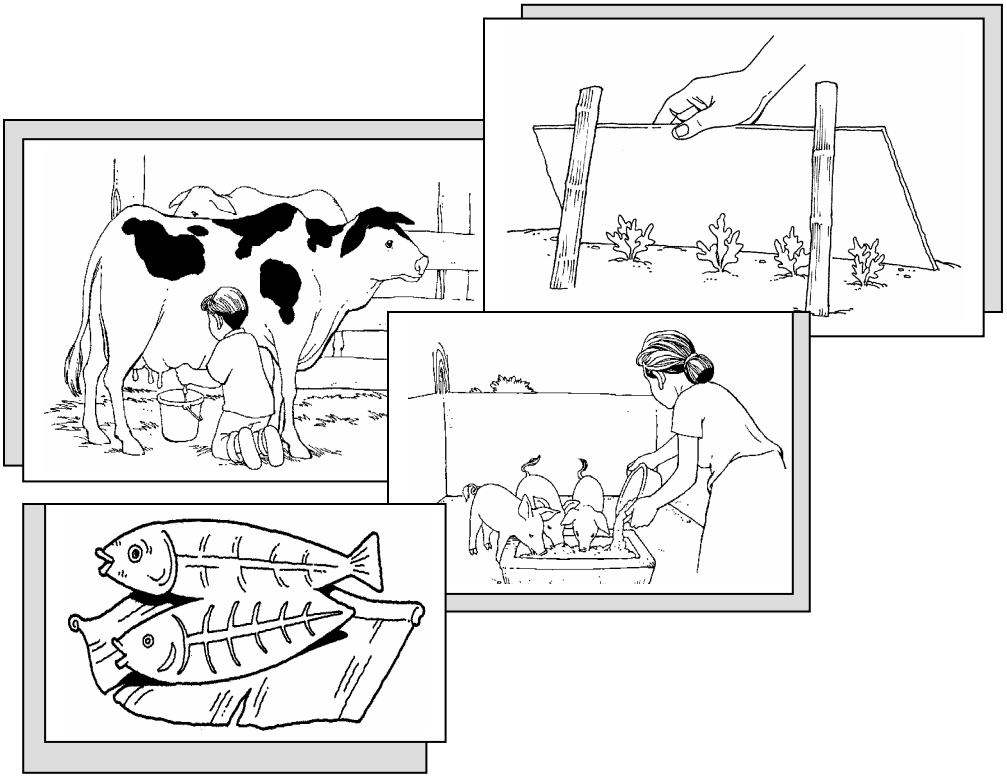
PROJECT EASE

Effective and Affordable Secondary Education

TECHNOLOGY AND LIVELIHOOD EDUCATION

Agriculture and Fishery Arts



MODULE 2

BUREAU OF SECONDARY EDUCATION

Department of Education
DepEd Complex, Meralco Avenue
Pasig City

Plant Production
First Year

Module 2
Happy, Joyful, Growing Soil

What this module is about

Hello, dear student! Did you enjoy reading module 1? Do you want to find out what is the next important step in crop production? Of course, you should know how soil is thoroughly prepared so plants will grow abundantly.

Like the human body, soil needs proper nourishment so planted crops will grow fast, healthy, and productive. Now, look at your backyard. Do you have vacant spaces for planting vegetables? Is your soil healthy or unhealthy? Are there weeds or trees growing? Is it really an ideal place for plants to grow?

Soil has minerals and nutrients for plants to absorb. Hence, it should be free from weeds to grow healthy. These soil nutrients are only available to plants if the soil is porous enough and plant roots could deeply reach it. Now, are you ready to prepare your soil for your favorite crops to grow? So, what are you waiting for? Continue reading this module.

What to learn from this module

After studying this lesson, you should be able to:

1. explain the importance of soil preparation;
2. discuss the proper methods of preparing the soil for planting;
3. relate each method of soil preparation appropriate for a particular crop and season; and
4. prepare soil for planting using appropriate farm tools and equipment.

PRETEST

Choose only the letter of the correct answer.

