MANAGEMENT OF SOIL CONSTRAINTS IN THE POTATO INDUSTRY

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Soil characteristics and nutrient status can vary significantly across the area of a pivot. Varying or matching fertiliser applications to the needs of different zones will result in a more uniform crop, as well as maximising yield and quality. But how to do this?

PUTTING NUTRIENTS WHERE THEY'RE NEEDED

Ben and Greg discussed the benefits of grid-based soil mapping. This high-definition soil sampling technique is used to produce "maps" showing what rates of gypsum, phosphorous and other nutrients need to be applied where, and what soil types are present. Greg showed an example where Colwell P under a pivot ranged from only seven to 66 (Figure 13).

GPS referenced samples (0-20cm) are taken using an automated soil sampler mounted on an ATV. For a standard 1ha grid, 8 – 10 subsamples are collected in a diagonal across different grid lines. These can be tested for pH, nutrients, and other factors (OM%, bulk density, disease etc).

The resulting "prescription file" is supplied with the necessary GPS coordinates to properly apply the nutrients through VR compatible spreaders. This might be used, for example, to alter application of MAP based on phosphorous requirements. So, for the pivot noted above, MAP application ranged from 0 to 600kg/ha. While the average was 230 kg/ha, application was targeted at those areas where it was needed and avoided where it wasn't (Figure 14).

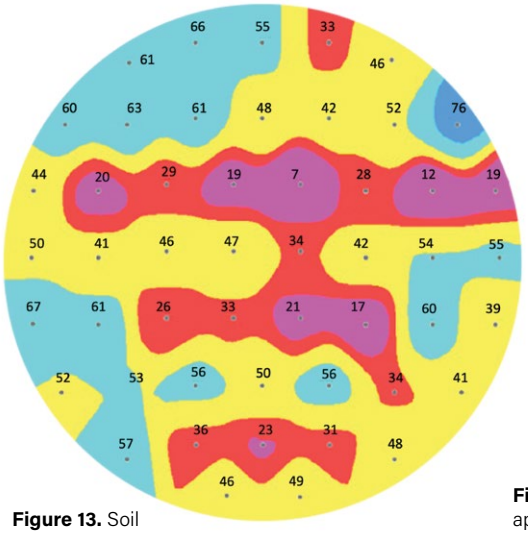

Figure 13. Soil sampling on a 1ha grid – Colwell P

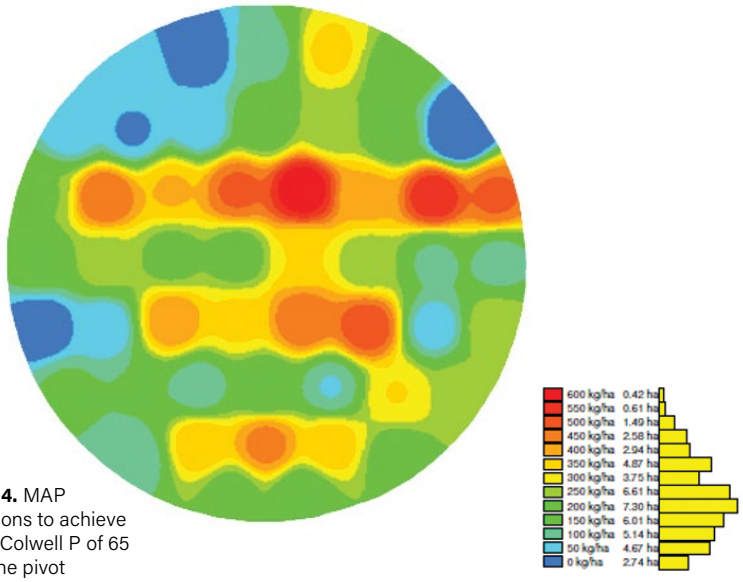

Figure 14. MAP applications to achieve uniform Colwell P of 65 across the pivot

Figure 15. EM38 maps can be used to change seeding rates during planting, with wider spacing on lighter soil types

ELECTROMAGNETIC SOIL MAPPING

Another service Precision Agriculture provides involves measuring soil conductivity (EC) to create an EM38 map. Electrical conductivity is influenced by the water holding capacity of the soil, so can be used as a proxy for different soil textures. "Overwatering or underwatering can have a huge impact on how well potato crops perform," commented Greg. "Using an EM38 map and identifying the different soil textures under a pivot helps us to set up variable rate irrigation on compatible pivots. Not only are there potential water savings, but major improvements in both uniformity and yield which drives better returns."

The previous issue of PotatoLink described how software systems such as John Deere T3RRA Cutta or OptiSurface can be combined with ditch digging hardware to improve water flows under a pivot. Greg confirmed the usefulness of such systems, "You can also combine the EM38 data with elevation to develop drainage maps. Adding drains (surface or subsurface) to remove excess water and prevent ponding can really help overall crop yields and harvestability."

EM38 maps might also be used to change seeding rates – with wider spacings used on light soils compared to heavier areas, allowing all tubers to reach similar sizes (Figure 15). "New systems are available now in the potato equipment scene which adjust planting rates on the go, these are already used quite commonly in broad acre cropping."

SO, HOW MUCH?

The average cost of doing basic soil testing is around $65-70/ha. "This is a cost that could be returned in lime savings alone," states Greg. "Additional savings are likely in terms of reduced fertiliser applications as well as higher crop productivity."

While adoption is still in the early stages, a number of larger potato companies have been trialling the technology, as have other industries such as onions, leafy greens and tree crops.

In an environment with increasing input costs, tight margins, and pressure to grow ever more sustainably, smart farming technology like this is only going to become more important.