



meatup FORUM

**For the latest in red meat research and development
Cooma, NSW – 13 May 2026**

Managing Soil Acidity: putting Theory into Practice

Theory

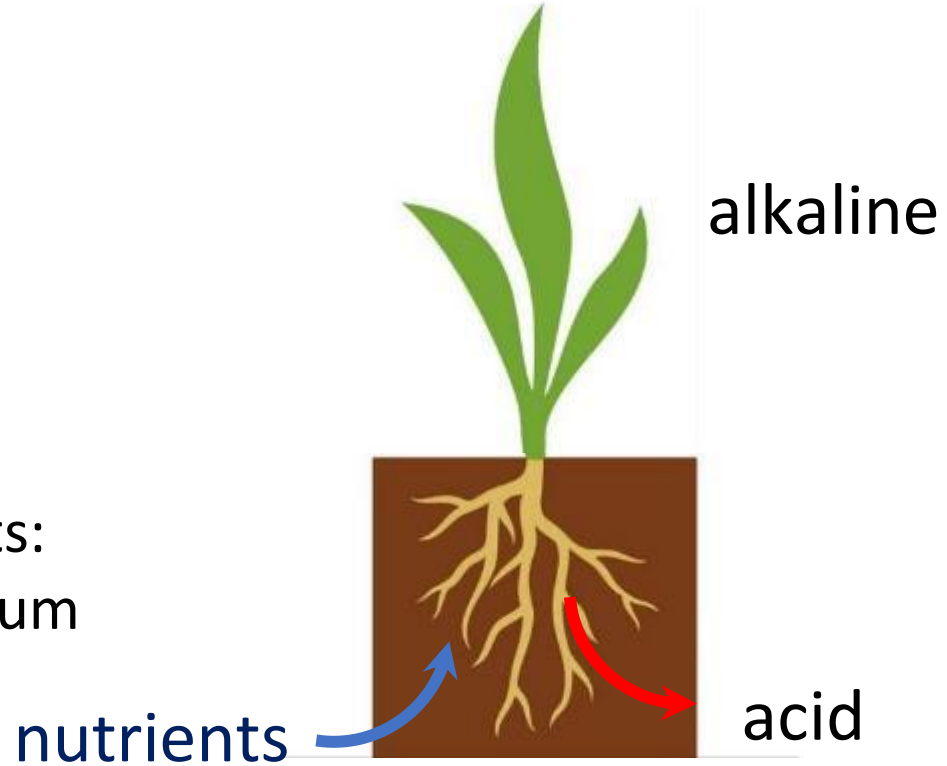
Richard Hayes
NSW DPIRD

Practice

John Jeffries
Delegate Station

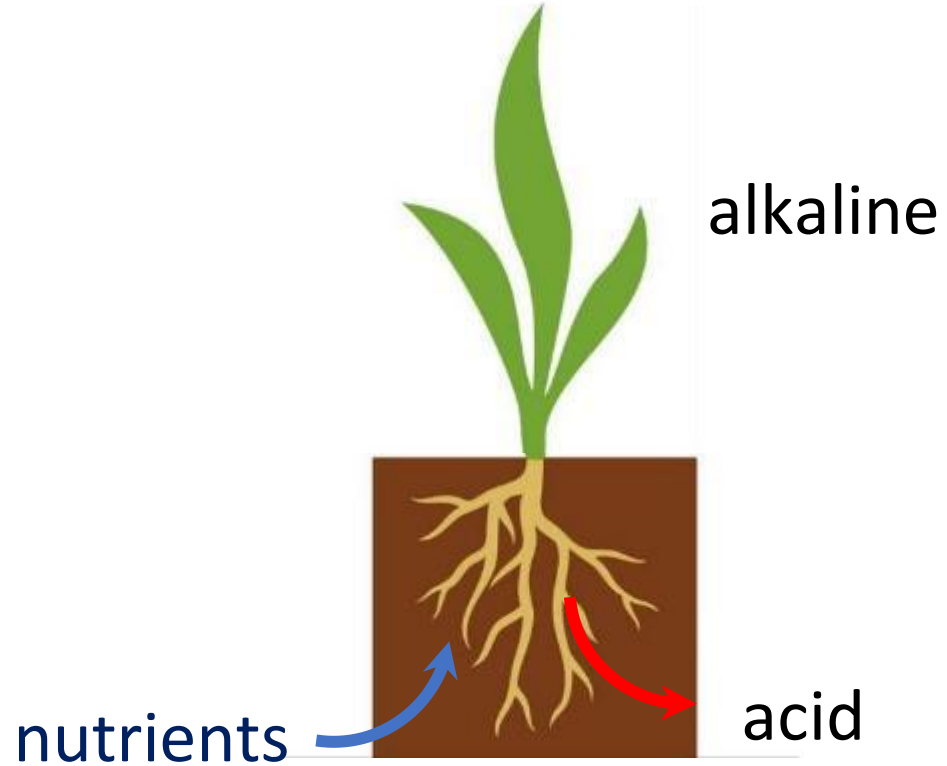
How did we get to this?