1. One of the advantages of land preparation is to
    a. test the soil
    b. promote good harvest
    c. have a fruitful planting
    d. promote good soil condition

2. If the growth of disease causing organisms is not controlled this will
    a. provide aeration of the soil
    b. help the plants to grow healthy
    c. serves as a fertilizer to the plants
    d. create a problem to crops most of the time

3. When the water moves downward to the soil, this promotes development of
    a. fruits
    b. new shoots
    c. plants to grow
    d. roots in plant deeper

4. When the land is harrowed thoroughly, it could also destroy
    a. weeds
    b. soil nutrients
    c. microorganisms
    d. insect pests

5. After putting fertilizer in the soil and levelling it, the next method of preparing the soil is
    a. harrowing
    b. watering
    c. putting markers
    d. measuring seedbed

6. Primary tillage or plowing is done by
    a. digging the soil manually
    b. using a shovel to dig the soil
    c. using a power tiller hitched to cow or carabao
    d. using a spading fork to till the soil

7. A tool used for clearing or removing weeds is
    a. ax
    b. fork
    c. knife
    d. hoe

8. A tool which is used for tilling thick soil is
    a. grab hoe
    b. trowel
    c. shovel
    d. rake

9. A tractor is an example of equipment required in
    a. chemical technology
    b. mechanical power technology

c. animal-draft technology
d. manual technology

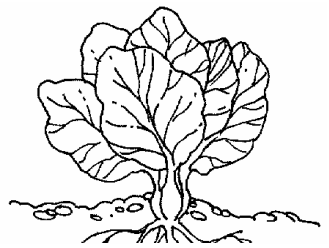
10. To plant vegetable fruit for a particular season like sweet pepper, one should follow these steps, except one.
    a. Select a well-drained clay wet soil.
    b. Plow and harrow the land area.
    c. Know the medicinal value of the plant.
    d. Water the seedbed thoroughly.

Lesson 1

Importance of Soil Preparation

Were you able to experience planting root crops such as sweet potato, cassava, ube, carrots, or radish wherein its storage roots were not fully developed as expected? Have you seen leafy vegetables such as pechay and mustard whose leaf petioles turn violet and became stunted? What about the eggplants and pepper whose fruits were too small compared to those you have seen in your local market? Do you know the causes why it happened? Surely, it is because of poor soil preparation.

Remember that soil is an important medium in crop production because mineral elements are deposited into the soil and absorbed by plant roots. These elements are called **soil nutrients**. These nutrients are absorbed by the roots and transported to the different parts of the plant to develop flowers, fresh leaves, new shoots and fruits. It is therefore advisable to prepare the soil thoroughly, so that plants could maximize its use.



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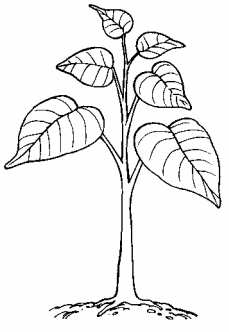


Activity 1

Answer these questions:

1. Which of the following plants reached the depth of 3 m beneath the soil surface?
2. Which of the illustrated plants has the ability to penetrate only a shallow part of the soil?
3. Which plant needs more thorough and deep land preparation? Why?

Why is it important to prepare the land thoroughly before planting?

1. **To promote good soil condition**. Soil must be tilled to a depth of about 10 to 12 inches if planting vegetable and ornamental plants. Before working the soil, spread organic materials such as compost or manure one to four inches thick. This will improve the condition of the soil that is beneficial to plants.

   Remember to work on the soil when it is not too wet nor too dry. How do you do this? Pick up a clump of soil and roll it into a ball. If the ball is sticky, it is too wet to work. Wait a few days until it dries out a bit more. If the soil is too fine or dry to roll into a ball, water the area evenly and wait a day or two. If your garden area has never been worked before, remove all humps, rocks, and weeds either mechanically or manually.

