CE8603
IRRIGATION ENGINEERING

METHODS OF IRRIGATION

Water application methods are grouped as:

1. Flooding
2. Applying it beneath the soil surface
3. Spraying it under pressure
4. Applying in drops (Drip)

- **Irrigation methods**

I. Surface
II. Sub-surface
III. Pressurized irrigation

- **Surface** is grouped as Border, Check basin and Furrow irrigations. Border is again classified in to two as straight and contour. Check basins may be of rectangular, contour or ring, whereas furrow irrigation is classified as deep furrow and corrugated furrows. These may be again straight or contour according to direction and leveled and graded as per their elevation

I. Surface irrigation

1. Border irrigation

- The land is divided into number of long parallel strips called borders. These borders are separated by low ridges.
- The border strip has a uniform gentle slope in the direction of irrigation. Each strip is irrigated independently by turning the water in the upper end.
- The water spreads and flows down the strip in a sheet confined by the border ridges.

- **Advantages**

1. Border ridges can be constructed with simple farm implements like bullock drawn “A” frame ridger or bund former.
2. Labour requirement in irrigation is reduced as compared to conventional check basin method.
3. Uniform distribution of water and high water application efficiencies are possible.
4. Large irrigation streams can be efficiently used.
5. Adequate surface drainage is provided if outlets are available.

- Width of border strip: It varies from 3-15m

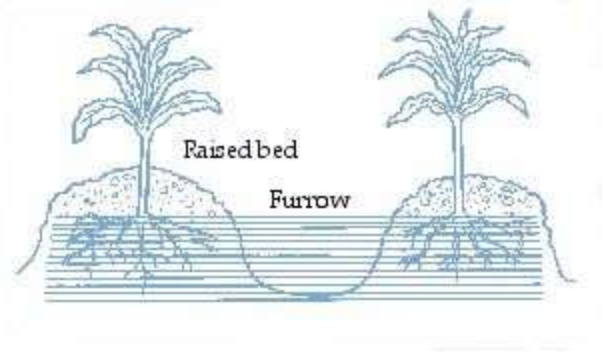
2. Check basin irrigation

- It is the most common method.
- Here the field is divided into smaller unit areas so that each has a nearly level surface. Bunds or ridges are constructed around the area forming basins within which the irrigation water can be controlled.
- The water applied to a desired depth can be retained until it infiltrates into the soil. The size of the basin varies from $10m^2$ to 25 m^2 depending upon soil type , topography, stream size and crop.

- **Advantages**

1. Check basins are useful when leaching is required to remove salts from the soil profile.
2. Rainfall can be conserved and soil erosion is reduced by retaining large part of rain
3. High water application and distribution efficiency.

Furrow irrigation



- Used in the irrigation of row crops.
- The furrows are formed between crop rows.
- The dimension of furrows depend on the crop grown, equipment used and soil type.
- Water is applied by small running streams in furrows between the crop rows.
- Water infiltrates into soil and spreads laterally to wet the area between the furrows.
- In heavy soils furrows can be used to dispose the excess water.

- **Advantages**

1. Water in furrows contacts only one half to one fifth of the land surface.
2. Labour requirement for land preparation and irrigation is reduced.
3. Compared to check basins there is

less wastage of land in field ditches

II. Sub-surface irrigation

- In subsurface irrigation, water is applied beneath the ground by creating and maintaining an artificial water table at some depth, usually 30-75 cm below the ground surface.
- Moisture moves upwards towards the land surface through capillary action Water is applied through underground field trenches laid 15-30 m apart.

- **Advantages**

1. Minimum water requirement for raising crops
2. Minimum evaporation and deep percolation losses
3. No wastage of land

- **Disadvantages**

1. Requires a special combination of natural conditions.
2. There is danger of water logging
3. Possibility of choking of the pipes lay underground.
4. High cost.

DRIP IRRIGATION SYSTEM

- Drip or trickle irrigation is one of the latest methods of irrigation. It is suitable for water scarcity and salt affected soils.
- Water is applied in the root zone of the crop

Components

- A drip irrigation system consists of a pump or overhead tank, main line, sub-mains, laterals and emitters.

- The mainline delivers water to the sub-mains and the sub-mains into the laterals. The emitters which are attached to the laterals distribute water for irrigation.
- The mains, sub-mains and laterals are usually made of black PVC (poly vinyl chloride) tubing. The emitters are also made of PVC material
- The other components include regulator, filters, valves, water meter, fertilizer application components, etc.,

- **Advantages**

1. Water saving - losses due to deep percolation, surface runoff and transmission are avoided. Evaporation losses occurring in sprinkler irrigation do not occur in drip irrigation.
2. Uniform water distribution
3. Application rates can be adjusted by using different size of drippers
4. Suitable for wide spaced row crops, particularly coconut and other

- **Disadvantages**

1. High initial cost
2. Drippers are susceptible to blockage
3. Interferes with farm operations and movement of implements and machineries
4. Frequent maintenance
5. Trees grown may develop shallow confined root zones resulting in poor anchorage. LAYOUT OF SPRINKLER IRRIGATION SYSTEM

Sprinkler

- **A sprinkler system usually consists of the following parts.**

1. A pumping unit
2. Debris removal equipment
3. Pressure gauge / water-meter
4. Pipelines (mains – sub-mains and laterals)
5. Couplers
6. Raiser pipes
7. Sprinklers
8. Other accessories such as valves, bends, plugs, etc.

- **Types of sprinkler system**
- On the basis of arrangement for spraying irrigation water
  1. Rotating head (or) revolving sprinkler system
  2. Perforated pipe system
- **Based on the portability**

1. **Portable system:** It has portable mainlines and laterals and a portable pumping unit
2. **Semi portable system: A** semi portable system is similar to a fully portable system except that the location of the water source and pumping plant are fixed.
3. **Semi permanent system:** A semi permanent system has portable lateral lines, permanent main lines and sub mains and a stationery water source and pumping plant.

- The mainlines and sub-mains are usually buried, with risers for nozzles located at suitable intervals.

4. **Solid set system:** A solid set system has enough laterals to eliminate their movement. The laterals are placed in the field early in the crop season and remain for the season.

5. **Permanent system:** It consists of permanently laid mains, sub-mains and laterals and a stationary water source and pumping plant. Mains, sub-mains and laterals are usually buried below plough depth. Sprinklers are permanently located on each riser.

- **Advantages**

1. Water saving to an extent of 35-40% compared to surface irrigation methods.
2. Saving in fertilizers - even distribution and avoids wastage.
3. Suitable for undulating topography (sloppy lands)
4. Reduces erosion

- **Disadvantages**

1. High initial cost
2. Efficiency is affected by wind
3. Higher evaporation losses in spraying water
4. Not suitable for tall crops like sugarcane