**I. Saline Soil Reclamation and Management:**

Saline soils in which the soluble salts contain appreciable amounts of calcium and magnesium do not develop into alkali soils by the action of leaching water. The reclamation is comparatively easy in such soils. The main problem is to leach the salts downward below the root zone and out of contact with subsequent irrigation water.

**Following methods may be used for removal of salts:**

**(A) Mechanical Methods:**

**(i) Flooding and leaching down of the soluble salts:**

The leaching can be done by first ponding the water on the land and lowering it to stand there for a week. Most of the soluble salts would leach down below the root zone. After a week, standing water (dissolved with soluble salts) is allowed to escape. Such, 2 to 3 treatments are given to reclaim highly saline soils. Sometimes gypsum is also added to flood water when the soluble salts are low in calcium to check development of alkalinity.

**(ii) Scrapping of the surface soil:**

When the soluble salts accumulate on the soil surface, scrapping helps to remove salts. This is a temporary cure and salinity again develops on such lands.

**(B) Cultural Methods (Crop, Soil and Water Management):**

**(i) Providing proper drainage:**

If the soil is not free draining, artificial, drains are opened or tile drains laid underground to help wash out the salts.

**(ii) Use of salt free irrigation water:**

Salt free good quality of irrigation water should be used.

**(iii) Proper use of irrigation water:**

It is known that as the amount of water in the soil decreases the concentration of salts in the soil solution increases, thus, moisture should be kept at optimum field capacity.

**(iv) Planting or sowing of seeds in the furrow:**

The salt concentration even in smaller amounts is most harmful to the germinating seedlings. Water generally evaporates from the highest surface by capillarity and hence, these points have maximum salt concentrations. If the seeds or seedlings are planted inside the furrows, they escape the zone of maximum salt concentrations and thus, can germinate and develop properly during their early growth stage.

**(v) Use of Acidic Fertilizer:**

In saline soil, acidic nature of fertilizers (e.g., Ammonium sulphate) should be used.

**(vi) Use of organic manures:**

The organic manures have very high water-holding capacity. When sufficient amount of these manures are added the water-holding capacity of soil increases and as a result the conductivity of the soil solution decreases.

**(vii) Ploughing and leveling of the land:**

Ploughing and leveling of the land increases the infiltration and percolation rate. Therefore, salts leach down to the lower levels.

**(viii) Retardation of water evaporation from soil surface:**

Water may be conserved in the soil retarding the water evaporation. Thus, salts may remain in the lower level with the water.

**(ix) Growing of salt tolerant crops:**

(a) High salt tolerant crops: Para grass, barley, sugar beet, etc.

(b) Moderately salt tolerant crops: Wheat, rice, sorghum, maize, flax etc.

(c) Low salt tolerant crops: Beans, radish, white clover etc.

(d) Sensitive crops: Tomato, potato, onion, carrot etc.

**II. Reclamation and Management of Alkali (Saline-alkali and non-saline-alkali) Soils:**

Alkali soils cannot be reclaimed by mere flooding the land. In the case of saline-alkali soils, flooding is likely to do more harm. Leaching (flooding) down of soluble salts make the soil alkaline (only Na-clay remain in the soil). Soils get dispersed and become compact (impervious).

In alkali (non-saline-alkali) soils, exchangeable sodium Na-clay is so great as to make the soil almost impervious to water. But even if water could move downward freely in alkali soils, the water alone would not leach out the excess exchangeable sodium. The sodium-cation must be replaced by calcium-cation and then leached downward.

**Following chemical methods are used for reclaiming the alkali soils:**

**(A) Chemical Methods:**

**(i) Application of gypsum:**

By cationic exchange, calcium is often used to replace sodium in alkali soil. If the soil has no reserve of calcium carbonate, the addition of gypsum (calcium sulphate) is necessary. When gypsum is used as a reclaiming agent, calcium replaces the exchangeable sodium and converts the clay back into calcium-clay (Ca-clay).

Sodium sulphate goes into solution and is then removed by washing it out with water or leaching down with water with the help of artificial drains. Addition of gypsum improves physical conditions of soil. Soils become flocculated and drainage improves. pH is lowered down to a desirable level.

**Gypsum requirement is alkaline soil:**

For reasonable crop production on a sodic soil, the lowering of the ESP to the level of 10 is considered sufficient. The amount of gypsum required to be added to a sodic soil to lower the ESP to a desired value is known as gypsum requirement. It is expressed in milliequivalent of Ca++ per 100 gm. of soil. Gypsum requirement can be calculated from the data on CEC and ESP of the soil.

**For a sodic soil, suppose, CEC = 30 and ESP = 60, gypsum requirement to lower the ESP to 10, will be:**

or = 10 m.e. of Ca++ per 100 gm. soil.

Besides gypsum that is best soil amendment for sodic soil, several other materials may be used for reclaiming alkaline soils.

**Gypsum equivalents of some such materials are given below:**

**(ii) Use of sulphur:**

In the case of alkali soil that contains free calcium carbonate, addition of sulphur, sulphuric acid, iron and aluminium sulphate, green manure (produce acidity) etc. reclaim the soil very effectively. The acidity developed during the course of their decomposition of soil, neutralizes alkalinity. At the same time brings calcium carbonate into solution which then reacts with the sodium clay and converts it into calcium clay.

When sulphur is spread on the soil, it is oxidised to sulphuric acid, which converts sodium carbonate into sodium sulphate. If calcium carbonate is not present in the soil, it should be added artificially when sulphur is used for reclamation.