2. **To control the growth of weeds**. When soil is being tilled, weeds growing in the area are disturbed. Their roots are exposed to sunlight and may die. If deep tillage is done, there will be a significant reduction in the growth of weeds.
3. **To control the growth of disease causing organisms present in the soil**. Nematodes and other microorganisms present in the soil are exposed to adverse climatic condition when soil is plowed. These microorganisms create a problem to crops most of the time if not controlled. By working thoroughly the soil, it will prevent the attack of disease causing organisms to plants in a natural way
4. **To improve the water holding capacity**. A well-prepared soil prior to planting has its great advantage. Aside from the fact that it is easy to work on soil, surface may be well-drained yet able to retain moisture as it is needed. This becomes very productive.
5. **To promote soil aeration**. Plant roots need oxygen underneath. When soil is well-prepared, this promotes soil aeration. This is very evident when plants are cultivated in the garden. After the practice, plants respond by forming new shoots, a result of oxygen passing through the particles of the soil where the roots of the plants are benefited.
6. **To take advantage of the soil nutrients present in the soil**. Soil nutrients under subsurface should be absorbed by the plant roots. This is especially true to those plants which are deeply rooted, like tomatoes, pepper, okra, trees, shrubs and others. When soil is not properly tilled, only a particular portion of the soil surface is useful to plants thereby nutrients present underneath become useless.
7. **To allow water to move downward**. If soil is loose because of thorough preparation water could easily pass through it. This promotes the development of roots in plant deeper, taking advantage of the soil nutrients present.

 Self check:

Choose the letter of the correct answer.

I. Soil must be tilled thoroughly before planting in order to
   a. block the entrance of oxygen to the soil
   b. increase the growth of weeds
   c. allow soil to become clayey
   d. improve soil condition

2. Nematodes and microorganisms present in the soil are killed when
   a. applied with fungicides
   b. water is plenty in the garden
   c. garden is planted with munggo
   d. exposed to adverse soil condition when soil is plowed

3. A well-prepared soil prior to planting has the capacity to
   a. retain moisture
   b. save more nutrients

c. allow soil to become compact
d. help insect pests harbor the area

4. A garden site that is well-prepared will promote soil aeration, meaning
    a. cultivation becomes easy
    b. potassium becomes abundant
    c. oxygen passes through the soil
    d. nitrogen evaporates from the soil

5. A well-tilled soil will allow water to easily pass through underneath, this is advantageous to
    a. vegetable plants
    b. deeply rooted plants
    c. flowering plants
    d. climbing plants

Lesson 2

Proper Method of Preparing the Soil for Planting

Suppose you are given an area to prepare for crop production, what are the things you should do to gain a successful project later on. Are you aware of it?

Here are some questions which will guide you in starting the project.

1. What kind of soil do you have? Is it wet or dry?
2. What type of crops do you want to plant?
3. Is it appropriate to the soil condition that you have?

This lesson will help you answer the questions above.

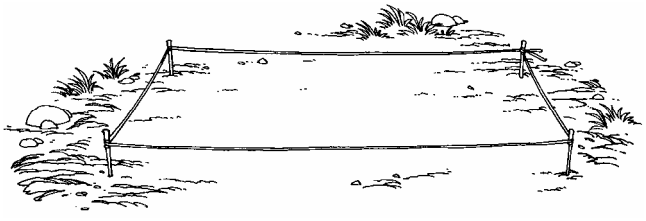
Lowland or low soil needs to be well-prepared. This means that the soil surface is weed-free, porous, and levelled to make planting easier. Proper soil preparation serves to level the field for uniform distribution of irrigation water, fertilizer, and pesticides. It also prevents or minimizes water to overflow from the land area.

Land or soil preparation may be divided into two stages:

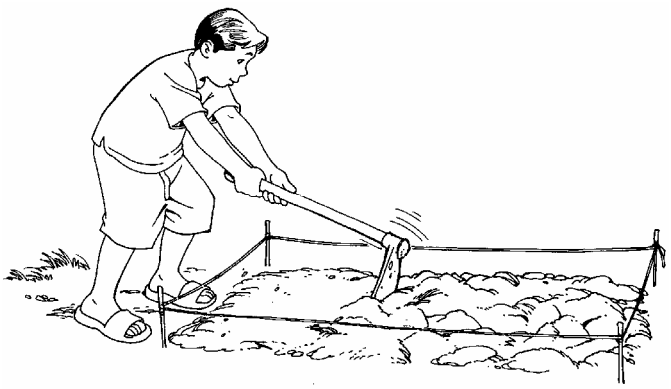
1. Primary tillage or plowing - this is the process of breaking up the soil. It can be accomplished by using a power tiller or moldboard plow hitched to a carabao or in some areas, they use cow as substitute.
2. Harrowing - the easiest way to harrow a field is leaving just enough water in the field to expose the high and low spots. But in some areas, it uses a native spike-toothed wooden harrow commonly drawn by an animal like plowing. This farm implement is good for bringing clods of soil to the surface and is effective in breaking soil into smaller bits. It could also destroy weeds at the same time.