Nitrogen inputs:
Urea, ammonium
Legumes



How did we get to this?

Grain
Hay
Meat
Wool



We are all on the same track



Slide: Courtesy J. Condon

Changes in pasture and soil properties with liming and superphosphate application on five soils in the Central Tablelands of New South Wales over 12 years

P. M. Dowling^{A,B,F}, I. A. Vimpany^{C,D,F}, M. K. Conyers^{E,F} , G. D. Millar^A, K. R. Helyar^{E,F}, D. L. Michalk^{A,F}, H. I. Nicol^{A,F}, J. Bradley^{D,F}, P. J. Milham^{D,F,G} and R. C. Hayes^{E,*} 

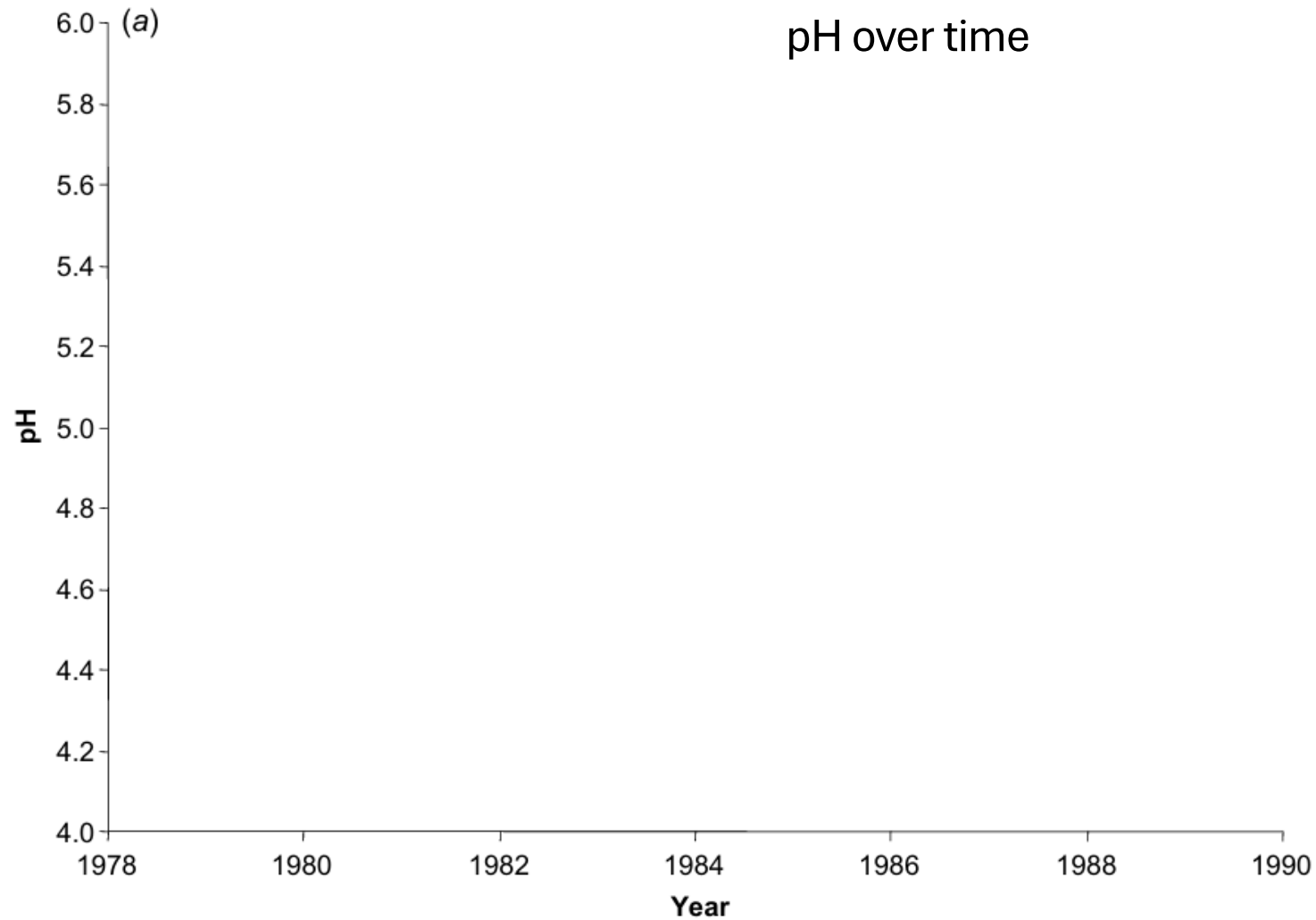
5 × sites

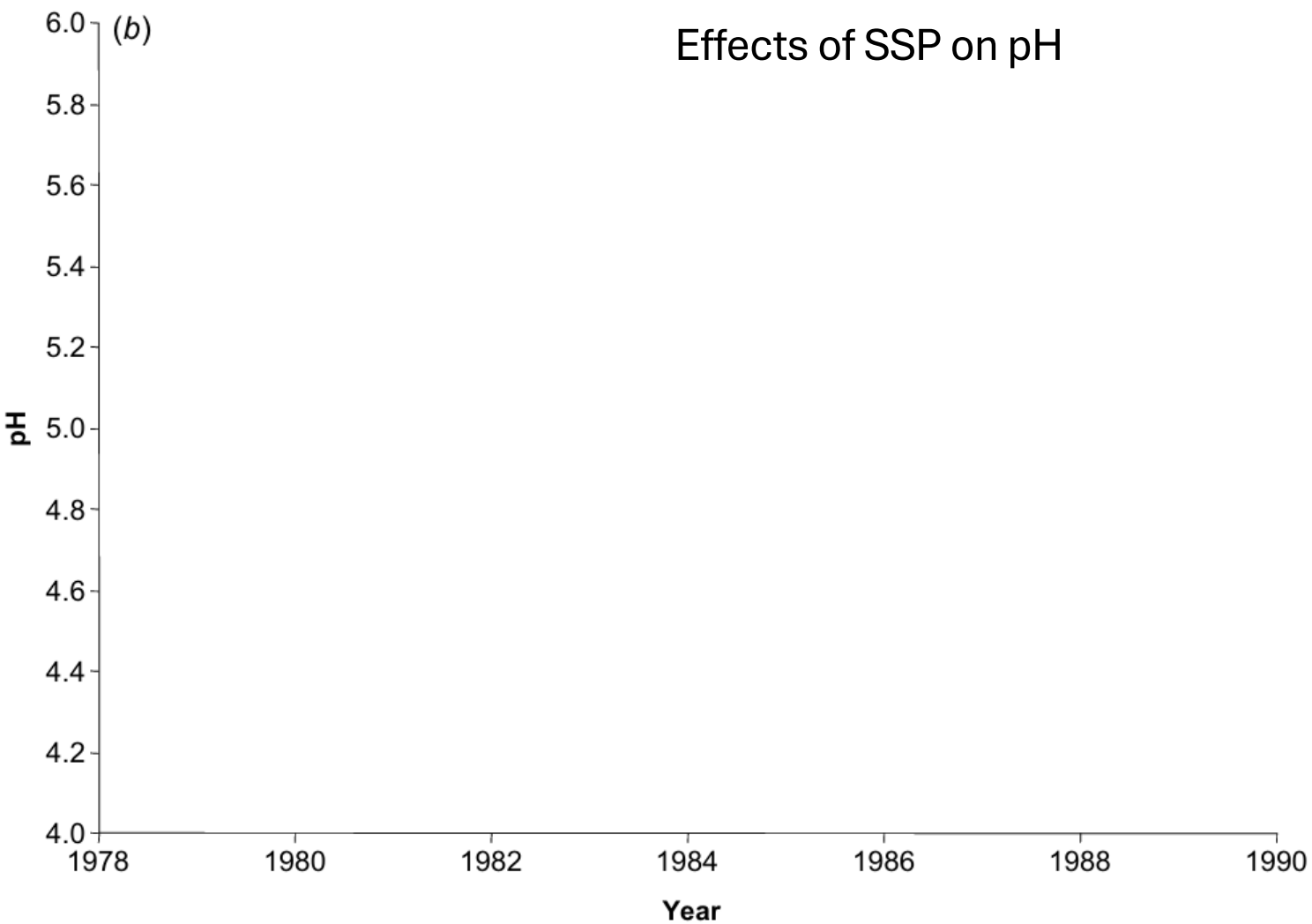
10 × trials

5 × lime rates

3 × superphosphate rates

pH over time



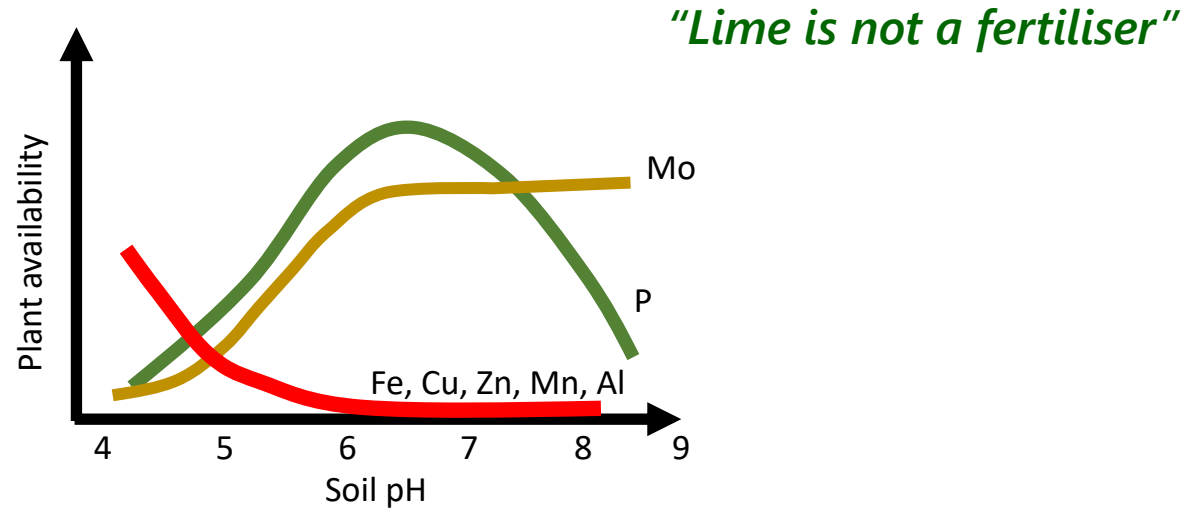


What happens at the destination Acidity?

