH of the media solution slowly over time. Alkalinity is one measure of the quality of water used for irrigation.

A. Water Quality/Alkalinity

Water's capacity to neutralize acids. In other words, irrigating with bicarbonates in water is equivalent to applying lime with each irrigation. The bicarbonates react with hydrogen ions and remove them from solution. This process effectively decreases the H+ ion concentration in the media and thus increases the media solution pH.

The reverse situation can also occur. Very pure water (low bicarbonates) can cause media solution pH to decrease over time. The pH drops, because there may not be enough bicarbonate to absorb excess hydrogen ions. Thus, the H+ concentration in the media increases. The most common solution for pure water sources is to increase the amount of pulverized dolomitic limestone incorporated into the media prior to transplanting plants into the media.

Another solution is to top-dress containers with the limestone. Finally, bicarbonate can be added to irrigation water in the form of potassium bicarbonate to improve the buffering capacity of the media solution (i.e., reduce pH fluctuation).

B. Fertilizers Applied.

Fertilizers are categorized into one of two groups: acid-residue or alkaline-residue.

The fertilizers themselves are not acidic or alkaline, but they react with microorganisms in the media and plant roots to affect media solution pH.

Fertilizers with ample ammonium or urea tend to acidify the media, i.e., lower the pH.

Fertilizers with ample nitrates tend to raise the pH of the media solution slowly over time.

Changing soil pH

Increasing pH of acidic soil

The most common amendment to increase soil pH is lime ($CaCO_3$ or $MgCO_3$), usually in the form of finely ground agricultural lime. Buffering capacity of soils is a function of a soils cation exchange capacity, which is in turn determined by the clay content of the soil, the type of clay and the amount of organic matter present. Soils with high clay content, particularly shrink-swell.

clay, will have a higher buffering capacity than soils with little clay. Soils with high organic matter will also have a higher buffering capacity than those with low organic matter.

Soils with high buffering capacity require a greater amount of lime to be added than a soil with a lower buffering capacity.

Decreasing pH of basic soil

- Iron sulphates or aluminum sulphate as well as elemental sulfur (S) reduce pH through the formation of sulfuric acid.
- Urea, urea phosphate, ammonium nitrate, ammonium phosphates, ammonium sulphate and mono potassium phosphate fertilizers have a
- Organic matter in the form of plant litter, compost, and manure will decrease soil pH through the decomposition process. Certain acid organic matter such as pine needles, pine sawdust and acid peat are effective at reducing pH.

Self-Check -2	Written Test

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

1. Write source of acidity?(6 points)

2. List down source of alkalinity?(6points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 3	Assessing and identifying common nutrient deficiency and toxicity problems

3.1 Determining nutritional problems in plants

Plants need the right combination of nutrients to live, grow and reproduce. When plants suffer from malnutrition, they show symptoms of being unhealthy. Too little or too much of any one nutrient can cause problems.

Both macro- and micronutrients are naturally obtained by the roots from the soil. Plant roots require certain conditions to obtain these nutrients from the soil.

First, the soil must be sufficiently moist to allow the roots to take up and transport the nutrients. Sometimes correcting improper watering strategies will eliminate nutrient deficiency symptoms.

Second, the pH of the soil must be within a certain range for nutrients to be release-able from the soil particles.

Third, the temperature of the soil must fall within a certain range for nutrient uptake to occur. The optimum range of temperature, pH and moisture is different for different species of plants. Thus, nutrients may be physically present in the soil, but not available to plants.

A knowledge of soil pH, texture, and history can be very useful for predicting what nutrients may become deficient.

Keep in mind that each plant variety is different and may display different symptoms.

• Many nutrient deficiencies may look similar.

• It is important to know what a plant species looks like when it is healthy in order to recognize symptoms of distress, for example some plants were bred to have variegated patterns in the leaves when they are healthy.

• Many micronutrients are used by plants to process other nutrients or work together with other nutrients, so a deficiency of one may look like another (for instance, molybdenum is required by legumes to complete the nitrogen fixation process).

• If more than one problem is present, i.e. if water stress, disease, or insect pressure occurs simultaneously with a nutrient deficiency, or if two nutrients are deficient simultaneously, the typical symptoms may not occur.

Too much of any nutrient can be toxic to plants. This is most frequently evidenced by salt burn symptoms. These symptoms include marginal browning of leaves, separated from green leaf tissue by a slender yellow halo. The browning pattern, also called necrosis, begins at the tip and proceeds to the base of the leaf along the edge of the leaf.

3.2 Common nutrient deficiency and toxicity problems

3.2.1 Symptoms of nutrient Deficiency

Visual nutrient deficiency symptoms can be a very powerful diagnostic tool for evaluating the nutrient status of plants. Many of the classic deficiency symptoms such as tip burn, chlorosis and necrosis are characteristically associated with more than one mineral deficiency and also with other stresses that by themselves are not diagnostic for any specific nutrient stress.

However, their detection is extremely useful in making an evaluation of nutrient status. In addition to the actual observations of morphological and spectral symptoms, knowing the location and timing of these symptoms is a critical aspect of any nutrient status evaluation.

3.2.2 Sources of Visual Symptoms

Stresses such as salinity, pathogens, and air pollution induce their own characteristic set of visual symptoms. Often, these symptoms closely resemble those of nutrient deficiency. Pathogens often produce an interveinal chlorosis, and air pollution and salinity stress can cause tip burn.

Pathological symptoms can often be separated from nutritional symptoms by their distribution in a population of affected plants.

If the plants are under a nutrient stress, all plants of a given type and age in the same environment tend to develop similar symptoms at the same time.

However if the stress is the result of pathology, the development of symptoms will have a tendency to vary between plants until a relatively advanced stage of the pathology is reached.

