farmtalk

This article contains information most relevant to the less than 350 mm rainfall mallee farming region

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Mallee Sustainable Farming Inc. SA NSW VIC

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Precision Ag in the Mallee

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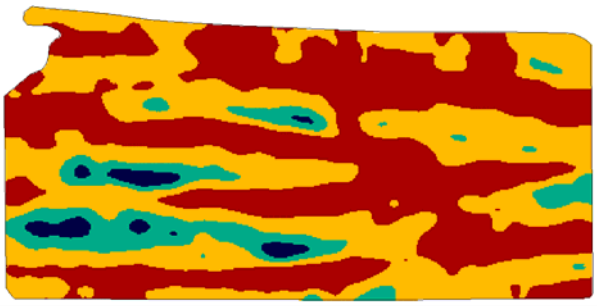

Figure 1 Paddock map showing paddock management zones based on 'Your Soils Potential' software model

The issue

Precision agriculture (PA) is matching each part of the paddock to the correct inputs in order to optimise yield potential. PA is made possible by Global Positioning System (GPS) technology which permits a grower to locate any position in their paddock.

The benefits of Precision Agriculture:

- Improved information leading to better decision making.
- Optimised production from each paddock zone.
- Improved whole paddock productivity and profitability.
- Developing a record of paddock/farm information and traceability for the paddock treatments and activities.

PA Components

Precision Agriculture has four components:

1. Geo-location of paddock information
2. Identifying and characterising paddock variability
3. Modelling
4. Implementing practices to manage variability

Geo-location of paddock data

The geo referenced map of a paddock is obtained from various sources such as:

- the GPS receiver in tractor or header as it drives around the paddock. Data collected can also be placed in different image layers and can be viewed singly or overlayed over one another. Information in these layers is GPS positions, and can also include harvest yield data, NVDI data, elevation, EM38 data and paddock management zone data, or
- From aerial or satellite imagery. PA providers are able to offer high resolution geo referenced paddock maps. Geo referenced maps can be imported into suitable software packages and each data point in the paddock can be geo-located.

Identifying and characterising paddock variability

Each paddock has in-field variation firstly from its underlying bedrock and subsoils. These basic foundational structures result in significant changes in the soils and paddock landscapes, which in turn can cause very large changes in paddock responses. Even flat paddocks can have very significant variation in the soils.

Typical paddock variations are seen in permanent or slow changing features such as:

- Landscape (elevation, hills, slopes and flats),
- Soil textures (sand etc.)
- Soil profile depth,
- Soil chemistry (levels of phosphorus, nitrogen, carbonate, potassium, calcium, ph (acidity or alkalinity), trace elements, salinity, boron, chloride, sodium, magnesium etc. Etc.),
- Appearance of rock or rock layers, and
- Variable features such as climatic conditions (rain, frost, wind, flood)

The permanent features can be mapped onto layers. The variable conditions and their interactions with the permanent features can be modelled and mapped. Each point in the paddock can collect different pieces of information. This database is a valuable tool in decision making on the paddock.

Zoning

Management zones can be delineated within the paddock, and there are various models available to complete this process. The models predict the yield response of each paddock zone and these zones are defined according to the predominant variable causing yield change. For example if frost is the major yield factor then zones will be drawn on elevation or aspect to identify areas according to frost potential.

Other paddock zone models typically categorise zone response to various inputs such as water or phosphorus and or nitrogen. An algorithm is used to draw the management zone layer, which can in turn be imposed over other map layers.

There are a number of models that can be employed to predict potential yield responses such as 'Yield Prophet'.

In the case of the SA and Vic Mallee 'Your Soils Potential' has been used to analyse soil EM38 readings together with physical and chemical information to produce a response curve of unavailable water curve for each EM38 reading.

From that curve the distinct zones are determined. Ultimately the farmer makes the decision according to risk, cost and potential yield benefit. PA agronomists can smooth the process between GPS hardware and computer software handling the various information layers and also provide valuable contribution into the decision making process.

Implementing practices to account for variability

Application of crop management decisions requires seeding, spreading or spraying equipment that supports variable-rate technology (VRT). Variable rate inputs could be:

- Fertiliser, such as Phosphorus and or Nitrogen, but also trace elements
- Crop type – for example wheat in the flats, lupins on the hills
- Seed rate – higher canola rate on the hills to maintain effective establishment rates

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Once the management decisions are made prescription maps are loaded into the tractor or sprayer computer which in turn manages the variable rate controller in the seeder, spreader or sprayer.

The prescription map enacts the zone management plan for each location in the paddock. The seeder, spreader or sprayer computer also records the final application in a verification map.

In Summary

Using Precision Agriculture:

- Is not about trying to even up the yields across the paddock,
- It is recognising and understanding the variations in yield potential.
- Is applying the appropriate inputs to best allow that potential to be reached.
- Is not always about applying more fertiliser, but rather redistributing inputs into the areas of greatest potential return.

Technology will not replace good agronomy and technical knowledge. The best results are found when good technology and agronomy are matched.
New technologies are becoming available including crop sensors to identify in-season crop input needs and even protein sensing at harvest – all increasing the bang for your buck.

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