DRAINAGE

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Concept of Drainage

Adequate water is essential for crop plant but the excess water is harmful for crops. So, as the irrigation is needed to meet the water requirement, the excess water should also drain out immediately. **The artificial removal of excess water from crop field is called drainage**.

The following are the detrimental effect of excess water –

- ✓ Excess water hampers the crop growth.
- ✓ It facilitates the infestation of pest and diseases.
- ✓ Root cannot be well developed in waterlogged condition.
- ✓ Useful organisms in soil decrease due to waterlogging as there is lack of oxygen.
- ✓ Nutrient unavailability may occur in waterlogged soil.
- ✓ It reduces the temperature of soil.
- ✓ Waterlogging increases the salinity and alkalinity.
- ✓ Waterlogging makes barrier in timely farming activities.
- ✓ It sometimes facilitates soil erosion.

Objectives or benefits of drainage:

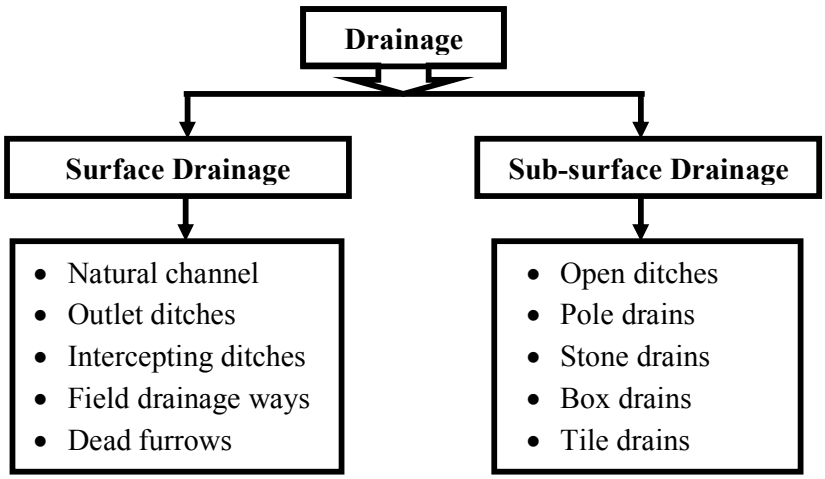
- ➢ Drainage improves the soil structure and increases productivity.
- ➢ It facilitates proper growth of crop plants.
- ➢ It facilitates early ploughing and planting.
- ➢ It accommodates more crops in cropping patterns.
- ➢ It facilitates proper root growth.
- ➢ It increases soil aeration.
- ➢ It decreases soil erosion.
- ➢ It provides suitable environment for microorganisms.
- ➢ It increases soil temperature.
- ➢ It removes excess salt from soil.
- ➢ It prevents the soil from waterlogging.

Methods of Drainage:

There are two main types of drainage:

A. Surface drainage, and
B. Sub-surface drainage.

They are further divided into several types shown in the flow chart below:



A. Surface or open drainage

This method is widely used in Bangladesh. In case of surface drainage, several main drains are cut on the soil surface. The depth and width of drain depends on the type of soil. Sloppy drains are more suitable for open drainage. A number of narrow drains (sub-drain) are attached to main drains. Sub-drains collect the excess water from field and finally drained out through main drains.

Fig. 1.1 Graphical view of Open drainage

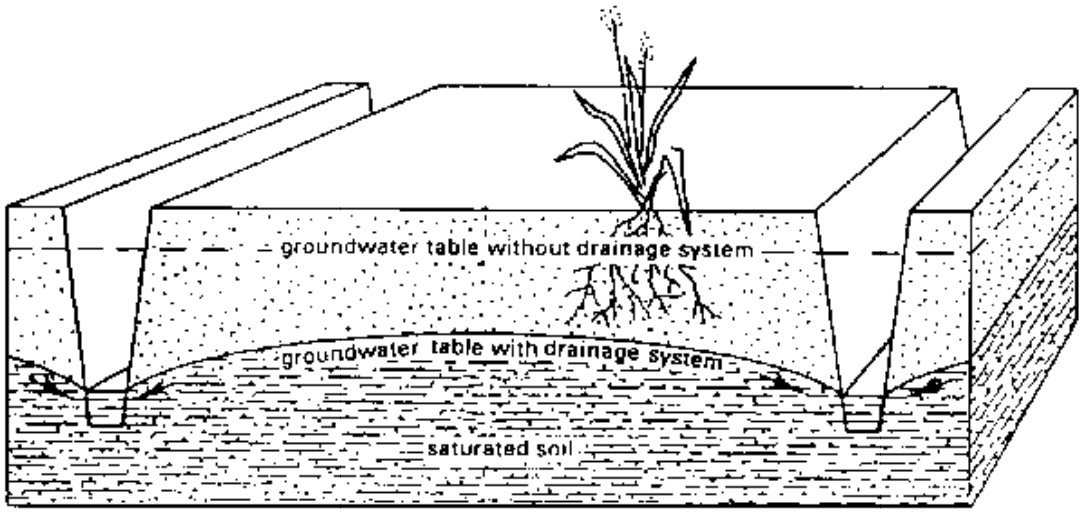


Fig. 1.2 Schematic Illustration of Open drainage

Advantages of Surface or open drainage

- ☑ Efficiency of drainage is high
- ☑ It most suitable in clay soil
- ☑ No technical know-how is necessary for drain preparation and maintenance
- ☑ Less cost involvement