Self-Check -3	Written Test

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

1. List down deficiency symptom on plants?(4 points)
2. How to identify nutrient deficiency and nutrient toxicity?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 4	Monitoring soil moisture content and applying water/irrigation

4.1 Maintaining and monitoring water application

Irrigation is the artificial application of water, with good economic return and no damage to land and soil, to supplement the natural sources of water to meet the water requirements of crops. Irrigation is the key input in crop production. Full benefit of crop production technologies such as high yielding varieties, Fertilizer use, Multiple cropping, crop culture and plant protection measures can be derived only when adequate supply of water is assured. Irrigation becomes necessary for successful crop growing when the amount, frequency and distribution of rainfall are unpredictable, untimely and may be insufficient. Irrigation should be profitable and applied in times of crop need and in proper amount. The excess or under irrigation may damage lands and crops. Irrigation applied earlier to the actual time of crop need results waste of water, while delayed irrigation may cause water stress to crops and reduce the yield.

Irrigation is beneficial only when it is properly managed and controlled Faulty and careless irrigation does harm to crops and damages lands.

4.2 Determining water requirement of the crop

Wilting, leaf curling (or rolling), and, in some cases, color changes (maize turns bluish green, bean leaves turn dark green) are the initial signs of moisture stress (lack of water). Yellowing and eventual browning (“firing”) of the leaves, starting at the tips, are very advanced symptoms that occur after days of continuous moisture stress. However, most of these symptoms can also be caused by anything else that interferes with water uptake or water transport such as nematodes, soil insects, fungal and bacterial wilts, stem borers, and even very high temperatures. N deficiency can cause yellowing too. Although young plants can usually tolerate the initial symptoms (wilting, curling, color change) without any significant yield drop, older plants (especially those that are flowering and fruiting) should not be allowed to reach this stage or yields may be seriously affected. For example, if corn wilts for 2-4 days during pollination, yields are usually reduced by 50%.

Remember, methods of irrigation application depend on types of crops and availability of irrigation facilities.

Self-Check -4	Written Test

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

1. What is irrigation ?(3 points)

2. Write the symptom of water stress on crops ?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 5	Monitoring and maintaining field drainage

5.1 Monitoring and maintaining drainage

Irrigation and drainage are complementary practices the necessity for drainage being increased by low efficiencies in the conveyance and application of irrigation water. Adequate drainage improves soil structure and increases the productivity of the soil. Drainage benefits irrigation agriculture in many ways such as:- facilitating early plowing and planting, lengths the crop growing season, Provide more available moisture, decreases soil erosion, helps in soil aeration, leaches excess salts from the soil.

Self-Check -5	Written Test

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

1. Write the advantage of drainage on the farm area ?(4 points)

Note: **Satisfactory rating - 2 points** **Unsatisfactory - below 2 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Instruction Sheet	Learning Guide # 58

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

- Assess cope and size of weed, pests and disease infestation
- Identify, assess carefully, monitor ,select and apply appropriate controls methods
- Select and implement control measures following principles of weed control according to the integrated pest management standards or industry code of practice
- Monitor control methods to identify side effects to other plants, animals or external environment
- Assess effectiveness of control methods in reference to specified industry and enterprise standards
- Monitor and Control late growing weeds carefully and ensur the maximum purity of the seed during harvesting

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

- Assessing scope and size of weed, pests and diseases infections
- Identifying, assessing carefully, monitoring ,selecting and applying appropriate controls methods
- Selecting and implementing control measurements
- Monitoring controlling methods to identify side effects to other plants, animals or external environment's
- Assessing effectiveness of control methods
- Monitoring and controlling late growing weeds carefully

Learning Instructions:

13 Read the specific objectives of this Learning Guide.

14 Follow the instructions described below 3 to 6.

15 Read the information written in the information "Sheet 1, Sheet 2,".

16 Accomplish the "Self-check 1," **in page -18, and 72,** respectively.

17 If you earned a satisfactory evaluation from the "Self-check1" proceed to "Operation Sheet 1, Operation Sheet 2 and " **in page -16,and 19.**

18 Do the "LAP test"

Information sheet 1	Assessing scope and size of weed, pests and diseases infections

1.1 Monitoring the crop for pest damage

The first step in an IPM program is to monitor fields for signs of pest damage or potential pest problems. Proper weed management involves a thorough inspection of each field after crop harvest to identify major weed species in the field. When an annual crop is to be grown in the field the following year, this information is used to assess the importance of each weed species and to select the appropriate management strategy to be used for the coming crop. In annual crops, fields also are monitored after the crop has emerged to assess the effectiveness of the selected management alternative and whether additional management tactics are needed.

Except for seed treatments and foliar applications in small grains, fungicides seldom are used for managing diseases in field and forage crops. However, fields should be scouted to monitor the presence of crop diseases. By identifying diseases in a field, the farm manager can implement management tactics such as crop rotation, tillage, or selection of resistant cultivars. Disease scouting should be done frequently during the growing season.

Because of their natural mobility and reproductive potential, insects are among the most difficult pests to manage. A field badly infested with an insect pest one year may have very little damage the following year. Conversely, a field that has been insect free for years suddenly may have severe insect damage.

The unpredictable nature of insect damage has led many farmers to apply insurance insecticide treatments. Although insurance applications may help you sleep better at night, you may be using resources better employed in other farm enterprises. Routine field monitoring can prevent the unnecessary use of funds to manage pests that are economically insignificant and can help direct management efforts to those fields that can benefit.

For insect management, fields should be scouted every seven to ten days to adequately monitor changing pest populations. Longer periods between field monitoring can mean detecting pest damage only after significant losses have occurred. For pests such as the black cutworm in corn, significant damage can occur within three to five days if fields are not watched closely.

In corn, monitoring should begin about a week after the crop has been planted. Insect pests such as the seed corn maggot, seed corn beetle, wireworm, and white grub can feed on newly planted seed. lists the key corn insect pests and the plant growth stages during which they can cause crop damage. Monitoring can be terminated after the pest management decision has been made for the corn rootworm. In situations where European corn borer is prevalent, however, continue monitoring to assess the degree of stalk lodging and ear drop page. This information is useful in assessing the population potential for the next growing season and in determining if another more resistant variety should be planted in the future.