However, if you are planning to start a garden in your school or backyard, here are simple ways to follow on how to prepare the soil before planting.

1. Remove all the unimportant things that can stop the growth of your crops or plants. This might be tree branches that can hinder sunlight, humps, and rocks.

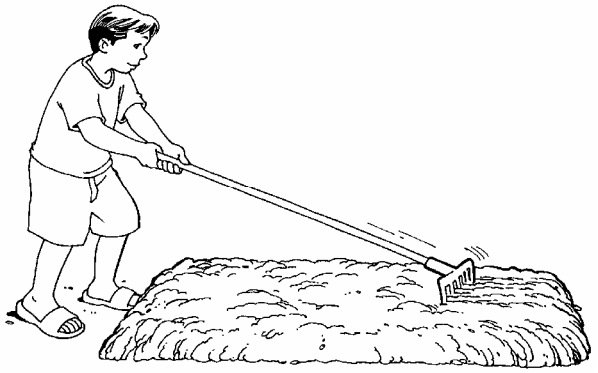


2. Measure and place 4 markers to have a bed soil for planting.
3. Tie the 4 markers together to encircle the bed or area for planting.
4. Using a grab hoe or a fork tip hoe, dig or till the soil properly. Pulverized it by using a fork.



5. Place fertilizer on top of the soil. If it is compost, incorporate it well through harrowing or pulverizing.

6. Use a rake in levelling the soil. Water the prepared bed soil.



7. Repeat the same procedure if the area is big enough for other crops to be planted.

Remember that the number of your prepared bed soil depends on the wideness of the space you have for planting. A one foot distance between beds is enough for you to move freely and comfortably while working in your area. See to it that there is right water canal around each bed soil for it helps the plants grow fast and healthy.

Self-check:

Arrange the steps below in preparing the soil for planting in proper order. Use numbers 1-5.

_____ 1. Put 4 markers to form a bed soil.

_____ 2. Level the soil and water it.

_____ 3. Place organic fertilizers on the soil.

_____ 4. Remove unimportant materials in the planting area.

_____ 5. Dig or till the soil properly.

Lesson 3

Tools and Equipment Used in Preparing the Soil

Some garden tools were already mentioned in lesson 2. In this lesson other tools and equipment used in preparing the land will be fully discussed. This will guide you on what tools are appropriate to use in soil preparation.

Remember that it would be best and convenient to plant if you use the right tool. Sometimes, farm tools are easily worn out because they have been used inappropriately by users. If the needed tools are not available, you can use substitutes if you are resourceful by converting recycled materials for the purpose. For example, an old spoon or ladle can substitute the hand trowel. Just flatten it with a hammer and presto! It will serve the purpose. If you are blessed enough with complete tools and equipment in farming, be sure to protect it so that it will last long.

In developing countries like ours, traditionally, planting is done by using animal-drawn system wherein a plow or harrow is attached to a carabao in working the area. This is only ideal to small farmers where labor is cheap. However, as time passes, system of land technology is improved too. There are modern machines that can be used to produce good quality products. With the modern farm machines, planting becomes easy however, this does not replace the manual technique of planting.

Here are some of the common tools and equipment used in preparing the soil.

A. **Hand tools** - These are different tools used for clearing and tilling the soil.

1. Knives - These are available in different designs, weights and sizes. Heavy knives are used for clearing, removing or cutting succulent weeds. Curved knives are used for cutting grasses.
2. Grab hoe - This is used for tilling thick soil.
3. Fork tip hoe - This is used for rocky and hard soil.
4. Spading fork - This is used for a desired deep tilling of the soil.
5. Trowel - This is used for transferring seedlings, loosening the soil and planting trees.
6. Ax - This is used for cutting big branches of trees.
7. Shovel - This is used for digging canal along bed soil and clearing grasses too.

