



United States
Department of
Agriculture

Soil Health - Sodium Adsorption Ratio (SAR)

USDA-NRCS Caribbean Area

Puerto Rico

US Virgin Islands

0 5 10 20 30 40 Miles

Legend

Surface Layer



Summary

The sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from a saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. It is a diagnostic parameter for the sodicity hazard of a soil. When SAR is greater than 13, the soil is considered a sodic soil. Sodic soils have excessive levels of sodium (Na) adsorbed on the cation-exchange sites of clays. In other words, they have a high exchangeable sodium percentage. In addition, these soils are low in total salts. The sodium causes the soil particles to repel each other and, as a result, the soil disperses. This process prevents the formation of soil aggregates and degrades soil structure. The dispersed physical condition results in poor water infiltration, the formation of surface crusts, and the restriction of water and air movement through soil, and it restricts seedling emergence and root growth. Also, there is increased dispersion of organic matter. Soil management on sodic soils should aim to preserve or increase soil organic matter in the surface soil, which increases infiltration and water movement through the soil (Diaz and Presley, 2017). Maintaining good drainage and low ground-water levels is important. In the reclamation process of sodic soils, the excessive sodium is replaced by calcium supplements before the leaching process begins (NDSU, 2018).