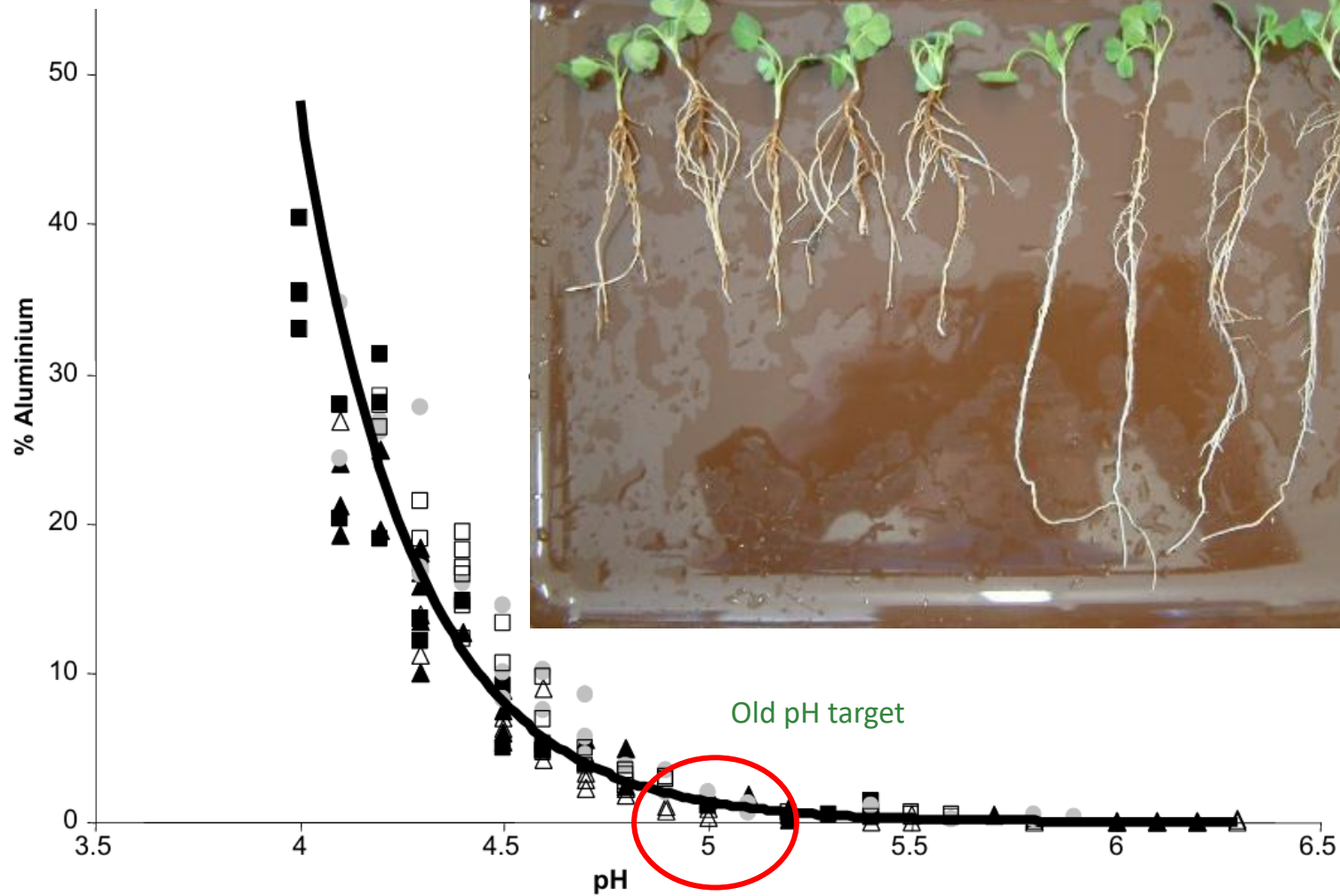
Affects nutrient availability

Potential to affect:

- Plant growth
- Microbial populations
- Macro-organisms (eg worms)



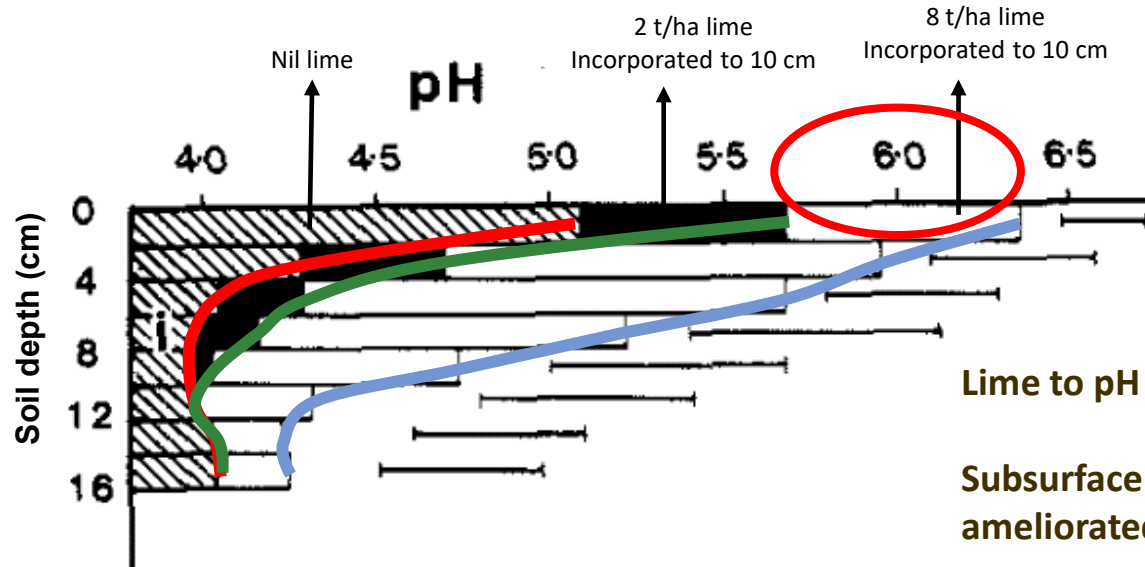
Source: agric.wa.gov.au



Revised pH target...

The influence of surface incorporated lime on subsurface soil acidity

M. K. Conyers and B. J. Scott



Lime to pH ≥ 5.5 at the surface, then...

Subsurface acidity begins to be ameliorated

Stratified pH profile

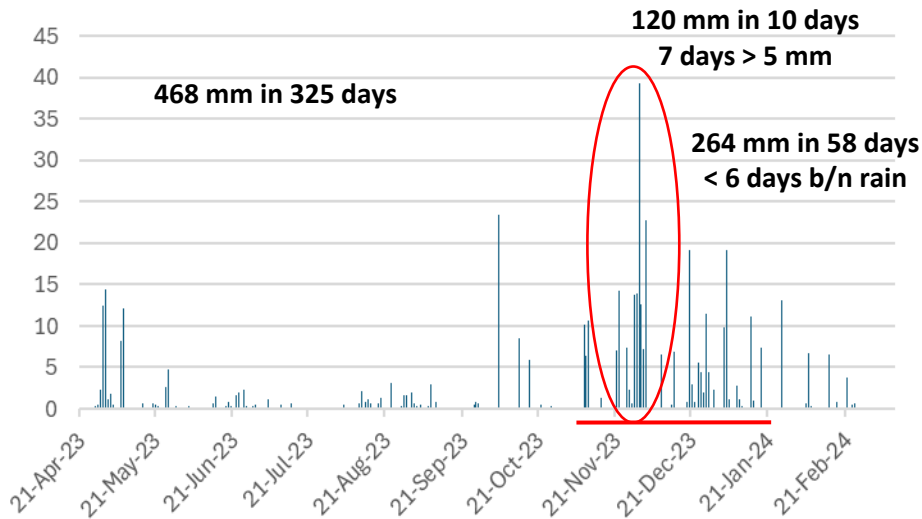
pH ameliorated to the depth of incorporation