B. **Animal - Draft Technology**

Here, vegetable planting or farming is done with the use of animals like carabaos, buffalos, cattle, and horses. Before plowing the soil, see to it that the farm is free from weeds and debris. You can do this by using a spike tooth harrow which is entirely made of hardwood but there are those made of metals. The harrow is pulled by the animal and passed over the field several times until the weeds are removed from the roots.

Moreover, in tilling the soil, moldboard plow is used. Here the soil clods are broken. However, this method is time consuming.

C. **Mechanical Power Technology**

The tractor is one of the most important equipment required in mechanical power technology. It is available in different sizes and capabilities. The smallest tractors are usually two-wheel in design and are commonly used for tilling the soil. If it is steady, the tractor's power take off device can be connected to a water pump or a power generator. When attached to a trailer, the tractor can save the transport needs in the farm.

Which do you think is the best way in putting up your garden?

 Self-check:

Identify the farm tool described in each statement.

_____ 1. These tools have different designs, weights, and sizes which are used for clearing weeds.

_____ 2. It is pulled by the animal and passed over the field several times until the weeds are removed.

_____ 3. It is used for tilling thick soil.

_____ 4. It is used for making canal along bed soil.

_____ 5. It is used for cutting branches of trees.

Lesson 4

Method of Soil Preparation Appropriate for a Particular Crop and Season

You have already learned how to start a garden, to prepare the soil and its importance and proper tools in planting. I am sure you are now ready to plant your desired crops or vegetables.

This lesson will provide you the important ways of soil preparation appropriate in a particular crop and season.

Let us take for example the sweet pepper. This crop is important to our body because it contains vitamins A and C. It can be a money-maker for it is in demand at home and in pizza restaurants where sweet pepper is used as condiments. Do you want to try planting this in your available planting area? Here are the proper steps to produce good quality sweet pepper.

1. Select a well-drained sandy dry to clay wet soil.
2. Plow and harrow the land area 2 to 3 times until the soil is well-pulverized.
3. Set furrows at 0.75 cm to 1 metre apart.
4. Start planting the seeds or seedlings.
5. Water the seedbed thoroughly.

Can you now grow sweet pepper and be a top producer of this in famous pizza restaurants? Do you want another example of vegetable that you can produce in your area? Aside from sweet pepper, what other vegetable is profitable and is used in several food establishments. This is most seen as seasoning in soup, lomi, mami, congee or goto. This spice crop is used in salads and vegetable dishes. It has medicinal value to correct physiological disorders such as cough, obesity, insomnia, hemorrhoids, constipation, and menstrual discomfort. Do you have an idea what is this vegetable? Yes, it is the bunching onion. Here is how to plant it.

1. Prepare the land by plowing and harrowing. It requires 1 to 2 times depending on the condition of the soil. You may apply animal manure prior to bed preparation.
2. Raise beds up to 50 - 100 cm apart but if the soil is well-drained, these are not necessary.
3. Trim top portion of the leaves prior to transplanting to reduce transpiration and increase plant survival.
4. Transplant in seedbeds at a distance of 10 cm × 15 cm. Use markers to provide proper spacing and to facilitate transplanting. Dibbles may be used to make holes. Plant deep enough. Care must be taken so as not to damage the basal portion of the plant.
5. Press the soil lightly around the basal portion. Make sure that the roots are in full contact with the soil.
6. Irrigate the field before and after transplanting.

Another popular vegetable among root crops is radish. It can be grown on silt loam or sandy loam type of soil that is friable, well-drained and rich in organic matter.

Here is how it is planted.

1. Plow the soil 2-3 times at 30-40 cm deep and harrow to obtain a fine tilth.
2. Construct a seedbed 1 metre wide and 10-15 cm high.
3. Make thin shallow on the bed at about 25 cm apart and 2 cm deep.
4. Plant the seeds either broadcast or drill. When drill method is preferred:
   a. Drill the seeds thinly 12.14 cm deep in furrows of 20-25 cm apart.
   b. Cover the seeds thinly with fine soil.
   c. Thin the seedlings at 10 cm apart as soon as they developed true leaves.

