A Review on Methods of Irrigation used in Agriculture

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Abstract:
Water is a critical input for agricultural production and plays an important role in food security. Irrigated agriculture represents 20 percent of the total cultivated land and contributes 40 percent of the total food produced worldwide. Irrigated agriculture is, on average, at least twice as productive per unit of land as rainfed agriculture, thereby allowing for more production intensification and crop diversification.

I. INTRODUCTION:
Irrigation can be stated as application of water to the soil for crop growth and development. The application of water to plants is made naturally through rainfall and artificially through irrigation. Irrigation is defined as the artificial application of water to the soil for the purpose of crop growth or crop production in supplement to rainfall and ground water contribution.

METHODS OF IRRIGATION

1. Surface
2. Sub-surface
3. Sprinkler irrigation
4. Drip irrigation

I. Surface Irrigation: Water application is given on the surface of plot.

It is further classified into:
- Border
- Check basin
- Furrow irrigations.

Border is again classified into 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.

Suitability: To soils having moderately low to moderately high infiltration rates. It is not used in coarse sandy soils that have very high infiltration rates and also in heavy soils having very low infiltration rate. Suitable to irrigate all close growing crops like wheat, barley, fodder crops and legumes and not suitable for rice.

Advantages
1. Border ridges can be constructed with simple farm implements like bullock drawn “A”frameridger 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.

2. Check basin irrigation
1. It is the most common method.
2. Here the field is divided into smaller unit areas so that each has a nearly level surface.
3. Bunds or ridges are constructed around the area forming basins within which the irrigation water can be controlled.
4. The water applied to a desired depth can be retained until it infiltrates into the soil.
5. The size of the basin varies from 10m2 to 25 m2 depending upon soil type, topography, stream size and crop.

Adaptability
1. Small gentle and uniform land slopes
2. Soils having moderate to slow infiltration rates.
3. Adapted to grain and fodder crops in heavy soils.
4. Suitable to permeable soils.

Limitations
1. The ridges interfere with the movement of implements.
2. More area occupied by ridges and field channels.
3. The method impedes surface drainage
4. Precise land grading and shaping are required.
5. Labour requirement is higher.
6. Not suitable for crops which are sensitive to wet soil conditions around the stem.

3. 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.

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 then ground surface.
   • Moisture moves upwards towards the land surface through capillary action
   • Water is applied through underground field trenches laid 15-30 m apart.
   • Open ditches are preferred because they are relatively cheaper and suitable to all types of soil.
   • The irrigation water should be of good quality to prevent soil salinity.

Advantages
1. Minimum water requirement for raising crops
2. Minimum evaporation and deep percolation losses
3. No wastage of land
4. No interference to movement of farm machinery
5. Cultivation operations can be carried out without concern for the irrigation period.

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.

SPRINKLER IRRIGATION SYSTEM
Water is sprayed into the air and allowed to fall on the ground surface somewhat resembling rainfall. The spray is developed by

Advantages of sprinkler irrigation
- Elimination of the channels for conveyance, therefore no conveyance loss
- Suitable to all types of soil except heavy clay
- Suitable for irrigating crops where the plant population per unit area is very high. It is most suitable for oil seeds and other cereal and vegetable crops
- Water saving
- Closer control of water application convenient for giving light and frequent irrigation and higher water application efficiency.

DRIP IRRIGATION
Drip irrigation refers to application of water in small quantity to the zone of the plants through a network of plastic pipes fitted with emitters. At present form, it has become compatible with plastics that are durable and easily moulded into a variety and complexity of shapes required for pipe and emitters.

ADVANTAGES:
- Increased water use efficiency
- Better crop yield
- Uniform and better quality of the produce
- Efficient and economic use or fertilizer through fertigation
- Less weed growth
- Minimum damage to the soil structure
- Avoidance of leaf burn due to saline soil
- Usage in undulating areas and slow permeable soil
- Low energy requirement (i.e.) labour saving
- High uniformity suitable for atomization.

DISADVANTAGE:
- Clogging of drippers
- Chemical precipitation
- Salt accumulation at wetting front

II. REFERENCES