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TOPIC: SOIL SALINITY AND SODICITY

COURSE TITLE: ENVA-CC4 (Theory): Land management and soil conservation

PAPER: CC4

UNIT: 2 (fundamentals of soil science)

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Soil salinity means appreciable amount of salt and soil sodicity emphasises on sodium. Sodium is a highly reactive soft metal.

What is the fate of NaCl in soil?

In soil the surface of clay particles are naturally electrically charged having an excess of electrons on its surface. This excess of electrons can be balanced by deficit of electrons on sodium ions (as it is Na^+). In the presence of right sort of clay particles the sodium ion becomes attached to the negative clay particles, leaving the Cl^- or other anions dissolved in the soil water. During next rain Cl^- ion may leached down even upto the groundwater.

This orphaned Na^+ has a particular effect on clay particle. Sodium is a large ion and takes up more space than other ions. So in excess it acquires large space on clay surface leaving other cations like calcium ion and can have dire consequences for soil.

Sodic clay is dispersed which means that the clay won't stay together and instead infiltrates the smallest spaces between the soil particles. As a consequence, the soil loses its structure. When it dries it glues together. When it wets it turns to mud. Water no longer flows through the soil and air cannot reach the roots. During heavy rain the soil washes off.

ESP (exchangeable sodium percentage): ESP can be defined as the relative amount of sodium ions present on the soil surface, expressed as % of total cation exchange capacity (CEC).

High ESP and EC (electrical conductivity) indicates soil sodicity.

If ESP is greater than 15 then the soil is sodic soil.

Treatment of sodic soil

Many soils are naturally sodic. Others become sodic through poor management.

1. Applying gypsum ($CaSO_4$) is effective but may not be economically viablefor large area. Rate= 5 ton/ha every 10 years.

Function of gypsum: gypsum works by supplying calcium ions, which displaces the sodium ions and taking up less physical space in the clay particles, allow clay particles to come together again. As gypsum doesnot move easily through the soil, thus surface applications will not reduce subsoil sodicity. In this case deep ripping is necessary.

2. Application of $CaCl_2$ can be effectiveif the soil is acidic but not applicable for alkaline soil.

Salinity Management

Drainage is the best method for salinity management. Both vertical and horizontal drainage can be applicable.

Vertical drainage: during irrigation some portion of irrigated water should be allowed to leach to reduce salinity.

Horizontal drainage: strip farming is the best method. One piece of land between two croplands remains fallow land so that the irrigation water applied on cropland can spread and reduce salinity of croplands.