CHAPTER 3

OBJECTIVES

At the end of this chapter, students should be able to:

â—† explain the meaning of drainage.

â—† list importance of drainage.

â—† list various types of drainage.

â—† describe the various types with their advantages and disadvantages.

3.1 Introduction

Drainage is an important operation required in soils that have high water table, or where excess water cannot percolate easily to the root zone of the crop. When soil is saturated with water, soil air is expelled and this affects the respiration of plants. Waterlog also encourages loss of soil nutrients through leaching. Drainage improves the aeration of the soil and encourages the activities of aerobic soil organisms and return waterlogged soil to normal conditions.

3.2 Meaning of Drainage

Drainage is the artificial removal of excess water from a marshy or waterlogged farmland in order to create a good environment for optimal crop growth. It is a way of allowing crops to have unhindered access to soil air.

3.3 Importance of Drainage

It improves soil aeration which is essential for proper plant root growth and development.

â It creates favourable conditions for the optimum development of beneficial soil organisms.

â It results in increased crop yield and improved quality of the crop.

â It improves nutrients uptake by crops.

â Root development is increased as there is no interruption of root growth by excess water.

â It permits the use of flexible crop rotation and better soil management practices.

â It lowers the specific heat of the soil.

â Seed germination is enhanced.

â It makes cultivation easy.

â Toxicity of plants can be prevented.

â The decomposition of plant and animal residues is increased.

â It reduces soil acidity.

â It improves soil structure and enhances water infiltration into the soil

3.4 Types of Drainage

There are two main types of drainage

1. Surface or channel drainage

2. Subsurface or underground drainage

3.4.1 Surface or channel drainage

This is the removal of excess water from the surface of the land through one of the following:

1. Open ditches or channels

2. Lateral ditches or field drains

Drainage channels are constructed to dispose off excess water. The floor and sides of the channels are made of concrete and should slope very gently away from the farm.

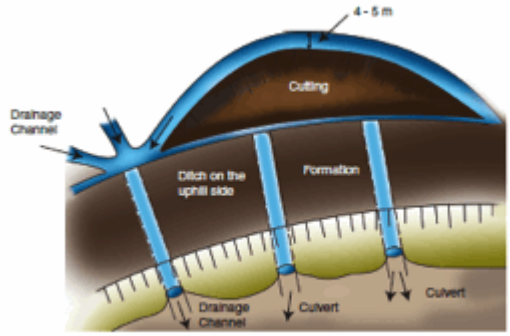

FIGURE 3.1 Drainage channels or ditches

3.4.1.1 Advantages of surface drainage

â It takes relatively less time to remove all the excess water from the field.

â It is easy to construct and maintain.

â It is comparatively cheaper to construct than the underground system.

â It can be constructed with simple farm tools such as hoes, spade and shovel.

â It can be practised where soil is light impermeable, shallow and where low value crops are grown.

3.4.1.2 Disadvantages of surface drainage

â It occupies land which should have been cropped.

â It obstructs and disturbs the movement of farm machinery.

â Drainage channels can provide shelter for rodents and other pests of crops.

â It is easily silted up if not well maintained.

â It encourages soil erosion.

3.4.2 Sub-surface or underground drainage

This is the removal of excess water from the farmland artificially through a network of tiles or pipes laid below the surface of the soil. Water seeps into the tiles as the soil around the tiles gets saturated and eventually flows out through an outlet where it is discharged.

3.4.2.1 Advantages of underground or subsurface drainage

â It is more efficient than the channel drainage system.

â It does not obstruct movement of machines and farmers.

â It prevents build-up of surface run-off.

â More land area is available for cultivation as no land area is used for erecting ditches and surface water channels.

