CASE STUDY

Point of Difference Project:

The Point-Of-Difference (P.O.D.) Project funded by the Great Barrier Reef Foundation and delivered by Farmacist focuses on refining nutrient and chemical management by increasing the adoption of precision agriculture within the sugarcane industry. In addition to the delivery of an extension support program, grower incentives, and the collection of soil datasets, the project provides funding to improve the understanding of and further investigate soil constraints.

Project Involvement:

Background

In January 2021, a Mackay canegrower planted a crop of Kuranda soybeans in a fallow block with the aim of growing it for seed. Electrical connectivity (EC) mapping had been undertaken in May of 2020, with a soil test taken in the 0-20 cm layer in September of the same year. The soil test did not indicate any major constraints to production.

A sorghum crop planted in September and harvested in December demonstrated a number of poor growth areas. This was further evident in the soybean crop with germination being extremely patchy, and large areas having no plant population at all.

Following the application of a desiccant in June, the poorer-performing soybean patches died off at a faster rate than the remainder of the paddock. After harvest of the soybean, sensitive weed dominated these areas.

As the canegrower had become a participant in the POD project, funding was available to undertake further investigation into identifying the underlying causes of the within-paddock variability and provide guidance to determine the best possible management methods.

Figure 1: Poor patch in the soybean crop showing no germination.

Figure 2: Sensitive weed dominance following soybean harvest.

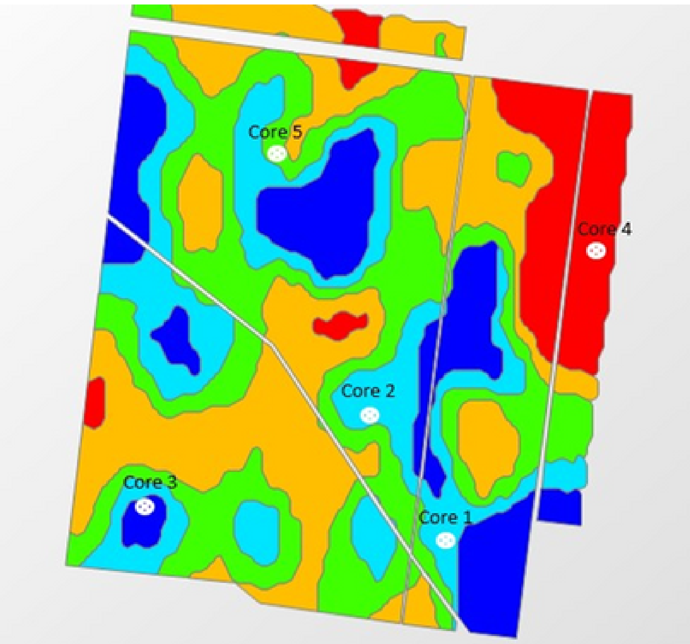


Figure 3: EC map and core location map of the paddock.

Methods:

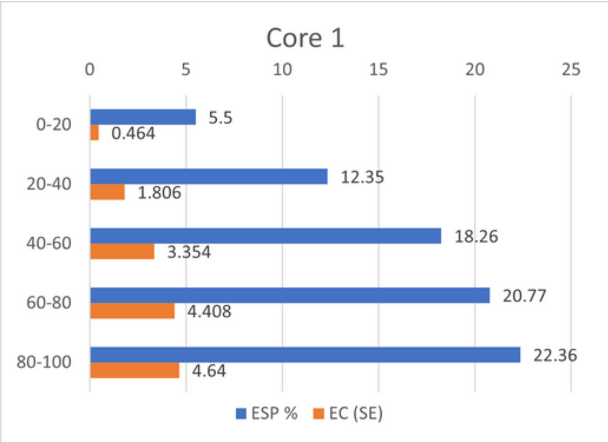
Based on the results of EC mapping and the presence of restricted crop growth, five soil cores were taken in varying sites to a depth of one metre. From each of these cores, soil samples were taken for 0-20cm, 20-40cm, 40-60cm, 60-80cm and 80-100cm depths and submitted for a complete analysis.