Few economically important insect pests of soybeans exist in Pennsylvania; however, several insect pests can cause significant damage in a limited number of fields within a season.. Scouting for insects in small grains should begin after plant emergence and continue until harvest. In wheat, corn leaf and English grain aphids and Hessian fly can attack young seedlings in the fall and early spring. Armyworm can clip off wheat heads as the grain begins to reach maturity.

Monitoring crops for pests should not be a series of independent processes, but part of an overall integrated monitoring plan. For instance, scouts do not walk into an alfalfa field and look only for insect

pests. Instead, they are observing insect numbers, diseases, weeds, the general health of the crop, and the stage of crop growth, while assessing potential problems. This information provides a baseline for future evaluations of crop health and helps measure the economic significance of specific pests in the field. By routinely monitoring a field, the farm manager can note subtle changes in the crop and take corrective action before major problems occur.

The occurrence of multiple pests in a field can influence the potential damage from pests. For instance, a field with a heavy weed infestation will experience greater yield losses if an insect or disease problem also is present. In fact, weedy fields often attract insects because of the high humidity. Certain weeds also are attractive to insects. Because common chickweed is a preferred host of the black cutworm, fields with heavy chickweed infestations have a significantly higher probability of developing a black cutworm problem. Therefore, fields with heavy chickweed infestations should be monitored closely for black cutworm infestations. Producers can reduce the potential for this pest by eliminating chickweed from fields at least 10 days before planting.

Besides the interaction of multiple pests, plant growth stage also can influence pest damage. Because some diseases and insect problems occur only during specific growth stages of the crop, it is important to know what growth stages are susceptible to which pests.

By knowing the pest history of the field and what problems exist in it during a growing season, farm managers can develop a crop production strategy to reduce pest damage. This strategy should be integrated along with other management decisions, such as fertility management, tillage method, and conservation management.

Monitoring methods

Many pest problems can be identified simply by observing them in the field. Weeds and diseases typically fall into this category, as do some insect and mammalian pests. Others, however, require specialized equipment to estimate their numbers. For example, monitoring populations of corn soil insects such as the wireworm, white grub, seed corn maggot, seed corn beetle, black cutworm, and rootworm larvae requires the use of a shovel or trowel in addition to a visual damage inspection. These insects all feed below ground level and must be located by digging.

One method for monitoring wireworm populations involves burying corn or other grain in a mesh material. Because carbon dioxide is given off by the seed as it begins to sprout, larvae of the wireworm are attracted to the grain and can be found feeding in the corn contained in the mesh material. This is an effective method of monitoring old sod fields before planting a corn crop. Economic threshold values have been established for this method.

Pheromone traps can be used to monitor the population of black cutworm adults that migrate into Pennsylvania during early spring. A pheromone trap contains the scent of the female moth, and this attracts the male. By calculating and summing 300 degree days from the time eight moths are collected, the period when larva feeding occurs can be calculated. This is useful in determining when to begin scouting fields.

Backlight traps can be used to monitor the flight periods of a number of moths. Important insects that can be monitored this way include European corn borer, true armyworm, fall armyworm, sod webworm, and corn earworm. Egg deposition usually is correlated with moth flight. Although light traps are useful monitoring tools, considerable experience is needed to sort out the economically important insects from the hundreds of other insect species collected in the trap.

Although numerous methods have been developed to scout crop pests, the best pest management tool is observation. If you take the time to scout fields during critical periods, you can avoid most significant pest damage. Information and organization are keys to successful pest management. In addition to scouting fields, an experienced crop manager or consultant can use field characteristics to help identify fields with a high probability of developing a pest problem. _shows field characteristics for corn that increase the likelihood of infestation by a given insect pest. Both weeds and diseases are affected by field conditions. For instance, weeds such as yellow nut sedge prefer moist environments and tend to be a problem in areas that are wet. Nut sedge, in turn, serves as a host for billbug infestations. Many fungal diseases are more common in wet fields. Knowledge of the properties and history of a field can be a very powerful tool in making variety selections and deciding on crop production techniques.

Self-Check -1	Written Test

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

1. Write. how to monitors for pests?(4 points)

Note: **Satisfactory rating - 2points** **Unsatisfactory - below 2 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 2	Identifying, assessing carefully, monitoring ,selecting and applying appropriate controls method

2.1 Assessing weeds, pests and diseases population

2.1.1 Weed assessment

Assessment 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 assessment include walking fields, drive-bys, and, field mapping. assesment 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 assesment, 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.

2.1.2 Disease and pest assessment

Frequent field assessment is important for monitoring crop development and identifying problems in the early stages before they become severe. Correct diagnosis is crucial because control measures are different for the different diseases. In all cases, the farmers must first assess a pest problem and decide if it is severe enough to need control measures. Then, if control is necessary, the farmer needs to decide what control measures to use, and how those actions will affect the pest population (effectiveness) and the area where they are applied (safety). Many pest-control programs cost a lot of money, so farmers need to weigh the cost of the control measure against the benefit it will provide in terms of crop yield and quality protection.

Self-Check -2	Written Test

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

1. Write the assessment methods of weed, and diseases?(8 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 3	Selecting and implementing control measurements

3.1 Weed Control methods.

Measures against weeds comprise mechanical (cultivation and moving), cultural or cropping, biological and chemical means.

Mechanical methods. Hand-pulling or hand-weeding, hoeing, tilling, mowing, burning, flooding, smothering, etc. are examples of physical methods of weed control, involving the use of physical energy through implements,either manual, bullock-drawn or power-operated.

Hand-weeding is the most efficient method,but it is back-breaking,time-consuming and costly. Tillage is a practical and economical method of controlling annual weeds. The plough (disc,mouldboard,etc.), the harrow (disc,spike and spring-toothed) and the cultivator (duck-foot, blade,*bakhar*, etc.) are implements in use to eradicate weeds.

