MANAGING SALINE SOIL

Salinity

Salinity problems are caused from the accumulation of soluble salts in the root zone. These excess salts reduce plant growth and vigor by altering water uptake and causing ion-specific toxicities or imbalances. Finding a suitable cure for salinity problems is often complex.

Salinity levels

Saline soils contain large amounts of water soluble salts that inhibit plant growth, yield and quality. The salts are white, chemically neutral, and include chlorides, sulfates, carbonates and sometimes nitrates of calcium, magnesium, sodium and potassium.

The yields and quality of most crops are not significantly affected where salt levels are below 2 dS/m. Generally, a level of 2 to 4 dS/m affects some crops. Levels of 4 to 5 dS/m affect most crops and above 8 dS/m will affect all but the very tolerant crops.

Salt affected Cucumbers

Treatment of saline soil

There are generally two ways to manage saline soils, particularly on the NAP. First, salts can be moved below the root zone by applying more water than the plant needs. This method is called the **leaching requirement** method.
In the second method, salts can be moved away from the root zone to locations in the soil, other than below the root zone, where they are not harmful. This method is called **managed accumulation**.

Soil salinity facts

- Crop losses may occur with irrigation water containing as little as 850 ppm, or an EC value of >1.3 dS/m.
- Salt-affected soils may inhibit seed germination and retard plant growth.
- Saline soils cannot be reclaimed by chemical amendments, conditioners or fertilizers.
- Saline soils are often reclaimed by leaching salts from the plant root zone.
- Soils high in salt and/or sodium will limit crop yields.
- Salt-affected soils may contain an excess of water-soluble salts (saline soils) or exchangeable sodium (sodic soils) or both an excess of salts and exchangeable sodium (saline-sodic soils).
- Periodic soil testing and treatment can improve the conditions in salt-affected soils that contribute to poor plant growth.

Leaching Requirement

Leaching is accomplished at key times during the growing season, particularly when a grower may have high quality dam/mains water available. Planned periodic leaching events should include a post-harvest irrigation to push salts below the root zone area of the newly prepared soil for the new crop.

Generally at the end of a crop cycle is the best time for a large, planned leaching event because nutrients have been drawn down. A smaller mid-crop cycle leaching event is also useful if dam/rainwater is available. However, since each case is site-specific, examine the condition of the soil, groundwater, drainage, and irrigation system for a given field before developing a sound leaching plan.

Managed Accumulation

In addition to leaching salt below the root zone, using certain bed mounding and pulsing irrigation techniques salts can also be moved sideways to areas away from the primary root zone.

Double-row bed systems require uniform wetting patterns to move salt accumulation toward the middle and outside of the beds. This leaves the root area of the bed relatively free from injurious levels of salinity. Without uniform applications of water salts accumulate closer to one side of the plants than the other.

Good uniformity, with a full wetted strip.

Periodic leaching of salts down from the soil surface and below the root zone may still be required to ensure the beds are not eventually salted out.

Poor uniformity; salt left around plant root zone.

Salinity and Leaching Management

The advantage of leaching with high quality, low salinity rainwater water (if available to a grower) is that it can almost completely remove salts from the top 30cm root zone of the soil.

However, drainage of salts to the subsoil will not work where there is no saturated condition in the soil. Water will not move downwards to drainage if the soil around it is not saturated. Therefore the soil needs to be wet up slowly over three or four irrigations before leaching will be effective.

Most crop plants are more susceptible to salt injury during the early seedling stages. An early-season application of good quality water, designed to fill the root zone and leach salts from the upper 150mm to 300mm of soil, may provide good enough conditions for the crop to grow through its most injury-prone stages.

Salts are most efficiently controlled in the soil profile under higher frequency irrigation (shorter irrigation intervals, more often). Keeping soil moisture levels higher between irrigation events effectively dilutes salt concentrations in the root zone, thereby reducing the salinity hazard.

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