

## **10. AGRONOMIC PRACTICES FOR USE OF PROBLEM WATER - SALINE, EFFLUENT, SEWAGE WATER**

### **Quality of irrigation water**

Whatever may be the source of irrigation water viz., river, canal, tank, open well or tube well, some soluble salts are always dissolved in it. The main soluble constituent in water are Ca, Mg, Na and K as cations and chloride, sulphate bicarbonate and carbonate as anions. However ions of other elements such as lithium, silicon, bromine, iodine, copper, cobalt, fluorine, boron, titanium, vanadium, barium, arsenic, antimony, beryllium, chromium, manganese, lead, selenium phosphate and organic matter are also present. Among the soluble constituents, calcium, sodium, sulphate, bicarbonate and boron are important in determining the quality of irrigation water and its suitability for irrigation purposes. However other factors such as soil texture, permeability, drainage, type of crop etc., are equally important in determining the suitability of irrigation water. The following are the most common problems that result from using poor quality water.

#### **1. Salinity**

If the total quantity of salts in the irrigation water is high, the salts will accumulate in the crop root zone and affect the crop growth and yield. Excess salt condition reduces uptake of water due to high concentration of soil solution.

#### **2. Permeability**

Some specific salts reduce the rate of infiltration in to the soil profile

#### **3. Toxicity**

When certain constituents of water are taken up by plants which accumulates in large quantities and results in plant toxicity and reduces yield.

#### **4. Miscellaneous**

Excessive Nitrogen in irrigation water causes excessive vegetative growth and leads to lodging and delayed crop maturity. White deposits on fruits or leaves may occur due to sprinkler irrigation with high bicarbonate water.

### Classification of irrigation water quality

Quality of water	EC (m.mhos / cm)	pH	Na (%)	Cl (me/l)	SAR
Excellent	0.5	6.5 – 7.5	30	2.5	1.0
Good	0.5 – 1.5	7.5 – 8.0	30 – 60	2.5 – 5.0	1.0 – 2.0
Fair	1.5 – 3.0	8.0 – 8.5	60 – 75	5.0 – 7.5	2.0 – 4.0
Poor	3.0 – 5.0	8.5 – 9.0	75 – 90	7.5 – 10.	4.0 – 8.0
Very poor	5.0 – 6.0	9.0 – 10.	80 – 90	10.0 – 12.5	8.0 – 15.0
Unsuitable	>6.0	> 10	>90	>12.5	>15

(SAR – Sodium Adsorption ratio)

### Factors affecting suitability of waters for irrigation

The suitability of particular water for irrigation is governed by the following factors.

1. Chemical composition of water (TSS, pH; CO<sub>3</sub>, HCO<sub>3</sub>, Cl, So<sub>4</sub>, Ca, Mg, Na, and B)
2. Total concentration of soluble salts or salinity (EC)
3. Concentration of sodium ions, in proportion to calcium and magnesium or sodicity (SAR);
4. Trace element boron may be toxic to plant growth, if present in limits beyond permissible
5. The effect of salt on crop growth is of osmotic nature. If excessive quantities of soluble salts accumulate in the root zone the crop has extra difficult in extracting enough water from salty solution, thereby affecting the yields adversely.
6. Besides this, total salinity depends of the extent to which exchangeable sodium percentage (ESP) of soil increase as a result of adsorption of sodium from water. This increase depends on sodium percentage.
7. Soil characteristics like structure, texture, organic matter, nature of clay minerals, topography etc.

8. Plant characteristics like tolerance of plant varies with different stages of growth. The germinating and seedling stages are usually the most sensitive to salinity.
9. Climatic factors can modify plant response to salinity. Tolerance to saline water irrigation is often greater in winter than in the summer. Rainfall is the most significant factor for the leaching of salts from the plant root zone. Temperature also plays a vital role.
10. Management practices also play great role. Wherever saline water is used for irrigation, adoption of management practices which allow minimum salt accumulation in the root zone of the soil is necessary.

The primary parameters that have to be considered to ensure effective irrigation management for salt control are the water requirement of crop and quality of irrigation water. Correct irrigation should restore any soil water deficit, to control salt levels.

Points to be considered for the management and use of poor quality water

1. Application of greater amounts of organic matter such as FYM, compost etc., to the soil to improve permeability and structure.
2. Increasing the proportion of calcium, through addition of gypsum ( $\text{CaSO}_4$ ) to the irrigation water in the channel, by keeping pebbles mixed pure gypsum bundles in the irrigation tank.
3. Mixing of good quality water with poor water in proper proportions so that both the sources of water are effectively used to maximum advantage.
4. Periodical application of organic matter and raising as well as incorporation of green manure crops in the soil.
5. Irrigating the land with small quantities of water at frequent intervals instead of large quantity at a time.

6. Application of fertilizer may be increased slightly more than the normally required and preferably ammonium sulphate for nitrogen, super phosphate and Di Ammonium Phosphate (DAP) for phosphorus application
7. Drainage facilities must be improved
8. Raising of salt tolerant crops such as cotton, ragi, sugar beet, paddy, groundnut, sorghum, corn, sunflower, chillies, tobacco, onion, tomato, garden beans, amaranthus and lucerne.

### **Use of poor quality water**

Besides the salinity and alkalinity hazard of water, some industrial effluents and sewage water are also problem water that can be reused by proper treatment. The complex growth of industries and urbanization (Urban development) leads to massive increase in waste water in the form of sewage and effluent. Waste water supplies not only nutrient but also some toxic elements such as total solids of chloride, carbonate, bicarbonate, sulphate, sodium chromium, calcium magnesium, etc., in high concentration. Besides this the effluent or waste water creates BOD (Bio chemical Oxygen Demand) These waste water when used for irrigation leads to surface and sub surface source of pollution due to horizontal and vertical seepage.

### **Projected waste-water Utilization**

It is estimated that 287,000 million m<sup>3</sup> of waste water can be reusable during 2000 A.D. Hence this waste water can be properly treated as follows

- ❖ Dilute with good quality water in the ratio of 50:50 or 75:25
- ❖ Alternate irrigation with waste water and good quality water
- ❖ Treat the effluent water through fill and draw tanks, lime tank, equalization tank, settling tank, sludge removal tank, aerobic and anaerobic treatment tanks etc.,