Successful experiences managing salts and sodium

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That's not snow—it's salt. Some areas on the righthand side of this photo are starting to look a bit better after four years. Photo submitted by Sharon Clay with the Journal of Environmental Quality article found here: https://doi.org/10.1002/jeq2.20223. The photo is not associated with any of the examples used in this article.

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Two takeaways from a course I took in college on saline and sodic soils were that (1) saline, saline-sodic, and sodic soils are almost always extremely variable and (2) a practical approach would be far superior to a mathematical approach. An approach offered was to reduce salinity until areas with poor permeability occurred. Amend those areas and then leach, repeating the process until no areas with poor penetration remained. The approach would vastly reduce the amount of gypsum and money required. Two college texts related to this were *Diagnosis and Improvement of Saline and Alkali Soils* (Richards, **1954**) and *Irrigated Soils: Their Fertility and Management* (Thorne & Peterson, 1949). My second job after college was to build and operate a soil-testing lab for a fertilizer dealer. R.S. Ayers, who would later co-author *Water Quality for Agriculture* (Ayers & Westcot, 1985), was a valuable mentor. Following are five experiences with managing saline and sodic soils.

The first was when a client with saline-sodic land that had never been farmed asked how to reclaim the land and grow onions as the first crop. Time was money! After explaining the risks, an approach was outlined. Samples were collected, and Schoonhover gypsum requirements and calcium carbonate contents were determined (Richards, **1954**). Sufficient lime was present to replace the sodium. Sulfuric acid was applied followed by leaching with solid set sprinklers. The onion crop was a great success, except for the sand streaks where soil pH had been reduced to less than 4.0.

They were easy to spot and were limed, making the client happy.

Next, a new almond grower had a sodic spot in his orchard. On his own, he applied sulfuric acid and leached. Water penetration improved, but tree growth did not, so he added more sulfuric acid. After that did not seem to do the trick, he called me. Samples from 6-inch increments to a depth of 9 ft revealed pH values as low as 3.0. Exchangeable hydrogen has the same impact on permeability as sodium. Lime was incorporated with a backhoe, and today, that spot cannot be found.

The third example is when one of our employees came to me claiming that the lab had made a serious mistake. Analysis of a sample from an area that looked and acted like a sodic soil according to the analysis contained little sodium. Comparison of the sum of cations with an EC_e (electrical conductivity of a saturation extract) times 10 indicated that a lot of something was missing. The sample was from a winery wastewater disposal area. The potassium adsorption ratio was well above 15%. A gypsum application followed by leaching resolved the issue. Following that experience, potassium was added to the salinity and sodicity diagnosis.

A fourth experience was when a client wanted to add sulfuric acid to a furrow-irrigated sugar beet crop to improve sodium-limited infiltration. Soils were calcareous, so acid could be used. Application uniformity was a concern. Water samples were collected from the head ditch before acid was added and from intervals down a furrow. Water pH was about 8.4 prior to acid addition and very acidic following the addition, but 200 ft or so down the furrow, it was about 8.4. The first-encountered calcareous soil neutralized the acid. Water run acidification was not a good method for reclaiming water or the calcareous-sodic soil.

Finally, an overhead vineyard was to be planted on a 160-ac parcel. A 4-ac area near the center had been developed as a shop, yard, and residential area. Historically, such areas have been located on the lowest quality land. Observation pits were excavated and soil profiles sampled. Soils were saline-sodic. There would be one opportunity to apply amendments as the trellis structure would preclude entry of large equipment. Schoonhover gypsum requirements and calcium carbonate contents were determined. Sulfuric acid was applied and incorporated into the surface 6 inches. Gypsum based on the Schoonhover gypsum requirement for the remaining 5 ft profile was applied. The 160-ac field was prepared for planting and the trellis system installed. Low-pressure mini-sprinklers were installed, and in the 4-ac area in need of reclamation, a second set of hoses and mini-sprinklers was installed. As the vineyard was irrigated, the sodic area received twice as much water as the balance of the field. Vines were planted in the 4-ac spot a year later than the balance of the field. After four years, the only way the spot can be identified is by the double hoses.

References

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