# Three-dimensional measurement of soil water and subsoil constraints using electromagnetic induction

*Brendan Griffiths, Andrew Smart, Sally Poole and Nick Barton, PCT Agservices*

**Key words**

soil water measurement, subsoil constraints, EM survey, pedotransfer function

**Take home messages**

The challenge in our business is to develop methods of measurement of soil physical characteristics that are repeatable, reliable, and accurate to a reasonable degree of confidence. Our current work is revolving around improving the current, and often either fairly subjective, or very labour-intensive methods of assessing soil water, and also understanding and characterising the impact of subsoil constraints.

Most of the work done by PCT Agservices involves the collection and management of spatial GIS data, and applications for the use of that data via management and analytics. Our challenge has been to develop methods of measuring soil physical characteristics that are repeatable and reliable, and accurate to a reasonable degree of confidence. Work largely revolves around the spatial estimation of soil water and subsoil constraints.

A range of different methods can be used when estimating soil water. We are investigating a number of different applications for the use of spatially generated EM datasets. At present, the most repeatable and reliable method we use is derived from a pedotransfer function. These functions model a range of soil physical parameters, including soil water, based on soil textural analysis, from sand, silt, and clay.

Regression analysis is used to create a three-dimensional layer of soil water holding capacity, from geo-referenced soil test points, generated to represent the dataset from the spatially collected EM survey. This provides a modelled, unconstrained soil water holding capacity in three dimensions, and at field level.

From the same EM survey and the same geo-located soil testing points, we again apply regression analysis against other soil test data. This allows us to classify other spatial layers showing the extent of, and depth to, a range of subsoil constraints, largely related to sodicity or salinity, or both.

From this we then can gain a far better visualisation of the ability of the soil to hold water, and the things that may inhibit the ability of the roots to extract it. Once we have classified our layers of soil water holding capacity and of subsoil constraints, we can then relate those layers/datasets back against yield and/or crop biomass to gain an understanding of the extent to which those layers are influencing yield, either positively or negatively.

As mentioned, there are a several other methods/techniques that we are working on that include the use of EM as a tool to spatially estimate plant available water. This is certainly something we are close to perfecting, but at this stage more work is needed to confidently and reliably repeat the method, and we need more full profiles to work with.

**Contact details**

Brendan Griffiths
PCT Agservices
'Shannon', Kentucky Rd Boggabilla
Mb: 0427 715990
Email: brendan@pct-ag.com