Interpreting salt movement using soil water monitoring data

THE same data (Figure 2) over the 'targeted' leaching management period. Leaching under rainfall during the dominant winter period occurred until early September. As the crop came out of dormancy water use to 90cm is clearly shown, an indication that salinity throughout the root zone was not limiting water extraction by the crop. The root zone depth was confirmed (soil pit) to be 85cm, with 85 per cent of root density within the upper 50cm.

Active water extraction to 60cm occurred throughout the monitoring period. Steeper slopes of the plots from late September onwards indicated increasing crop water requirements due to rapid development of the leaf canopy and warmer, drier weather. From mid-September irrigation no longer reached 90cm. Implications for salt build up in the root zone and plant uptake were outlined above from Figure 1.

A10-day break in irrigation occurred mid-October. The crop was forced to search for deeper water potentially leading to uptake of salt which had built up during previous irrigations. Drainage to 90cm occurred from late October to the end of the monitoring period as the result of more frequent irrigation. However the soil at 90cm had not reached the full point indicating that the volume of draining water reaching that depth was minimal and deposition of salt likely. Since the depth of water extraction remained at 60cm uptake of salt deposited around 90cm was less likely.

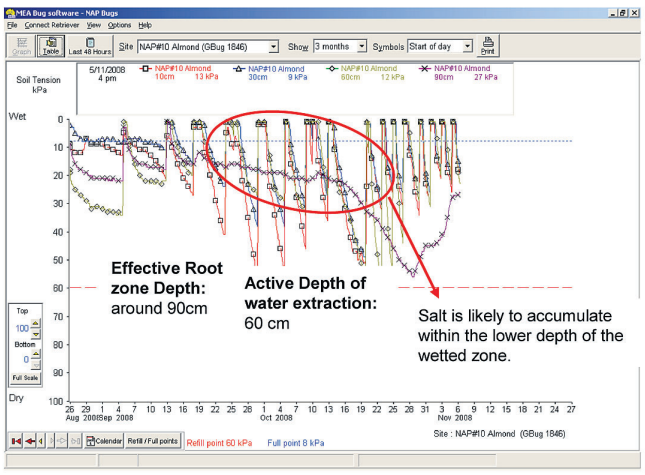

Figure 2: Interpreting salt movement using soil water monitoring data. (Source ICMS 2009)

Outcome of irrigation management on root zone salinity

THE resultant weighted root zone salinity by soil solution extractor is shown in Figure 3. Weighted salinity accounts for the relative uptake of soil water by each quarter of the root zone. The standard FAO weightings outlined in article 3 were used.

Measured salinities of extracted soil solution samples are much higher than other methods used to monitor soil salinity. This is why it is extremely important to calibrate results with plant response via observations and tissue testing. Thus the focus here was to qualitatively look at the overall trend.

Leaching occurred during late autumn and winter (black arrow), with salinity levelling out during August. Salt accumulation represented by the green arrow, coincided with the time when irrigation no longer reached 90cm (Figure 1).

The jump in salinity indicated by the yellow arrow coincided with the break in irrigation. When drainage began to reach 90 cm from late October onwards, root zone salinity levelled out at a new high (light blue arrow).

The rapid increase in salinity shown by the red arrow coincided with major heat wave conditions in January, where irrigation could not keep up with crop demand for water.

The responsiveness of the soil solution extract data to external factors makes this method potentially very useful from a management perspective, backed with field observation of crop response.

Crop response to salinity is usually measured using the saturated paste extract method or ECe. The crop has a threshold salinity of only 1 dS/m after which yield potential declines with increasing root zone salinity. The average weighted salinity was much higher -around 5.5 dS/m.

With good management the crop can produce 60-70pc of the potential yield for the plant species. However, a wet cold winter led to poor seed set and a yield of only 50pc of the potential was obtained that season.

Nearly all irrigation water carries dissolved salts of which sodium chloride is one of the most commonly occurring. Application of irrigation water over a period of time will almost certainly result in the deposition of salts in the soil profile. Sodium ions tend to accumulate around clay particles and can impact on both soil and plant nutrition.

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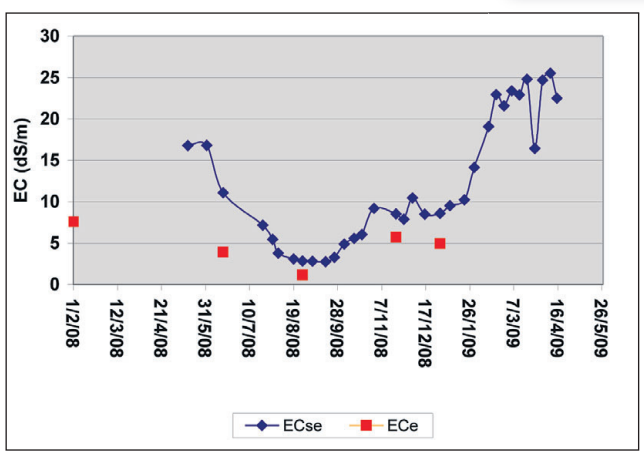

Figure 3: Weighted saturated paste (ECe) and soil solution extract (ECse) measurement. Standard FAO weighting percentages were used. (Source ICMS 2009)

• TRADE NOTES •

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