# Managing Soil Variability

**CRDC Grassroots Grant** 







Call to action for anyone with an interest in soils!

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Regional Soil Coordinators across Australia are developing a soil capacity gap analysis to help guide the future of our soils and are looking for your feedback!

Survey link below melbourneuni.au1.qualtrics.com/jfe/form/ SV\_6J...



"Aims to understand the current gaps in soil: knowledge, management, adoption and extension practices."









# Surveying & Sampling

- Standard Average Field Sampling
- EM survey & strategic zones
- EC (Veris) survey
- Grid Sampling
- Yield mapping zones

The recommended number of samples for a single comprehensive surface 0-10cm or 0-30cm soil test is 30 to 40 cores. This is the same for deep cores or surface in dryland systems. (Peverill, Sparrow & Reuter, 1999)



## Liebigs law of minimum



K & S

# Target Low Hanging Fruit

- Acidity (pH)
  - Soil Buffering capacity (CEC)
  - Driven by Past Production
  - Past amelioration and field history
- Sodicity (Exchangeable Sodium %)
  - Soil characteristics and parent material
- Phosphorus Variability (Colwell P)
  - Driven by Production
  - Farming practices Fertiliser rates

## EM Survey





## Soil zones



## Cotton yield v EM



- DualEM 100cm

# Grid Mapping

- Grid size optional to suit farming system
- 0-20cm depth (0-10cm dryland)
- 1ha grid (commercially 2ha common)

- Demo Farm
  - 0-20cm Depth
  - 1 ha grid





Average pH 5.89



#### Average t/ha 2.48





#### Average Colwell P -21



Average MAP rate – 198kg/ha

K Y S





Study Area – Green appears first on graphs Griffith-Coleambally, purple appears second Hay-Carrathool



Acidity





Average pH 5.89

Acidity



## Sodicity



## Phosphorus



## Magnesium



## Calcium:Magnesium Ratio



# Key Learnings

- Standard soil sampling practices may no longer be fit for purpose
- Identifying soil variability and the limitations to production in each field/farm is key
- More investigation into Calcium Magnesium Ratio, their interactions for soil structure & nutrient uptake
- Building valuable spatial data layers takes time start ASAP
- Quality data capture is critical

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- Managing soil variability is essential for optimizing agricultural productivity and sustainability. Soil variability refers to the natural differences in soil properties, such as texture, nutrient content, pH, and organic matter, within a given area. It can significantly impact crop growth, yield, and overall farm performance. Here are some strategies for effectively managing soil variability:
- Soil Testing and Mapping: Conducting soil tests to analyze nutrient levels, pH, and other critical soil properties is the first step in managing variability. Soil testing provides valuable insights into the specific needs of different parts of the field. The data obtained can then be used to create soil maps, highlighting areas with distinct soil characteristics.
- 2. Precision Agriculture Technologies: Embrace precision agriculture techniques and technologies to manage soil variability. This includes using Global Positioning System (GPS) technology, geographic information systems (GIS), and remote sensing to map and monitor the variability across the field accurately. These technologies enable farmers to apply inputs (e.g., fertilizers, water) more efficiently and precisely, based on specific soil requirements.
- 3. Variable Rate Application (VRA): VRA involves applying inputs (fertilizers, pesticides, etc.) at varying rates across the field, according to soil properties and crop needs. By using VRA equipment, farmers can target specific areas with different input requirements, thus reducing waste and optimizing resource utilization.

- 4. Crop Selection and Rotation: Choose crop varieties that are better adapted to the varying soil conditions. Some crops may perform better in certain soil types or with specific nutrient levels. Crop rotation can also help mitigate the impact of soil variability, as different crops have diverse nutrient demands and can improve soil health.
- 5. Soil Amendments and Fertility Management: Implement strategies to improve soil fertility and structure in areas with poorer soil conditions. This may involve adding organic matter through the use of compost, cover crops, or manure. Additionally, adopting sustainable practices like reduced tillage can help maintain soil structure and organic matter content.
- 6. Water Management: Soil variability often affects water retention and drainage. Implement appropriate water management practices such as contour plowing, terracing, or installing subsurface drainage systems to ensure adequate moisture levels throughout the field.
- Adaptive Management: Continuously monitor and evaluate the effectiveness of soil management strategies. Keep records of crop performance and soil conditions over time to identify trends and make necessary adjustments.
- Education and Expert Advice: Stay informed about the latest developments in soil management and seek advice from agricultural experts, agronomists, and extension services. They can provide tailored recommendations based on local conditions and crop requirements.

By implementing these strategies, farmers can better address soil variability, enhance agricultural productivity, and promote long-term soil health and sustainability.