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In the northern Adelaide Plains, almond and winegrapes are winter dormant and can especially benefit from rainfall-induced leaching.

Vegetable crops established during autumn and winter may also get some benefit from winter rainfall leaching.

Glasshouse crops can only benefit if the rainwater is harvested and reused for leaching irrigation between crops.

New glasshouse developments must incorporate harvested stormwater in the system design.

Opportunistic events

SIGNIFICANT rainfall events outside dominant rainfall periods (**Figure 1**) provide windows of opportunity for 'piggyback leaching', where irrigation is applied to refill the soil within the preceding 24 hours to facilitate leaching under the subsequent rainfall event.

System turnaround times, water availability and other factors may not make irrigation prior to rainfall possible.

Instead, the reverse is used, where a significant rainfall event is rapidly followed by irrigation to promote leaching, although the potential reduction in root zone salinity is limited by quality of the irrigation water source.

Drainage

GOOD drainage through and beyond the root zone is essential for effective leaching management, which requires maintaining good open soil structure.

Many natural water and reclaimed water sources are dominated by sodium.

Continual displacement of calcium and magnesium from clay surfaces by sodium can cause serious loss of structure and poor drainage.

The condition is called sodicity and is outlined in a later article.

Monitoring tools

DEVICES are available to log changes in either the volume or tension of soil water, from which the depth of irrigation and depth of plant uptake of water can be determined.

Tension is the energy by which water is held in soil and is partially-determined by salinity.

Higher salinity means that more energy has to be used by crops to take up the soil water.

In-situ probes can also monitor salinity using a range of technologies.

'Artificial roots' or ceramic extractors, such as the model shown, can be used to draw out the soil water from which salinity can be measured using a hand-held EC meter.

A plastic syringe and hand pump is used to form a vacuum and extract the soil solution from the ceramic collector.

Soil water is collected at a similar range of tensions that vegetable crops take up water, which means the salinity of the extracted water is similar to that to which the crop root zone is exposed.

Field measurement of salinity requires calibration with plant response via observations and tissue testing.

When completed in conjunction with soil moisture monitoring and soil testing, the information can reveal whether the crop is experiencing nutrient imbalance or toxicity and/or high overall salinity impacts.

Soil and tissue testing is outlined in a later article.

Daily soil water balancing tools, moisture monitoring equipment and general field observations can be used to associate changes in root zone salinity with irrigation management.

A tool which enables calculation of the daily water balance and leaching fraction, following rainfall or irrigation, is available from the PIRSA website.

Crop coefficients used to calculate water usage assume that the crop is growing under non-limiting conditions, which is not the case for crops affected by salinity, so field observation is essential to refine this tool.

A case study showing how the different monitoring tools can be use to proactively manage root zone salinity is outlined in article 6 of this series.

Positioning sensors

SENSORS should ideally be located within the upper and lower portions of the root zone, with at least one sensor located below the root zone.

Figure 3 shows approximate locations for monitoring systems with four sensors.

The upper two sensors are located in the active root zone where routine irrigation is applied. Positioning them about two thirds towards the edge of the wetted zone will provide more representative data on soil moisture levels and associated salinities.

Sensor 3 is located in the lower root zone.

Routine irrigation may not always reach this depth, resulting in accumulation of salt.

The sensor is important in assessing effectiveness of leaching irrigation and/or rainfall events in removing salt.

The fourth sensor is positioned at a depth that can detect deep drainage under leaching irrigation and/or rainfall.

If the data is showing that the soil is remaining continuously wet, it may be indicating a drainage problem.

Proactive real-time monitoring of root zone salinity is now a reality. Article 6 provides a case study to demonstrate the use of monitoring tools.

The next article in *SA Grower* (July) outlines how leaching is factored into the water budget.

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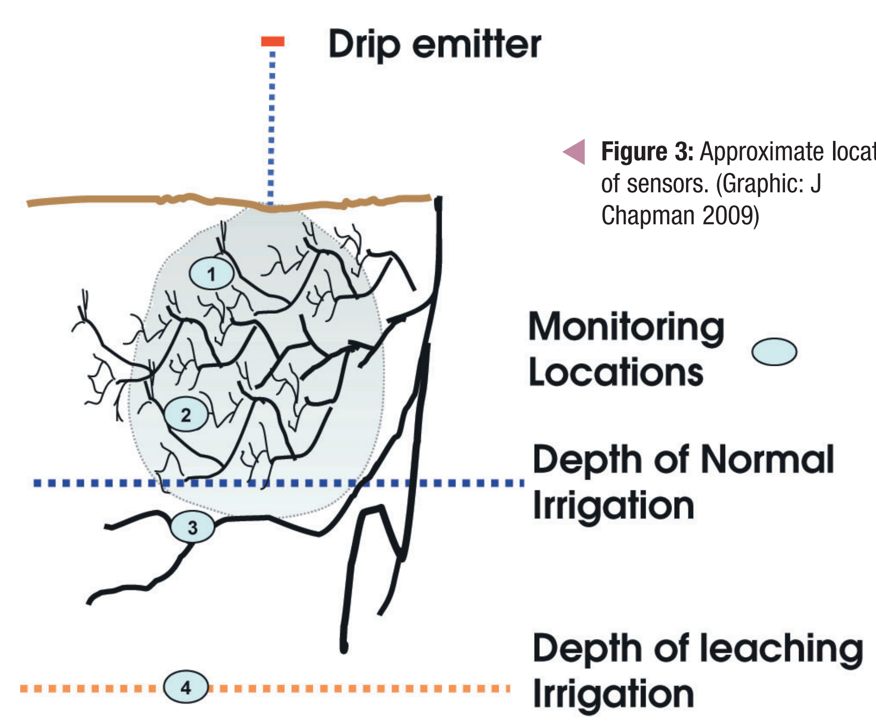
Next month: Targeting salinity management within crop root zones

▲ **Figure 2:** Salinity probes (left) Hydroprobe, salinity and moisture probe. Image Peter Toombe, 2010 and (right) active solute extractor (http://www.Sentek.com.au, 2009).



◀ **Figure 3:** Approximate location of sensors. (Graphic: J Chapman 2009)