Cultural or cropping methods. Weeds under many conditions are better competitors than crop plants for light, water, nutrients and soil space. However, farming practices are capable of changing the condition in such a way as to enable the crop plants to compete with weeds successfully by preventing them from acting as impediments to increased crop production. Seeds with good germination will give the crop a vigorous and close stand and thus enable it to steal a march on the weeds. Varieties which are well adapted to a region will obviously compete better with the weeds than varieties poorly adapted to it. quick-growing and short-duration varieties of crop plants with a large leaf area and good branching and the agronomist has to work out the proper seed-rate,depth,time and method of sowing, applying the most effective methods of irrigation and fertilizers and adopt a proper system of rotation.

Chemical methods The controlling of weeds in the growing crops with Herbicides increases their yields and ensures the efficient use of irrigation,fertilizers and plant-protection measures, such as the spraying of insecticides and fungicides. The removal of weeds from the growing crops facilitates easy harvesting and gives a high-quality produce without admixture with weed seeds. Chemical weed control can be adopted under conditions which make manual or mechanical weeding difficult. The chemical

method is easier, less time-consuming and less costly than weeding by hired labourers.

3.2 Insect Control methods

a group that promotes safe, effective pest control around the world, recommends the following steps:

(1) Reduction of the pest population;

(2) Use of cultural (or natural, physical) methods;

(3) Enhancement of host plant resistance;

(4) Where appropriate, the identification and use of biological control agents; and

(5) Use of pesticides when necessary.

Reduction of the pest population –

Insect and plant growth regulators also can limit growth and reproduction of harmful insects **.**

Use of cultural methods –

These are considered “natural” ways of controlling pest populations.

Examples include using tillage and Crop rotation /breaks the cycle of pests thriving on one specific crop year after year/**.**

Enhancement of host plant resistance –

Through biotechnology, great strides have been made in recent years in breeding plants that are naturally resistant This is often done by taking a good trait from another species and putting it into the genetic make-up of a food producing plant to make it more resistant to a pest. These crops sometimes are called “transgenic” or “genetically modified” crops.

Identification and use of biological control agents –

Biological control uses living organisms to control other organisms. It uses the “good” species to control the bad.Many beneficial insects help control other insects.

Releasing natural enemies of harmful pests helps protect crops naturally by having the “good” insects do the hunting instead of using chemicals.

2.3 Use of pesticides –

Sometimes pesticides are simply the most effective way to control pests. These substances must be used responsibly. The evolution of pesticides has led to greater knowledge of scientists and farmers about the capabilities, limitations and risks of using pesticides.

.4 3 Disease Control method

Seed Treatments

Seed treatments are excellent for control of Seed borne diseases In order to keep our seed supply clean, seed treatments are highly recommended for all seed production fields.

Seed treatments also can reduce seed rot and seedling blight.

Certified Seed

Using certified seed reduces the risk of introducing a seedborne disease into the field.

Biocontrol is the use of natural biological competition, predation, or antagonism to control a pest.

Balanced Fertility

Maintaining balanced fertility may reduce some diseases. Chloride deficiency has been linked to greater

susceptibility to foliar diseases.Excess nitrogen can promote the development of powdery mildew.

Self-Check -3	Written Test

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

1. Write control method of weeds,insects and diseases :?(10points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 4	Monitoring controlling methods to identify side effects to other plants, animals or external environment's

4.1 Assessing the success of a management alternative

Once a management alternative has been implemented, it is a sound practice to evaluate its performance. If possible, leave one area untreated and examine it to determine crop yield in the absence of the activity. Without this, there is no way of knowing, for some insects, if an action was economically beneficial. For instance, if no insects were present in a field and a management strategy was implemented based on an improper assessment of the problem, then the absence of an untreated area would make it appear that the management action was successful.

By evaluating the success of each possible management strategy, you can determine the most effective approach to managing a pest or combination of pests. Evaluation also can help determine which management strategies are most effective under various conditions.

4.1 Monitoring control methods to identify side effects to other plants, animals or external env't

Once control measures have been applied, it is essential that the efficacy of the application is monitored, both in terms of its impact on targeted weeds and on beneficial insects. Scouting must continue as per usual after treatments have been made.

Depending on the data gathered from the assessment made on the effectiveness and side effect of the implemented control measures, the remedies should be given to make correction in the IPM methods to meet the enterprise specifications. So it proves that the pests and diseases will be controlled effectively, and the damage to non-target organisms will be minimized in the next control.

Self-Check -4	Written Test

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

1. How to minimize control methods side effect on plants ,animals and environments' ?(4 points)

Note: **Satisfactory rating - 2 points** **Unsatisfactory - below 2 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 5	Assessing effectiveness of control methods

5.1 Factors influencing herbicide efficacy

No herbicide is expected to give similar results applied anywhere and at any time. The effect of a few grams of herbicide spread over a hectare of soil or vegetation is affected by the atmospheric and soil environment variables which it has to face. Among the atmospheric factors are, rainfall, relative humidity, temperature, sunshine and wind velocity are important in influencing the course of action of herbicides.

Some herbicides perform better in sunny days rather than in cloudy days since photosynthetic activity in the target plant is very essential for their action. Ex;-2,4-D, parquet

Low humidity weather may dry out herbicide droplets even before the toxicant had chance to enter the plant shoots.

Rainfall received soon after application of the herbicide can make it ineffective by washing out from the foliage.

A very low temperature can result a weak and uneven kill because of slow biochemical reaction in the target weeds.

The activity of soil applied herbicide is dictated mainly by the clay and organic matter content of the soil for instance, in sandy soil most herbicides leach to the crop zone very fast, but in heavy soils they move slowly.

In dry soils the pre emergence herbicides remain ineffective on weeds for want of proper germination and absorption of the herbicide by them

Abnormal soil PH can modify the herbicidal effects.