Limitations of Surface or open drainage

- ⊙ Some land may be wasted
- ⊙ There may create problem in farm operation
- ⊙ It needs constant management
- ⊙ Not suitable for light soil
- ⊙ Weeds may grow in drains
- ⊙ Drains have to be prepared at every time of land preparation
- ⊙ There may chance of soil erosion

Types of surface drainage

1. **Natural channels:** Smaller channels/ditches, through which excess water id drained out.
2. **Outlet ditches:** Large open ditches whose primary function is to collect the excess water and discharge to final outlets.
3. **Intercepting ditches:** When high land discharges a considerable quantity of surface water into the low land, it is often cut of this flow through some ditches. It is done to stop the continuous flowing water over the low land to minimize soil erosion and crop damage.
4. **Field drainage ways:** Broad shaped shallow channels with side slopes on flat land are collectors of excess water from flat land. These channels infested with shallow land locked pockets tending to become permanent ponds.
5. **Dead furrows:** Dead furrows are running in the general direction of the main field collecting excess water in the field.

B. Sub-surface or closed drainage

This method is practiced in developed countries. In this method, drains are made below the soil surface. There are different kinds of drain such as tiles or pipe drain, box drain, rubber drain etc. Water drained out through the drains.

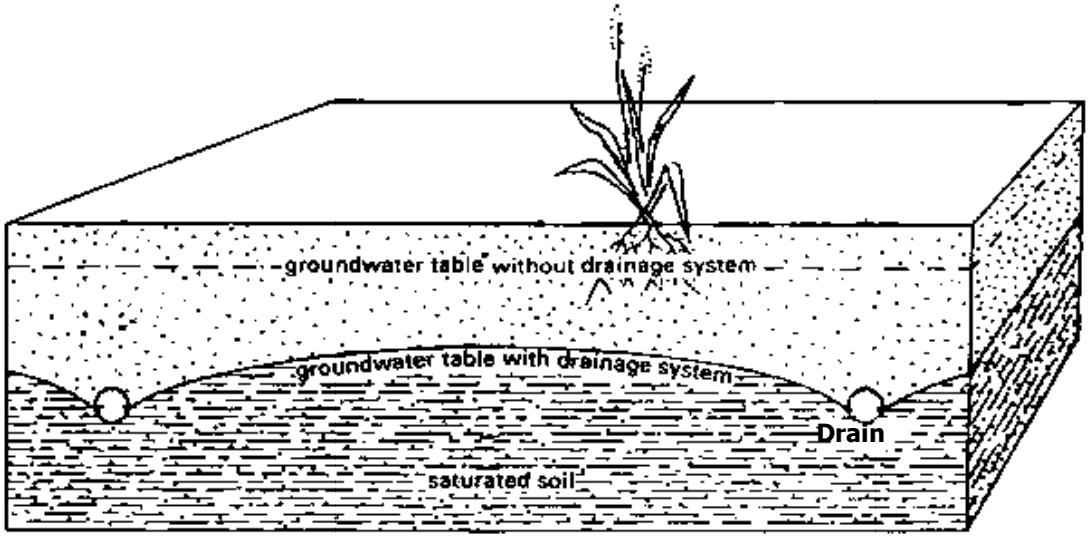


Fig. 2 Close drainage

Advantages of Sub-surface or close drainage

- ☑ Less waste of land.
- ☑ Drains can be used for several years.
- ☑ There is no possibility of soil erosion.
- ☑ It is also suitable for draining underground water.
- ☑ Suitable for light soil.
- ☑ No barrier for field operation.
- ☑ There is no problem of weed.

Limitations of Sub-surface or close drainage

- ⊙ Initial cost is high.
- ⊙ It needs technical knowledge.
- ⊙ Efficiency of drainage is less.
- ⊙ It is not so suitable for heavy soil.
- ⊙ Plant root, mud or sand may sometimes create problems by clogging the pipes or drains.

Types of Sub-surface or close drainage

1. **Open ditches:** Open ditches of suitable depth effectively relieve excessive wetness within the root zone of crops.
2. **Pole drains:** Farmers often dig ditches of 2 or 3 feet depth and 1 foot width in which three poles are placed. Collected water is then flowed down to an open ditch through an outlet.

3. **Stone drains:** Large flat stones are placed at the sides of the ditch with one over the top, thus forming a small channel, through which excess water can pass out.
4. **Box drains:** Box drains, usually made of low grade and locally available timber with holes, placed in the deep furrows.
5. **Tile drains:** Tile drains of either clay or concrete made and are placed in the deep furrows. The ends of the tiles are connected with an outlet. It is long durable drainage system with greater efficiency. But the installation cost is high. Tile drains are of different kinds:
    - **a.** Fish bone
    - **b.** Grid iron
    - **c.** Parallel
    - **d.** Double main
    - **e.** Random
    - **f.** Grouping.