Irrigation Problems: Excess and insufficiency of water supply, poor quality water, sewage water

Irrigation

Definition: Artificial application of water to soil which supplies moisture essential for crop growth is called as irrigation.

Advantages of Irrigation:

- Increase Food production.
- Cultivation of cash crops is possible.
- Protection from drought.
- Intensive cropping is possible.
- Maintain soil temp.
- Washes salts from problematic soils.

Problems due to excess / over Irrigation

- Impaired Soil Aeration.
- Imbalance in nutrient uptake
- Physiological imbalance in plants
- Restricted growth of root system.
- Toxicity of Nutrients: (manganese and iron)
- Loss of Soil fertility
- Soil erosion
- Destruction of beneficial soil structure and aggregate (Crumb to platy)
- Production of harmful gases (Anaerobic decomposition of OM leads to ethane, methane, carbon monoxide hydrogen)
- Activities of micro-organism:

Problems due to Insufficient water supply

- Soil shrinks and forms cracks and crevices
- Soil becomes unworkable for tillage and sowing.
- Reduces activities and survival of soil fauna and flora.
- Reduces crop stand and uniformity.
- Effects on growth and development.
• Retard physiological activities of crops.

PROBLEMS WITH POOR QUALITY WATER

Salinity:
Salinity problems related to water quality occurs if total quantity of salts in the irrigation water is high enough for the salts to accumulate in the crop root zone to the extent that yields are affected. If excessive quantity of soluble salts accumulate in the root zone, the crop has difficulty in extracting enough water from the salty soil solution. This reduces the water uptake by plant and usually results in slow or reduced growth.

Permeability:
This problem occurs when the rate of water infiltration into and through the soil is reduced by the effect of specific salts in the water to such extent that the crop is not adequately supplied with water and yield is reduced. The poor soil permeability causes difficulty like crusting of seedbed, water logging, and attack of disease, salinity, weeds, oxygen and nutritional problems.

Toxicity:
A toxicity problem occurs when certain constituents in the water are taken up by the crop and accumulate in amounts that result in reduced yield. This is usually related to one or more specific ions in the water viz. boron, chloride and sodium.

Miscellaneous:
Various other problems related to irrigation water quality occur with sufficient frequency and should be specifically noted. These include excessive vegetative growth, lodging and delayed crop maturity from excessive nitrogen in water supply, white deposits on fruits or leaves due to sprinkler irrigation with high carbonate water and abnormalities by an unusual pH of the irrigation water.

Irrigation with poor quality irrigation water
Crop growth in soils irrigated with poor quality water decreases due to increased osmotic stress and poor physical condition of highly dispersed sodic soils. The degree of harmful effect varies with the crop, variety and...
stage of growth. The adverse effect of poor quality irrigation water can with crop minimized by improving water quality and by suitable soil and irrigation management practices:

1. Soil Management:

Soils that are irrigated with irrigation water containing high salt content become saline. The reclamation of saline soil depends upon the efficiency of removal of salts from the upper to lower layers and is relatively simple if drainage is not restricted. The simplest procedure is to flood the field and retain the water.

The reclamation of alkali soil is more difficult than saline soil because alkali soil have very low permeability. The exchangeable sodium has to be replaced by calcium and the replaced sodium has to leach down to lower layers. The replacement of excessive exchangeable sodium can be done by calcium chloride, magnesium chloride – or – gypsum. Soluble calcium and magnesium salts are quite suitable for the reclamation of alkali soils, but these salts are expensive. However, gypsum by virtue of its low solubility and cost is quite suitable. Abort 4 – 1 tines of gypsum per hectare for 30 cm. soil depth is required for each mili-equivalent of sodium to be replaced by calcium.

2. Irrigation Management:

Irrigation management practice with poor quality water should be aimed at reducing salt concentration in root zone. This can be achieved by

- Giving heavy pre-sowing irrigation,
- By frequent shallow irrigation,
- By drip irrigation.

3. Management Practice:

- Growing of salt tolerant crops and varieties is the best alternative. Some of the salt tolerant crops are – sorghum, pearl millet, finger millet, rice, and castor.
- Application of F. Y. M or incorporation of green manures helps in reducing the adverse effect of irrigation with poor quality water.
Planting seed on the side of the ridge helps in better germination than on top of ridge.

**SEWAGE AND SLUDGE:**

Waste water containing human excreta in addition to other wastes called as **sewage**. In general, the sewage generated in India contains more than 90% water. The solid portion contains 40-50% organics, 30-40% inert materials, and 10-15% bio-resistant organic and 5-8% miscellaneous substance on oven dry weight basis.

It contains good amount of N, P, K and micronutrients like Fe, Zn, Cu and Mn. Sewage has two components, namely solid portion, technically known as **sludge** and liquid portion commonly known as **sewage-water**. Both the components of sewage are used in increasing crop production, as they contained plant nutrients. However, due to high bacterial contamination, untreated sewage or sludge should not be used for growing vegetables and other crops to be consumed raw and uncooked by human beings, since these crops also carry bacterial contamination.

These are separated by given preliminary fermentation and oxidation treatments to reduce the bacterial contamination and the offensive smell as well as to narrow down the C:N ratio of the solid portion. Sludge content 1.5 to 3.5% N, 0.78 to 4.0% P and 0.3 to 0.6% K on dry weight basis.

**Sewage Irrigation**

- Pollution caused by sewage water is one of the major problems in cities the world over. Sewage water is drained off into rivers without treatment. Careless disposal of sewage water leads to creation of a chain of problems like spreading of diseases, eutrophication, increase in Biological Oxygen Demand (BOD), etc.
- When raw sewage is treated to remove the solid portion or sludge, the water, technically known as treated effluent, is used for irrigation purposes. Such a system of irrigation is known as sewage irrigation. The field crops, when irrigated with sewage water receive N, P and K.
Thus the activated sludge and the effluent can be used with safety for manuring and irrigating all field crops except the vegetables which are eaten raw or uncooked.

The use of sewage and wastewater for irrigation is a common practice in rural and peri-urban areas of most developing countries.

Wastewater is often the only source of water for irrigation in these areas. Even in areas where other water sources exist, small farmers often prefer wastewater because its high nutrient content reduces or even eliminates the need for expensive chemical fertilizers.