â High-value crops are grown

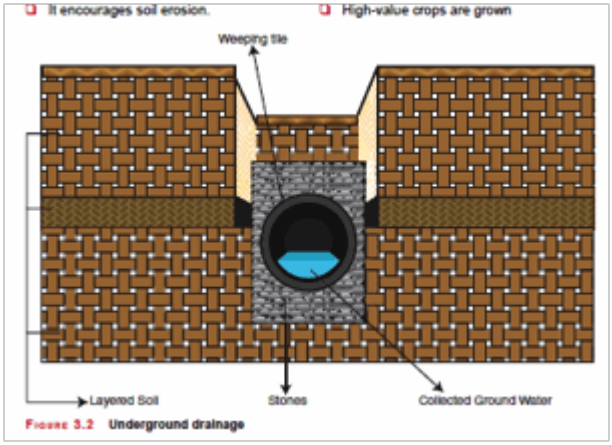

Figure 3.2 Underground drainage

3.4.2.2 Disadvantages of underground or subsurface drainage

â Underground drainage system is expensive to construct, repair and maintain.
â Construction and maintenance require experienced engineers.
â Roots of big trees can break the tiles (especially clay tiles) and render the system inefficient.
â It can be used only in very permeable soils.

3.5 Problems of Drainage

The following problems are associated with drainage construction, repairs and maintenance.
â High cost of establishment and maintenance.
â Reduction in the size of farmland.
â The reservoir where water is stored can act as breeding ground for pests.
â Acidity may increase around the reservoir.

Activity

Locate a waterlogged area in your locality or within the school premises and demonstrate the various drainage systems by constructing an open channel to allow the water flow out of the area.

SUMMARY

â—† Drainage is defined as the removal of excess water from marshy or waterlogged farmland artificially.
â—† Drainage is an essential operation to create a favourable or conducive environment for the growth of plants.
âœ§ The two main drainage systems:
1. Surface or channel drainage
2. Underground or sub-surface drainage

The advantages of soil drainage:

âœ§ It prevents water logging.
âœ§ It improves soil aeration.
âœ§ It enhances the rate of seed germination.
âœ§ It decreases soil erosion.
âœ§ It prevents toxicity to plants.

The problems associated with drainage construction:

âœ§ High cost of establishment
âœ§ It reduces the size of farmland and may obstruct the movement of farm machines
âœ§ It cannot be practised in all farmlands especially where water table is very high

REVISION QUESTIONS

Essays

1. (a) Explain the term surface drainage.

(b) List three advantages and three disadvantages of surface drainage.

2. Name two types of drainage and describe each type with their advantages and disadvantages.

3. (a) Give two reasons why surface drainage is often necessary in crop production.

(b) List four importance of drainage.

4. Describe in detail the surface and underground drainage systems.

5. Define drainage and state why it improves the productivity of waterlogged soils.

Objective Questions

1. Drainage refers to

(a) the removal of excess water from soil.

(b) the removal of nutrients from the soil.

(c) the addition of water to the soil.

(d) the protection of soil from erosion.

2. Which of the following statements is not an advantage of drainage?

(a) It removes excess water.

(b) It supplies moisture for plant growth.

(c) It reclaims waterlogged land and swamps.

(d) It improves soil structure.

3. Farm drainage does not lead to

(a) improvement in soil structure.

(b) improvement of soil temperature.

(c) increased soil aeration.

(d) reduction of soil alkalinity.

4. When soils are poorly drained

(a) they dry up easily.

(b) they form hardpans.

(c) the air content of the soil is reduced.

(d) the rate of decomposition is accelerated.

5. Which of the following is not an effect of water-logging on crop production?

(a) It inhibits plant development.

(b) It encourages leaching.

(c) It inhibits the activities of microorganisms in the soil.

(d) It causes plant roots to wilt.

6. Drainage types include the following except

(a) shadoof.

(b) channel.

(c) surface.

(d) underground.

7. Most crop plants do not survive in waterlogged soils because

(a) the dissolved nutrients are too diluted for crop plants.

(b) the plants will not photosynthesise.

(c) oxygen has been displaced leading to its deficiency for crops.

(d) their leaves are turgid for respiration

ANSWERS

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