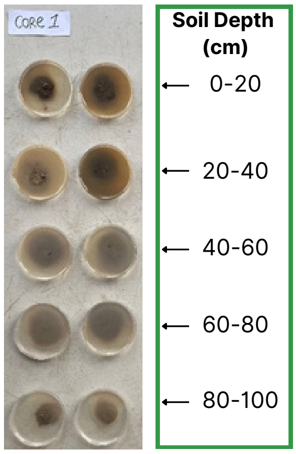
The soil from the cores were also tested for aggregate strength using an Aggregate Stability in Water Test (ASWT). A small soil aggregate is placed in a shallow dish of distilled water and monitored for slaking or dispersion. Slaking is when the aggregate falls apart into smaller crumbs and dispersion is when individual clay particles disperse into a fine suspension making the water cloudy. Dispersion is a useful indicator of sodicity in soils.

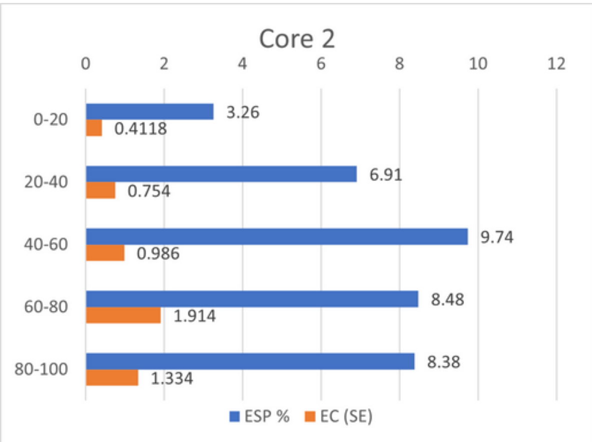
Results:

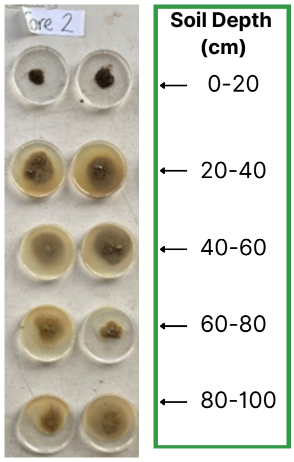
The results of the ASWT test were helpful in confirming the existence or absence of sodicity levels in soils. This was evident in the soil test findings, which revealed a significant rate of dispersion when the exchangeable sodium percentage (ESP) was greater than 6%. When the ESP is between 6 and 15%, the soil is deemed sodic, and when the ESP is greater than 15%, the soil is termed severely sodic. Other cations, such as calcium, magnesium, and potassium, are displaced from cation exchange sites on clay particles by sodium, causing soil particles to spread. As a result, the structure is compromised, and the pore space and permeability to both air and water are reduced.

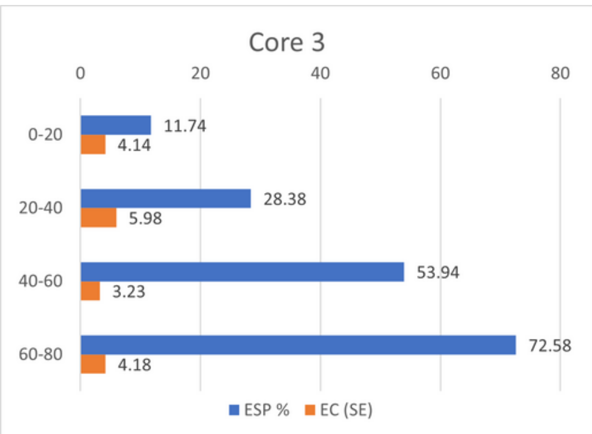
The ESP in the topsoil was 11.74% in the poorest performing locations where no soybeans developed, but increased to 72.58% in the 60-80cm soil profile, as expected, because sodicity increases with depth. The importance of ground truthing in block variation is highlighted in core 1's results, where the topsoil sodicity result was 5.5%. This typically means no soil amelioration would be applied because it is below the 6% threshold, but the ESP rose to 22.36% at depth, which would have an impact on cane yield. Without significant ground truthing, this would not have been detected. When the soil is improved where necessary, the cost of ground truthing can often be offset by the savings in input costs and enhanced cane output.

