EM38, Soil Moisture Probes, and Soil Variability

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EM38 is the most commonly used sensor in detecting changes in soil variability in South Australia. EM38 technology relies on an electromagnetic pulse being sent from one end of the machine through the ground and feeding back into the other end of the machine. The resulting "pulse" is the apparent electrical conductivity (EC_a). The EC_a can be influenced by several factors, some of these include the soil water content, soil salinity, and the relationship between clay content, clay type, depth to clay, or depth to rock.

An EM38 Machine is towed around behind a vehicle. Bluetooth radio in the machine feeds back into the vehicle, and combined with GPS provides a reading for each position.

An EM survey is site specific and provides a snapshot of the apparent conductivity at that particular point in time. Targeted Ground truthing (often involving extensive soil sampling) is an essential step to understanding the nature of the soil variability the EM38 is detecting. EM38 data is generally collected in conjunction with RTK elevation data providing information about the soil and elevation of the surveyed site.

Understanding how the soil varies across a site allows for various changes in spatial management across the site. The technology is currently being utilised across industries including broad acre farming, horticulture and viticulture. It is also utilised by various research agencies to better understand variability across their sites.

Some of the uses in these industries include:

- Variable rate application (both water through automated irrigation, and nutrient application in both irrigated and broad acre systems),
- Soil amelioration (clay spreading, delving, variable rate lime and gypsum applications),
- Planting maps; different crop species or varying root stock,
- Placement of moisture probes in both broad acre and irrigated systems to improve water and/or nutrient management.

Soil moisture probes saw their genesis in irrigated systems in the 1980's. They are now being adopted more broadly as telemetry systems for relaying data have become more versatile, cost effective and user friendly. Easy access to the data has been a key catalyst for increases in adoption.

The uptake and use of soil moisture probes had been primarily in the irrigated agriculture/horticulture industries. The initial use for probes was for decision support information for scheduling irrigation. The squeeze on resources (particularly water), and need for efficiency has become greater than ever.

In recent times soil moisture probes are being adopted in broad acre dryland agriculture. They are being used by cereal growers to predict with a high degree of accuracy how much moisture is left in the soil profile "bucket". This information can then inform decisions made about nitrogen applications, grain marketing, and risk management strategies.

Soil Moisture Probe equipment installed adjacent to a crop

Using EM and Soil Moisture Probes together

Utilising EM data, and understanding the spatial variability across a farm can assist in the most effective placement of soil moisture probes.

The site selection will depend on;

- The end information required,
- Whether multiple probes will be placed across a range of soil types allowing for spatial management,
- Whether an individual probe will be placed to be reflective of the "bulk of the field" that allows for management for the majority of the farm or field.

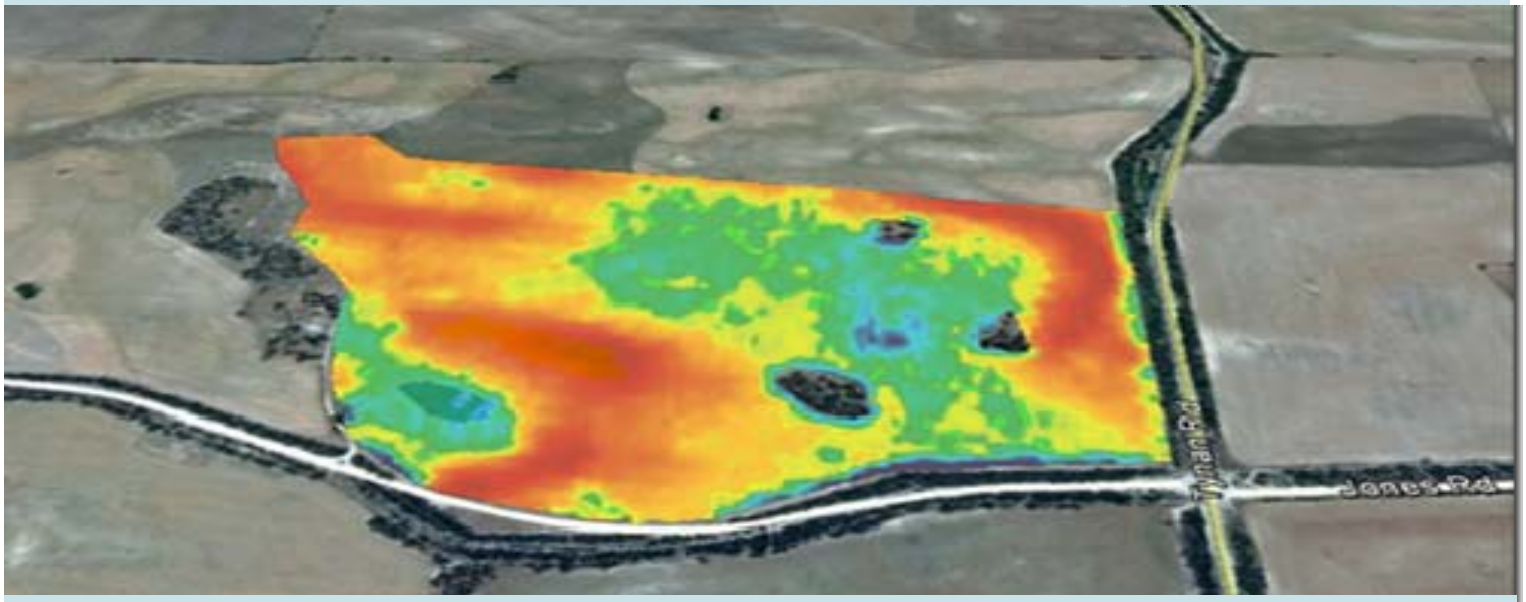
The EM38 (often combined with the elevation data to ensure low wet areas are avoided) can assist in ensuring that the probe site is representative of the field / target area to maximise outcomes.

Some examples of where EM38 data has been utilised in moisture probe placement:

- Broad acre; identifying key soil types and installing probes to improve decision making around nutrient management and yield potentials across the field.
- Broad acre; integration with the 'Yield Prophet' software program (for improved nitrogen decision making), and being utilised to improve risk management.
- Flood irrigation; improved and more accurate irrigation scheduling across paddocks.
- Pivot irrigation; identifying variation in soil water holding capacities to manage them to ensure optimum efficiency and productivity.

A recent example of the use of these technologies working together is the installation of two soil moisture probes in dryland paddocks at Coomandook where different soil types were identified to improve the understanding of water holding capacity and production capacity on these soils.

Sustainability, Agriculture & the Environment



EM38 image showing paddock variability

Tatiara the good country

Coorong Tatiara Local Action Plan

COORONG DISTRICT COUNCIL

Australian Government

National Landcare Programme

Government of South Australia

South Australian Murray-Darling Basin Natural Resources Management Board