Lowering the input risk

For growers to have the confidence to change to variable rate fertiliser they need the ability to cost-effectively establish a simple stable base 'map'. Over the past three seasons the Mallee Sustainable Farming Reaping rewards project in partnership with CSIRO and Mallee Focus has field tested the use of electromagnetic conductivity (EM38) as measurement of soil characteristics. The aim has been to developing maps that strongly associate yield and fertiliser responsiveness.

The result from this work is the practical application of EM38 as a tool to assist more cost-effective and lower-risk input use on Mallee soils and consequently an increased rate of uptake of variable rate fertiliser in the Mallee.

Dr Rick Llewelyn, CSIRO who has been leading this research, estimates that over 150,000ha of cropping land have been EM-mapped over the last three years in the Victorian Mallee. With a number of contractors now commonly offering basic EM mapping services for less than $5/ha, EM has become an easily accessible and potentially cost-effective layer of information for growers entering into more soil-specific paddock management.

Electromagnetic (EM) mapping measures the apparent electrical conductivity (EC) of soil. It responds to a combination of soil water, salinity and texture in varying proportions. While it is always necessary to take soil cores to calibrate and validate EM38 measurements, EM38 mapping is particularly useful in the Mallee as readings usually correlate well with soil characteristics that are associated with crop yield potential, such as common salt-related subsoil constraints that reduce plant available water.

Soils with low EM38 zones typically have a low water holding capacity (Plant Available Water Capacity), but because they are deep, plants roots can explore deeply into the soil profile. Zones with high EM38 values typically have subsoils containing higher levels of clay and salt concentrations. Rooting depth in these soils is usually shallow and much of the water in the profile is unavailable to plant roots.

The research has found that the use of EM38 is generally more reliable than just segmenting paddocks by the dune swale formations or by using yield maps alone to define fertiliser input zones.

For example, using five equal-sized zones at Carwarp, SA, the difference in average yield between the highest and lowest EM-based zone was 79 per cent in 2007 and 208 per cent in 2006. However, the difference in yield between the highest and lowest elevation-based zone was 27 per cent in 2007 and 58 per cent in 2006. While the EM mapping appears to be more sensitive, Dr Llewellyn reminds growers that that EM-mapping cannot be relied upon alone to zone paddocks.

"Overall, we have found that soil factors associated EC as typically mapped by EM surveys in the Mallee explained a large proportion of the variation in yield potential and nitrogen responsiveness in all but the very wettest years.

On average the trials have found that reducing nitrogen inputs on the high EM zones by at least half compared to other zones has produced the most profitable strategy in relation to reducing fertiliser costs.

To help advisers and farmers to consider zonal nitrogen management decisions the Mallee Sustainable Farming Zonal N Management tool wasdeveloped by Ben Jones. This tool helps

answer questions such as: if I have a set nitrogen budget for a paddock or cropping program how could it be best allocated?; when do I stop applying nitrogen in one zone and start applying it somewhere else?; how could the optimal rates change if my rainfall expectations change? To learn more about this tool go to: http://www.malleefocus.com.au/pa/page/msf-n-tool.aspx

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