# Farm Water Futures

## SALINITY AND SODICITY BASICS

**Salt is present in many irrigation areas throughout Queensland, particularly those that rely on groundwater supplies. Effective salinity management is crucial to ensure both environmental and economic sustainability.**

### What is salinity compared to sodicity?

Salinity is characterised by high electrical conductivities and low sodium ion concentrations compared to calcium and magnesium. Sodicity is characterised by low electrical conductivities and high sodium ion concentrations compared to calcium and magnesium. Situations that have both high electrical conductivities and high sodium ion concentrations are called saline-sodic.

### Effect of salinity and sodicity on crop performance

Salts are found naturally in soils, rainfall, irrigation water and groundwater. Salinity affects the growth of plants' leaves and roots. It lowers a plant's ability to extract water from the soil and causes poor germination and crop establishment and growth. Different salts have different effects on plant growth.

Sodicity affects soil structure, inhibits water movement and causes poor germination and crop establishment. The sodium in the system causes dispersion of clay soils, leading to soil structural problems such as hard setting layers, reduced infiltration rates and sealing and crusting of soil surfaces. If chloride is present, toxicity can accompany salinity and sodicity problems.

### Effect of salinity on water uptake

Plants actually use salts to transfer water from outside the root into the root for use by the plant. In low salinity situations, plants move salts through the root creating a salinity concentration gradient between the root and the soil. Water moves into the root to dilute the salt concentration and is subsequently used by the plant for transpiration. When salinity levels increase, plants cannot load enough salt into the root to create the gradient and water doesn't move into the root. The plant is undergoing a stress similar to drought, even though plenty of water may be present. Crops can cope with varying salt concentrations before stress becomes apparent.

### Management strategies

Once it has been established that a salinity or sodicity problem exists there are several management strategies that can be employed. All management strategies revolve around reducing or removing the salt/sodium from the irrigation system.

- **Change the salinity/sodium concentrations in the irrigation water** to reduce the levels experienced in the soil. Use a less concentrated source if available. Mix fresh water with poorer water, either during every irrigation or by alternating the sources during the irrigation schedule. For salinity, you can establish a crop rotation system utilising both salt sensitive and salt tolerant crops. Use the less salty water source on the less salt tolerant crop and the saltier water on the more salt tolerant crop.
- **Apply a leaching fraction to reduce the salinity/sodicity in the soil.** Applying a leaching fraction will remove salts/sodium from the root zone and reduce the impact on crop growth. Monitoring is required to determine whether a leaching fraction has occurred and to ensure that the leaching is not contaminating groundwater or stream flows.
- **Increase the efficiency of your irrigation system and reduce the volume of over-irrigation.** Inefficient systems have 'dry spots' and 'wet spots'. Irrigators have to over-irrigate to ensure that the 'dry spots' are wet enough. In the process they over-irrigate the 'wet spots'. Applying the water evenly will reduce the volume of water and salt/sodium being put into the soil.
- **Reduce soil surface evaporation.** Keeping the water in the soil will lower the salt/sodium concentrations. Mulching, either with organic matter or plastic mulches is effective. This is particularly effective in shallow rooted crops and during germination and establishment of crops.
- **Apply gypsum for sodicity** to increase the concentration ratio of calcium to sodium. Gypsum improves soil structure by repairing and maintaining clay aggregation and improves soil permeability and infiltration rates. It reduces the potential for water logging, crusting and runoff. Organic matter can also be used as it increases soil water holding capacity and lowers sodium concentrations.



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