DISTRIBUTION OF SODIC SOILS IN KRISHNAGIRI DAM CATCHMENT AND THEIR MANAGEMENT

R SRINIVASAN, N MADDILETI, RAJENDRA HEGDE

ICAR-National Bureau of Soil Survey and Land Use Planning, Regional Centre, Bangalore, Karnataka

*Corresponding author, E-mail: srinivasan.surya@gmail.com

Krishnagiri dam or Krishnagiri reservoir project (KRP) dam located about 6 km south-west of the Krishnagiri town in Tamil Nadu, across the south pennar river is one of the irrigation schemes of the state with a total irrigated command area of around 8000 acres. Farmers of this area are growing paddy as a double-crop in *kharif* and *rabi* seasons. When excess use of irrigation water and unlined canal or channels led to seepage of water through the bunds, drainage is impeded and caused waterlogging in adjacent fields. Soils of major paddy growing areas here are challenged with poor drainage and high-water table problems that gradually developed soil sodicity/ alkalinity in high magnitude. During summer, the irrigation water from the krishnagiri dam and tank supplies high sodium bicarbonates and less calcium and magnesium to the surface soils (Figure1). When the soil developed sodic condition, de-flocculation of soil particles cause poor physical properties leading to low water permeability and poor structure stability.

Figure 1. Salt affected soils in different locations of agricultural lands under the Krishnagiri dam command area

Sodic soils can be recognized by the spotty crop growth and often by the presence of white salt crusts on the surface. Excess sodium (Na) in soil causes poor and spotty stands of crops, uneven and stunted growth, and poor yields or crop failure, the extent depending on the degree of salt contents (Figure 2).

Figure 2. Poor crop performances at different locations of Krishnagiri dam command area

Problems of soils can be identified based on its characterization through detailed soil surveys or land resource inventories. This will provide comprehensive site-specific cadastral level information useful for the farm-level planning and integrated development of the area (Figure 3). Sodic soils here are of clay in nature with high pH (>8.5), poor soil structure, and low infiltration capacity. Sodicity of soils are measured by the sodium adsorption ratio (SAR), which is the ratio of the amount of cationic (positive) charge contributed to soil by Na, Ca, and Mg. If the SAR of a soil is above 13, it is classified as sodic soil. High Na levels may also be reported as exchangeable sodium percentage (ESP). Soils with ESP value >15% represent typical sodic soils, which means that Na occupies >15% of the soil's cation exchange capacity (CEC). Sodic soils tend to be hard and cloddy when dry and crust quickly.

Figure 3. Detailed Land resource inventory at 1: 10,000 scale

The extent of yield decline in crops growing under sodic soil condition depends upon different factors like crop growth, salt content of the soil, climatic conditions, etc. In some extreme cases where the concentration of salts in the root zone is very high that may hamper crop growth seriously. To improve the crop growth in such soils the excess salts must be removed from the root zone through the addition of gypsum and leaching. In order to find out ideal alternate/ tolerant cropping system for problematic soils a soil resource inventory is a must as that promotes identification of site-specific soil characteristics and problems (Figure 4).

Figure 4. Site-specific alternate cropping system i.e., jasmine, marigold and bajra

MANAGEMENT OF SODIC SOILS

- Soil amelioration consists of changing the growing crop to a more tolerant to sodicity.
- Changing the soil chemistry involves replacing exchangeable Na with Ca by the addition of available limestone or gypsum.
- Calcium added to the soil should be mixed into the soil and followed by the addition of water to leach the Na beyond the root zone.
- Incorporation of crop residues, manure, compost, cover crops, and green manure can help improve soil tilth and water infiltration.

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