ADVANCED IRRIGATION WITH SALINE WATER

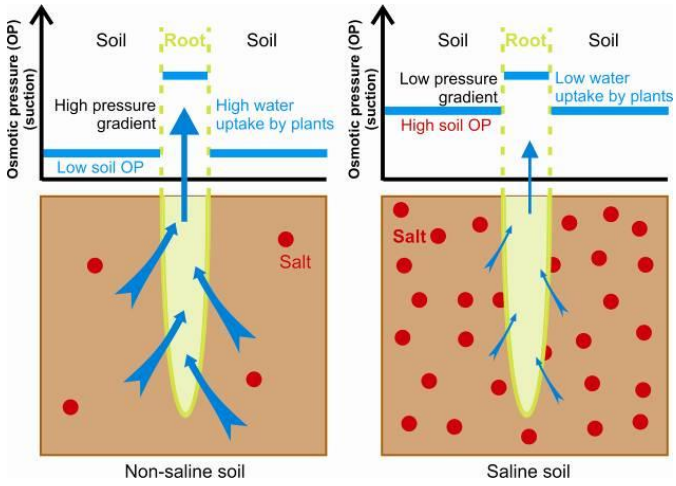
Advanced Irrigation

For protected cropping vegetable growers irrigating with water that contains high levels of total soluble salts (salinity) on the Northern Adelaide Plains.

There are many reasons for improving irrigation management. However, vast improvements can be achieved by implementing precision irrigation techniques.

Salt Stress

Any soil with high amounts of soluble salts makes uptake of water to the plants very difficult, called 'osmotic stress', which is basically a chemical drought. An obvious visual sign of this is when the plants wilt on hot days, which seems to be because of a shortage of water, even though the soil remains wet.



Osmotic pressure and the uptake of water to the plant roots.

This is where applying small amounts of water often (Pulsing), enables the plant to extract small amounts of fresher water each time it is applied. This practice also keeps pushing the salt sideways out of the plant root zone and to the edge of the beds.

Improved Irrigation Management

The precision irrigation practices that have been implemented by a group of Production Horticulture trainees from Virginia are based around the following important management strategies:

Managing Soluble Salts

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Particularly with a saline water supply, good irrigation management is vital to achieve efficient use of water, combined with higher yields and quality in vegetable production.

Crops may be affected by either the osmotic stress or salt toxicity or by both. At low salt concentrations toxic elements play a dominant role and at high salt concentrations, it is the osmotic stress that plays a major role.

Not enough water is as big a problem as too much!

Moisture stress in vegetables will induce the uptake of Sodium Chloride and can result in leaf burn and salt toxicity. Too much water can result in root rot, Pythium and fusarium diseases.

Optimum soil water reduces waterlogging and saline water-tables.

- soil improvements; such as the addition of compost, gypsum, lime and calcium
- preparation of the soil before planting; ripping and mounding up of the beds
- pulsing irrigations and leaching to flush salts out of the beds
- maintain adequate soil moisture at all times
- schedule irrigations to match crop water requirements
- regularly monitor salinity levels.

Pulsing irrigations with salty water

For pulsing irrigations to be effective in leaching salt out of the soil profile the following key factors need to be known first:

- soil texture, structure, topsoil depth and any impeding layers (carbonate/watertables etc.)
- root zone depth & the readily available water (RAW) value.

The key factors are important, as they will influence how much irrigation water needs to be applied to the crop and how often. Another key factor is that the crop needs to be planted in mounded beds, so as salt is able to be flushed out of the mounds.

The concept behind pulsing irrigations is that water is applied to the crop in short bursts of time, but more often. After a few waters this technique allows the water to spread wider across the beds (lateral spread), which then starts to push salts sideways to the edge of the beds rather than downward into the underlying heavy clay layers where it is trapped.

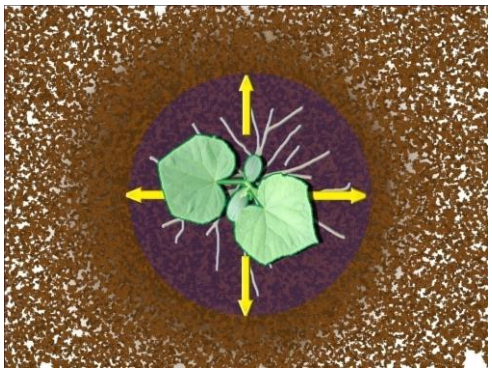
Growing Better Crops

Salinity can become a major problem when the groundwater is allowed to rise close to the soil surface. Shallow saline watertables at less than 50cm from the ground surface on much of the NAP can cause salt to accumulate in the root zone of crops.

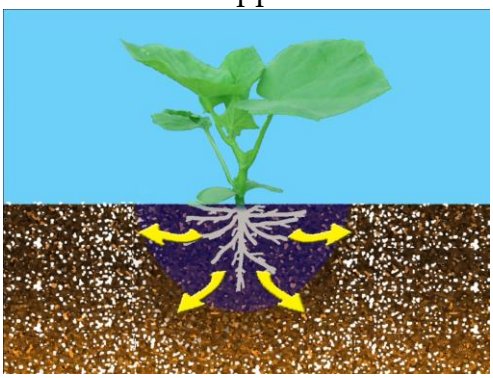
Evaporation and plant transpiration removes soil water leaving the salts behind in the upper layers of soil profile.

Sandy soil types that have large pore spaces and lots of air have a high infiltration rate and effective leaching of salt is achievable.

Clay soil types have small pore spaces, hold water tightly and have a low infiltration rate, making leaching much more difficult.



Left – top view & Right – side view of salts being pushed sideways out of the mounds. Minimal water is going down to the heavy clay layer or water-table.



In most instances leaching irrigations are longer/heavier irrigations to push salts down into the subsoil layers. This is only achievable when you have lighter, free draining soil structures. Not heavy clay!

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