Therefore, efficacy data involve the demonstration that the herbicide is effective for the stated purpose in the field

Self-Check -5	Written Test

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

1. Write the factors that to influence for herbicide efficacy?(6points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 6	Monitoring and controlling late growing weeds carefully

6.1 Late growing weed control

Weeds are troublesome in many ways. They reduce crop yield by robbing water, light, space, and soil nutrients. Weeds can produce allelopathic substances that are toxic to crop plants. Weeds often serve as hosts for crop diseases; they also may provide shelter for insects and diseases to over-winter.

Herbicide application can provide the most effective and time-efficient method of managing weeds. Numerous herbicides are available that provide effective weed control and are selective in that grasses are not injured.

Mechanical control consists of methods that kill or suppress weeds through physical disruption. Such methods include pulling, digging, disking, plowing and mowing. Success of various mechanical control methods is dependant on the life cycle of the target weed species.

- Hand pulling and digging are effective on annual and biennial species such as kochia, musk thistle, and diffuse knap weed. It is important to remove the upper 2-3 inches of taproot to prevent re-growth. Hand pulling or digging a perennial weed such as leafy spurge can be a futile effort unless one has the time necessary to diligently dig or pull re-growth over several seasons.
- Shallow tillage with a disk or sweep is effective for controlling annual species such as cheat grass or kochia, but can actually be counterproductive if trying to control perennial weeds such as Canada thistle, field bindweed, leafy spurge or Russian knapweed. Perennial root systems often have meristematic buds that can set roots and produce a new plant from root segments deposited on the soil surface. Shallow tillage of perennial weeds can result in a larger, denser and more uniform infestation than the initial patch.
- Moldboard plowing (complete turnover of the top 10-12 inches of soil) disrupts underground root systems and buries seed from the surface to a depth too deep to germinate. This type of tillage is seldom feasible to practice on a regular basis.

- Mowing is a suppression measure that can prevent or decrease seed head production. Mowed weeds will re-grow and set seed from a reduced height so a combined control method is necessary to be effective. Mowing causes perennial plants to weaken when forced to send up carbohydrates from underground root reserves to nourish re-growth. So mowing a perennial weed such as Canada thistle a couple of times during the summer can significantly weaken the plants, and when combined with a fall herbicide application, provides excellent control.

Self-Check -6	Written Test

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

1. Write controlling techniques of late growing weeds ?(6 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Instruction Sheet	Learning Guide # 59

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

- Assess crop maturity and determin appropriate time of harvesting
- Sample crop for moisture content against the classification standards
- Make the necessary preparation for harvesting operation and prepare harvesting equipment
- Identify the hygiene standards for the crop and the paddock from the harvest strategy and/or the crop storage plan
- Follow and complete the harvest strategy for each paddock
- Maximize the quality of the seed by maintaining the hygiene of all surfaces that come into contact with the seed and by continually checking and, where necessary, adjusting the harvester and ancillary equipment, including their height and other settings.
- Complete harvesting operation

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

- Assessing crop maturity and determining time of harvesting
- Sampling crop for moisture content
- Making preparation for harvesting and preparing harvesting equipment's
- Identifying the hygiene standards for the crop and paddock
- Following and completing the harvest strategy for each paddock
- Maximizing the quality of seed by maintaining hygiene of all surfaces and adjusting the harvester and ancillary equipment
- Completing harvesting operation

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1, Sheet 2,".
4. Accomplish the "Self-check 1," **in page -18, and 72,** respectively.
5. If you earned a satisfactory evaluation from the "Self-check1" proceed to "Operation Sheet 1, Operation Sheet 2 and " **in page -16,and 19.**
6. Do the "LAP test"

Information sheet 1	Assessing crop maturity and determining time of harvesting

1.1 Determining crop maturity

1.1. Physiology maturity and harvesting maturity

Crops are considered to be at physiological maturity when the translocation of photosynthesis is stopped to economic parts. Grain moisture will be fall from 40% to 20%. For instance, symptoms in some crops, sorghum and maize (black layer formation in the seeds), In pulses crops (green pods turns to black color pods).

Date of maturity of crops

Complete maturity, generally occurs 4-7 days after physiological maturity. The general symptoms of harvest at complete maturity are drying of grains or pods.

a. . Determining time of harvesting

Time of harvest a crop depends on a numbers of factors, include economic parts (product), utilization of the product, and post harvest storage.

1. The economic part of product of the crop plant could be the root, leaves, stems, grains or other parts. These plant parts have different times when it is best to harvest them
2. Utilization: - The economic part may be the same, but on one occasion, it may be desirable to harvest it fresh, while on another, it may be best to harvest it dry. For example, maize may be harvests fresh or dry depending on the intended use.
3. Storage methods:- Harvested products often requires some form of storage at the site of production while awaiting shipment to the market:-

Self-Check -1	Written Test

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

1. Write the factors that depend on time of harvestings (4 points)

Note: **Satisfactory rating - 2points** **Unsatisfactory - below 2 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____2_____

Information sheet 2	Sampling crop for moisture content

2.1. Collecting crop samples for moisture contents.

2.2.1 Seed moisture content

Evaluation of seed moisture content is an extremely important determination in seed testing. Knowledge of the seed moisture content is useful because it provides information regarding the potential for harvesting, cleaning, and plant injury as well as the likely hood for successful long term storage. Seed moisture content is conducted by first weighing the seeds to determine their wet weight. Then, the seeds are placed into an oven set for 100 c^o for grass, legume, and cereal seeds for 24 hours except for large or thick coated pine seeds and oil seeds such as brassica species in which 48 hours at 85 c^o is required. After the drying period the seeds are removed from the oven, placed in a desiccator for 15 minutes to cool, and the dry weight of the seed is determined.

Two methods are used to express seed moisture content and calculated in the following ways.