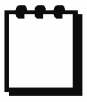
   If broadcasting method is used:
   a. Broadcast the seed directly into the soil.
   b. Cover with thin layer of soil afterwards.
   c. As soon as the plants developed true leaves, thin out and transplant them at 1.5 cm deep and 20 × 25 cm planting distances.

Now that you are through with bunching onion, radish and sweet pepper, is it not exciting to plant other vegetable crops with economic value? There are more to learn while you are going through other modules.

 Self-check:

Check (✔) if the statement is a method of soil preparation and cross (✘), if it is not included.

_____ 1. In planting sweet pepper, plow and harrow the land 2-3 times.
_____ 2. Start planting the seeds or seedlings.
_____ 3. Put fertilizer, 10-15 grams.
_____ 4. Check the vitamin content of the crop.
_____ 5. Know the medicinal value of the crop.
_____ 6. Construct a seedbed.
_____ 7. Cover the roots with thin layer of soil.
_____ 8. Irrigate the planting area.
_____ 9. Trim top portion of the leaves.
_____ 10. Press the soil lightly around the base of the plant.

 LET'S SUMMARIZE

- Soil preparation promotes good soil condition; prevents the growth of disease causing organisms; improves the water holding capacity of the soil; and promotes soil aeration.
- Following are the proper methods of preparing the soil:
  a. Plowing and harrowing
  b. Removing less important objects in the planting area.
  c. Measuring and marking the soil.

d. Digging the hole for planting.
e. Applying fertilizer to the soil.
f. Levelling and watering the soil.

- Hand tools are tools used for clearing and tilling the soil such as knife, hoe, fork, trowel, ax, and shovel.
- Animal-draft technology uses animals such as cows and carabaos in farming.

POSTTEST

Choose the letter of the correct answer.

1. In order to promote good soil condition, the soil must be
    a. watered thoroughly
    b. tilled thoroughly
    c. weed out thoroughly
    d. sterilized thoroughly

2. Which of the following creates a problem most of the time when soil is not thoroughly prepared?
    a. caterpillars
    b. flood
    c. maggots
    d. microorganisms

3. When the water moves downward to the soil, this promotes
    a. the development of fruits
    b. the development of new shoots
    c. the development of plants to grow
    d. the development of roots in plant deeper

4. When the land is harrowed thoroughly, it could also destroy
    a. weeds
    b. soil nutrients
    c. microorganisms
    d. insect pests

5. After putting fertilizers in the soil and levelling it, the next method of preparing the soil is
    a. harrowing
    b. watering
    c. putting markers
    d. measuring the seedbed

6. Primary tillage or plowing is done by
    a. digging the soil manually

b. using a shovel to dig the soil
c. using a power tiller hitched to cow or carabao
d. using a fork to pulverize the soil

7. A tool used for clearing or removing weeds is
    a. ax
    b. fork
    c. knife
    d. hoe

8. A grab hoe is used for
    a. digging canal
    b. tilling thick soil
    c. watering the land area
    d. drilling holes for planting

9. Which of the following tools and equipment is an example of a mechanical power technology?
    a. ax
    b. hoe
    c. shovel
    d. tractor

10. To plant vegetable fruit for a particular season like sweet pepper, one should follow these steps, except one.
    a. Select a well-drained clay wet soil.
    b. Plow and harrow the land area.
    c. Know the medicinal value of the plant.
    d. Water the seedbed thoroughly.

ANSWER KEY

Pretest

1. d
2. d
3. d
4. a
5. c
7. c
8. c
9. a
10. b
11. c

Lesson 1: Self-check

1. d
2. d
3. a
4. c
5. b

Lesson 1: Self-check

1. d
2. d
3. a
4. c
5. b

Lesson 2: Self-check

1. 2
2. 5
3. 4
4. 1
5. 3

Lesson 3: Self-check

1. knives
2. harrow
3. grab hoe
4. shovel
5. ax

Lesson 4: Self-check

1. ✔
2. ✔
3. ✔
4. ✘
5. ✘
6. ✔
7. ✔
8. ✔
9. ✘
10. ✔

Posttest

1. b
2. d
3. d
4. a
5. b
6. c
7. c
8. b
9. d
10. c