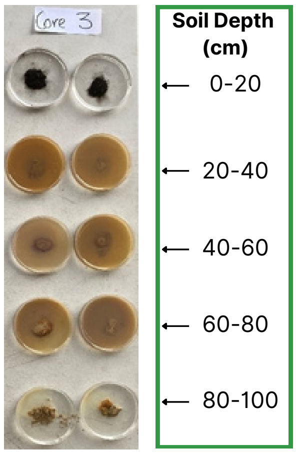


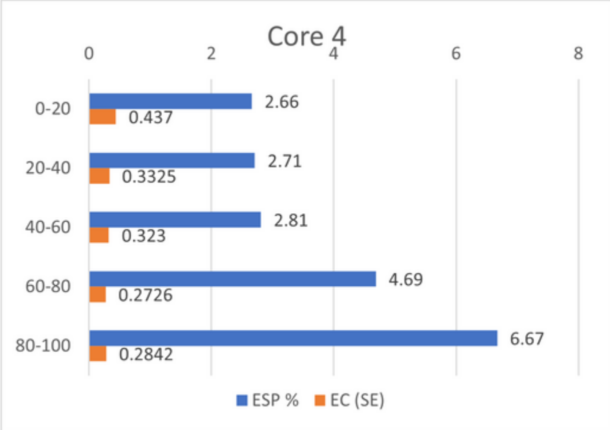


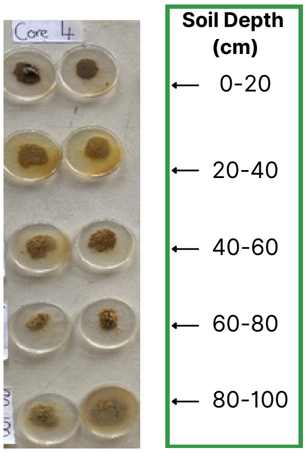


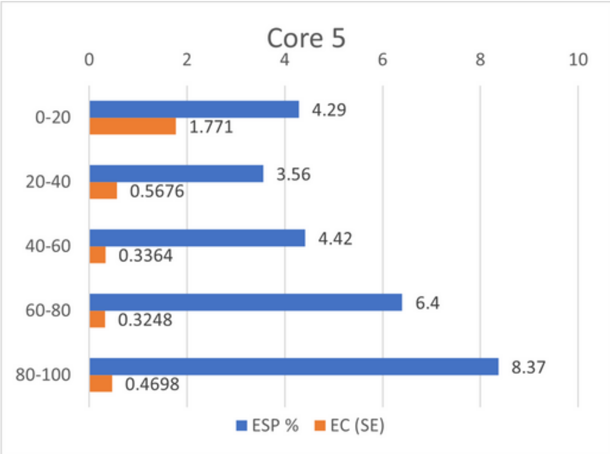


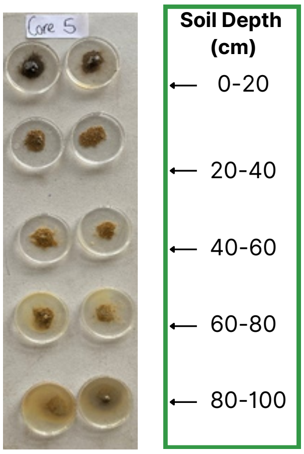












Ground-truthing to provide answers:

The type and extent of soil restrictions can be easily determined by ground truthing through deep soil core investigation. The use of spatial data sets like yield and electromagnetic maps can help determine the best soil test locations.

Although it is not always possible to solve soil constraint issues right away, identifying them is the first step towards resolving the problem. Fertiliser can be managed differently until the block is fallowed, where the constraints can then be addressed with the appropriate method.

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