Wet weight basis

$$\frac{\text{Weight befor drying – weight after drying}}{\text{Weight before drying}} \times 100 = \%\text{moisture content}$$

Dry weight basis

$$\frac{\text{Weight before drying – weight after drying}}{\text{Weight after drying}} \times 100 = \%\text{moisture content}$$

Self-Check -2	Written Test

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

1. Express two methods of seed moister content?(6 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 3	Making preparation for harvesting and preparing harvesting equipment's

. 3.1. Preparing for the harvesting operations.

In preparation for harvesting, an assessment is done of the tools and equipment required. This is done taking into account the size of the farm, the crop and/or cultivars, the period during which the harvesting must be completed, and the capacity of storing facilities, where applicable.

Once this information has been gather a decision can be made as to the number and size of picking teams, which in turn determines the equipment requirements.

In the case of mechanical harvesting such assessments will determine when a harvester should be booked, if the farmer does not own a harvester, and the number of harvesters that may be required. In addition, the numbers of back-up equipment such as tractors and trailers used for transporting harvested goods can be decided upon

Harvesting tools and equipments

Materials, tools and equipments for harvesting field crops are categorized into two:

1. Simple tools: - sickles, hoe for tuber crops and nut, picking machines and other modified tools for harvesting

2. Harvesting machines: - Combine harvester, cutters

Self-Check -3	Written Test

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

1. How to prepare harvesting operation ?(6points)
2. Write harvesting equipments?(4)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 4	Identifying the hygiene standards for the crop and paddock

4.1. Maintaining the hygiene standards for the crop and the paddocks.

Fresh fruits and vegetables are grown and harvested under a wide range of climatic and diverse geographical conditions, using various agricultural inputs and technologies, and on farms of varying sizes. Biological, chemical and physical hazards may therefore vary significantly from one type of production to another. In each primary production area, it is necessary to consider the particular agricultural practices that promote the production of safe fresh fruits and vegetables, taking into account the conditions specific to the primary production area, type of products, and methods used. Procedures associated with primary production should be conducted under good hygienic conditions and should minimize potential hazards to health due to the contamination of fresh fruits and vegetables.

ENVIRONMENTAL HYGIENE

Where possible, potential sources of contamination from the environment should be identified. In particular, primary production should not be carried out in areas where the presence of potentially harmful substances would lead to an unacceptable level of such substances in or on fresh fruits and vegetables after harvest. Where possible, growers should evaluate the previous uses of the sites (indoor and outdoor) as well as adjoining sites in order to identify potential microbial, chemical and physical hazards. The potential for other types of contamination (e.g., from agricultural chemicals, hazardous wastes, etc.) should also be considered. The evaluation process should include the following:

- Previous and present usage of the primary production area and the adjoining sites (e.g. crop grown, feed lot, animal production, hazardous waste site, sewage treatment site, mining extraction site) to identify potential microbial hazards including faecal contamination and contamination by organic waste and potential environmental hazards that could be carried to the growing site.

- The access of farm and wild animals to the site and to water sources used in primary production to identify potential faecal contamination of the soils and water and the likelihood of contaminating crop. Existing practices should be reviewed to assess the prevalence and likelihood of uncontrolled deposits of animal faeces coming into contact with crops. Considering this potential source of contamination, efforts should be made to protect fresh produce growing areas from animals. As far as possible, domestic and wild animal should be excluded from the area.

- Potential for contaminating produce fields from leaking, leaching or overflowing manure storage sites and flooding from polluted surface waters.

If previous uses cannot be identified, or the examination of the growing or adjoining sites leads to the conclusion that potential hazards exist, the sites should be analyzed for contaminants of concern. If the contaminants are at excessive levels and corrective or

preventative actions have not been taken to minimize potential hazards, the sites should not be used until correction/control measures are applied.

Self-Check -4	Written Test

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

1. Write potential sources of contamination from the environments ?(3 points)
2.

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 5	Following and completing the harvest strategy for each paddock

. 5.1. Harvesting strategy.

5.1.1. Pre-harvest grain losses and damage

Losses of seeds due to inadequate storage and other post-harvest factors at the farm, village and commercial levels have been observed, though losses in excess of 40 percent for other cereals are not un common. Deterioration of stored grain is influenced by physical (temperature, humidity), biological (microflora, arthropod, vertebrate) and technical (storage conditions, methods and duration) factors. Experience has shown that such losses are not easily reduced in the absence of well-integrated policies and plans to develop the total system of production, marketing, storage and distribution.

Food storage pests seem to have been associated with grain stores since time immemorial. Storage pests have been identified in grain stores found in the tomb of Tut'ankhamun (1345 BC) and other ancient sites (Buckland, 1981). So too, the discussion of proper grain storage techniques is not a contemporary issue. The ancient scholars Aristotle, Pliny and Vergil offered observations and recommendations of grain storage techniques, including the use of seed dressings of olive oil to kill infesting insects .

5.1. HARVEST TECHNIQUES

Modern and traditional methods of harvest technology often depend upon the scale of production. Self-propelled mechanical threshers may be found in use in all countries. However, reaping by hand-pulling of plants or cycling, stooking, shocking and stacking of straw followed by threshing, upon need of grain for food or sales, by stationary mechanical threshers or on oxen-trodden mud-packed threshing floors is common in many small-scale farming situations. On-farm storage of grain is common for smaller scale farmers, whereas direct sales to cooperative, government or private elevators are the norm for larger producers.

In all situations, grain must be harvested in a timely manner, before shattering, pre-harvest sprouting, bird damage or weathering, to minimize pre-harvest losses, yet must be dry

enough for storage. During threshing, cracking and breaking the grain should be avoided since damaged grain invites greater damage from storage moulds and insects, and reduces marketability.

Harvesting at the proper time can minimize shattering or pre-harvest sprout damage, but untimely harvests are often beyond the control of the farmer. Grain that shatters before and during harvest not only yields no return, but may cause additional expense as a volunteer crop. Pre-harvest sprouting reduces seed viability and may result in milled flour with inferior baking properties due to an excess amount of alpha-amylase that causes excessive liquefaction of dough and results in a wet and sticky crumb (Bloksma and Bushuk, 1988).

Alternately, grain may be harvested at a moisture content higher than is safe for storage, by reaping or swathing the grain and allowing it to dry in windrows, sheaves, stocks, shocks or stacked . seeds may be reaped or swathed with no loss of yield at any time after the completion of the maximum-weight phase of grain fill, which occurs when the moisture content of the kernel has declined to about 35 percent. These procedures allow seeds to dry more quickly, prevent harvest damage due to the presence of late weed growth and protect the otherwise standing grain from weathering.

Self-Check -5	**Written Test**

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

1. How to control grain harvesting loss ?(6points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 6	Maximizing the quality of seed by maintaining hygiene of all surfaces and adjusting the harvester and ancillary equipment

6.1. Maximizing the quality of the crop

The quality of the crop is maximized by maintaining the hygiene of all surfaces that come into contact with the crop. The quality of the crop also maximized by continually checking and, where necessary, adjusting the harvester and ancillary equipment, including their height and other settings.

6.2. Cleaning, sterilizing and maintaining harvest tools and equipment

Cleaning of harvesting tools refers to:

a) the removal of dirt and plant material as it becomes adhered and

b) to the removal of microscopic particles including disease organisms.

The harvested produce must not come into contact with post-harvest decaying organisms, as it will reduce the shelf life and quality of produce.

Removal of dirt, plant material etc. from tools and equipment prolongs the lifespan of tools.

Sterilization is the elimination of all transmissible agents (such as bacteria, fungi and viruses) from a piece of equipment. Sterilization of tools and equipment can be done before, during and after the harvest process.

3.1. Operating harvesting machinery and ancillary equipment

Good safety habits are vital for anyone who operates a combine, corn picker or other grain-harvesting machine. Failure to observe safety practices can be fatal!However, constant alertness is also necessary to prevent machinery accidents—accidents that often happen in spite of machinery that is designed for safety.

Machinery operators are not in top physical or emotional condition when they are tired, ill, worried, angry, or have their minds on something else. Accidents are most likely to happen under these conditions.

The combine operator is responsible not only for his safety but also for the safety of others who may be working on or just be near the machine. The operator must be aware of hazards and remain alert to situations that are potentially dangerous. This includes preoperational checks, starting, transporting, towing, operating, field repair and maintenance and stopping the combine..

Self-Check -6	Written Test

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

1. How to increase the quality of seeds ?(5 points)

Note: **Satisfactory rating – 2.5points** **Unsatisfactory - below 2.5points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Information sheet 7	Completing harvesting operation

7.1. Cleaning equipments

Cleaning in a working environment involves removing dirt, grime, scraps and grease from all surfaces, equipment, utensils, crockery, etc. This is considered an important part of a professional kitchen, and wherever else food is prepared for sale and consumption. The level of cleaning activity in a kitchen will depend on trading turnover and the size and layout of the kitchen. Cleaning is important not only from an appearance point of view, but also in the interests of hygiene to reduce the chances of bacterial growth and cross-contamination.

All surfaces of harvesters and any equipment that comes into contact with the crop should be cleaned, using one of the following methods: compressed air, water wash, vacuum and water, and/or brush.

There are some basic principles which are common to all equipment. These include:

- Ensure power is turned off and power cords are disconnected
- Gas equipment should have the gas turned off and
- The pilot lights extinguished correct chemicals should be used
- Protective clothing, gloves, goggles, and otherequipment should be used
- Ventilation should be provided
- Stainless steel surfaces should not be cleaned withscourers.

Self-Check -7	Written Test

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

1. Write conmen principles to clean equipments ?(6 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Operation Sheet 1	Determining the Moisture

1Determining the Moisture content of malt barley seed from a seed lot.

OBJECTIVES:-

To enable students know the concept of moisture in the seed

Materials required:-

- 100 gram of barley seed for a group
- 10 small paper ba**gs**
- Oven dry equipmen
- Sensitive balance
- Dessicator

Procedures:-

1. Collecting sample seed (free of impurities) and seed packets.
2. Weighing 100 gram of barley seed in each packet
3. Labeling the necessary information on the packet such as, crop name, group No., date,
4. Adjust the temperature of the oven dry to 100^{o} C
5. Adjust the time to 24 hours so that the oven dry stops automatically when the time is full.
6. After 24 hours take it out from the oven and put it in the Desiccator for 15 – 30 minutes to cool it.
7. Then weigh the dried sample
8. Calculate the % moisture content in dry and wet methods

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions:

1. If the dry weight of a seed is 200 gram and the weight after oven dry becomes 90 gram calculate the percentage moisture content in wet method and dry method. Show the steps

Instruction Sheet	Learning Guide # 60

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

- Implement post-harvest treatments according to the requirement
- Grade, package and label seed according to the marketing plan and enterprise work procedures.
- Select and apply *post-harvest treatments* according to harvested produce requirements, the enterprise integrated pest management strategy and the marketing plan.

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

- Implementing post-harvest treatments
- Grading, packaging and labeling seed
- Selecting and applying post-harvest treatments

Learning Instructions:

19 Read the specific objectives of this Learning Guide.

20 Follow the instructions described below 3 to 6.

21 Read the information written in the information “Sheet 1, Sheet 2,”.

22 Accomplish the “Self-check 1,” **in page -18, and 72,** respectively.

23 If you earned a satisfactory evaluation from the “Self-check1” proceed to “Operation Sheet 1, Operation Sheet 2 and ” **in page -16,and 19.**

24 Do the “LAP test” .

Information sheet 1	Implementing post-harvest treatments

1.1. Implementing post-harvest treatments.

1.1.1. **STORAGE**

Seed is 'in storage' from the time it reaches physiological maturity on the parent plant until it is planted by the farmer. Germination is highest at physiological maturity, and viability then declines inexorably until the seed dies. Deterioration of seed viability cannot be reversed once it has occurred. Good storage cannot improve the quality of poor seed; therefore, only seed with high germination and high vigor should be put into storage. Storage conditions should then be as favorable as possible to maintain quality. Un favorable conditions at any time during storage may reduce or destroy viability.

Seed should be harvested when it reaches harvest maturity, dried to a safe moisture content (if necessary), stored under favorable conditions and protected from damage and pests until it can be planted

Conditions that cause the loss of seed viability in storage include:

- Immature or damaged seed cannot survive long storage periods. Seed should be harvested when properly matured;

- mechanical injury to seed during harvest or handling makes it more susceptible to deterioration in storage;
- Seed should be properly dried before going into storage and protected from moisture and high relative humidity. Fungi (*Aspergillus* and *Penicillium*) cause damage to stored seed if seed moisture is high;
- High storage temperature has a damaging effect on seed. Stores should be designed so that low temperatures are maintained;
- some seed treatments cause seed to die if it is stored too long; therefore, seed should only be treated when it is certain that it will be sold for planting;
- Rodents, mainly rats and mice, can be most destructive to seed. Effective rodent control (traps and poison) is essential in all seed stores. A complete programme of exclusion, sanitation and control should be used;
- Insects should be controlled by a combination of insecticides and fumigants. Use safest fumigants (e.g. phostoxin) because some fumigants (e.g. methyl bromide) will reduce germination.

Keeping the seed as dry and cool as possible in clean stores is the best management practice. If seed is dry and cool, physiological processes, fungal activity and insect activity are low. Select a seed storage site that is cool and dry (low relative humidity). the problem associated with storage under tropical conditions. seed is storable for medium to long periods if kept under safe storage conditions. For, high seed moisture (above 11 to 12 percent) is the most damaging, and seed must be kept as dry as possible in storage. The response of seed to high atmospheric humidity (RH) in storage varies with temperature. that

at 25°C and 75 percent RH the equilibrium moisture content for wheat is 15 percent, and at 90 percent RH this may increase to 19.7%. it is also stated that the critical moisture content that increases the rate of respiration is 14.6 percent. In general, stored seed should be kept at moisture content levels below 12 percent and relative humidity should not exceed 50 to 60 percent.

in cereals there are more than 20 different species of storage pests of which grain borer (*Rhyzopertha*) and weevils (*Sitophilus*) occur most frequently. Some insects, such as the khapra beetle (*Trogoderma granarium*), are quarantine pests in some countries. In India, it is reported that the rice weevil (*S. oryzae*), lesser grain borer (*R. dominica*), khapra beetle and flour beetle (*Tribolium castaneum*) are important seed storage pest

Self-Check -1	**Written Test**

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

1. What is seed storage ?(3 points)

2. Write cause the loss of seed viability in storage?(5points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 2	Grading, packaging and labeling seed

1.1 .Threshing the harvested crop

During harvesting and threshing of sowing seeds follow the following procedures:-

1. Harvest and thresh the seed plot before harvesting the main crop.
2. Clean the thresher and threshing floor properly before threshing the seed crop.
3. After threshing, clean the seed with a winnowing basket and remove small and cut seeds with the help of a sieve.
4. Dry the seed to a safe seed-moisture level.

1.2 .Grading of the produce

Uniform grading is necessary for fair trading of crop produce. A producer can obtain a high price for his or her commodity if it is of superior quality. Factors upon which grades are based determine the quality or market value for purpose for which the particular grain is generally used.

1.3 Packing seeds

The produce has to be appropriately packed (in container or wrapping) for ease of sale, protection from damage or contamination, to facilitate transportation, and other factors. Some grain producers transport their produce directly to the elevator or consumer in trunks without any packing.

1.4 Seed Labeling

Place labels inside and outside the storage container, especially when lots of different types of seeds will be stored. The following should be included in the label:

(1) Name of seed: - hybrid name, lot number, origin, size, kind of crop

(2) Date of harvesting

(3) Date of storage

(4) Date of germination test was conducted; and,

(5) Percentage germination. If necessary, the characteristics of the plant and the seed should also be included.

6) Purity percentage including inert matter, noxious weeds per kg, weeds seed and other crops

Self-Check -2	Written Test

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

1. What is grading and packing means?(3 points)

2. Write the label information that to written on the container?(3points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

2_____

Information sheet 3	Selecting and applying post-harvest treatments

Use of insecticides

a. Building Treatment:-Empty buildings, containers and sacks should be cleaned and treated with chemicals to kill eggs, larvae and adults that may be hiding in crevices and cracks.

b. Fumigation :- Providing that the granary or storage bins are reasonably air tight, on farm fumigation of grains may be carried out using a 1:1 mixture of ethylene dichloride and carbon tetra chloride.

Disinfesting the storage system

Other treatment methods

Controlled or modified atmosphere (CA) refers to the process of altering the proportion of atmospheric gases oxygen, nitrogen and carbon dioxide (CO2) to produce a gas mixture toxic to insects. The advantage of the CA technique is that it provides disinfestations method that is chemical-free and suitable for ´organic´ grain, but it is expensive.

Self-Check -3	Written Test

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

1. Write post harvest treatment methods ?(6 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

Operation Sheet 1	1. Field visit at Ethiopian seed Enterprise (ESP) farm site and seed sieving enterprise

OBJECTIVES

To enable the students get awareness on, seed multiplication procedures, farming equipments and machineries and sieving machines, how to store and grade seeds, distribution of seeds……etc

Materials required:- Transport bus

Procedures:-

- Programming the trip schedule with the seed enterprise and creating awareness to students.
- Visiting in around area Seed multiplication farm Seeing practical seed multiplication process in field

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions:

- Kofele seed sieving, grading and distribution center, seeing practical seed multiplication process in laboratory and sieving and grading machine at work. /Duration two days/