Subsurface pH ameliorated

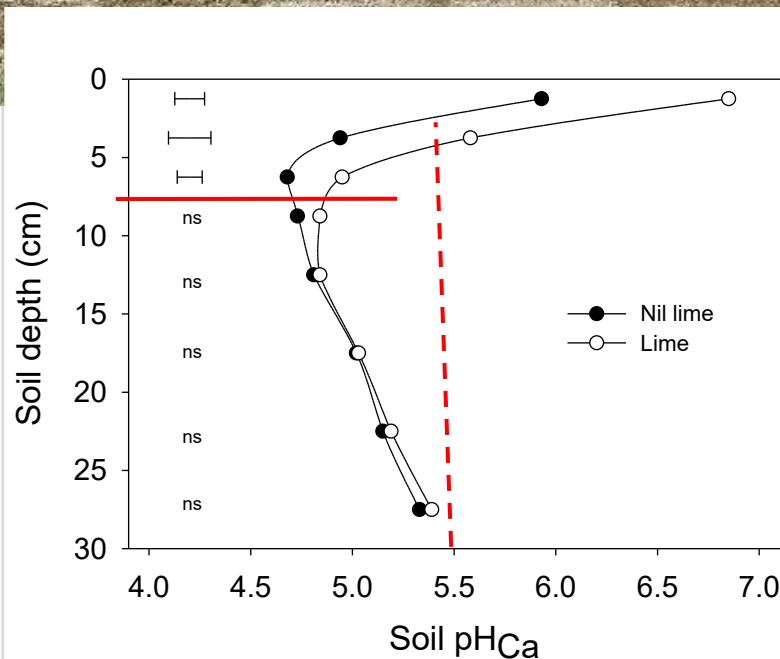
Bungarby lime



Rainfall post-lime



Limed (& sown!) 21 April 2023
4.5 t/ha surface applied



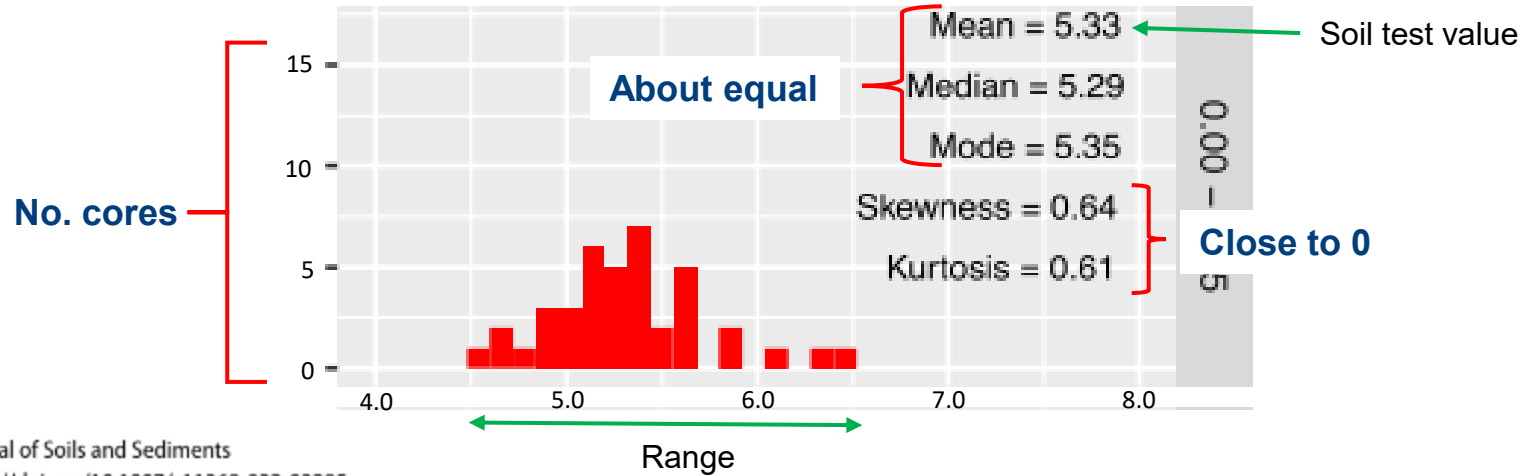
Soil sampled 11 March 2024

Interpreting soil test results



- The extent of soil acidity is underestimated by soil test values, due to:
- Soil sampling practice
 - Stratification
 - Depth of sampling
- Interpretation
 - Skewed distribution
 - Precision of soil tests

pH distribution



Journal of Soils and Sediments
<https://doi.org/10.1007/s11368-022-03285-x>

SOILS, SEC 1 • SOIL ORGANIC MATTER DYNAMICS AND NUTRIENT CYCLING •
 RESEARCH ARTICLE

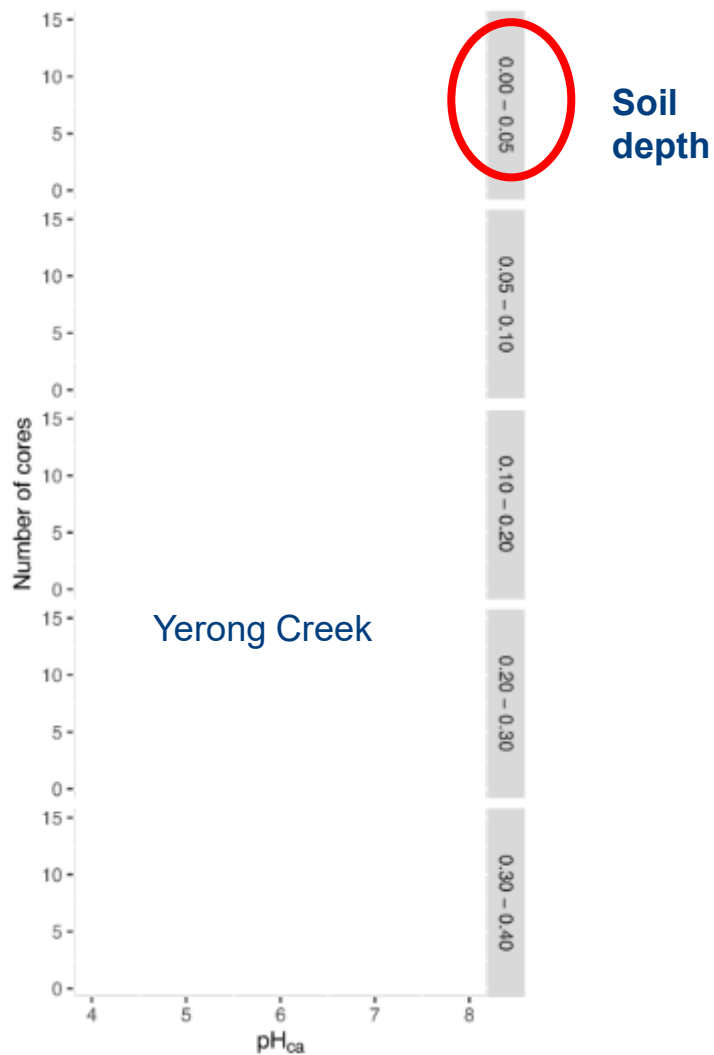
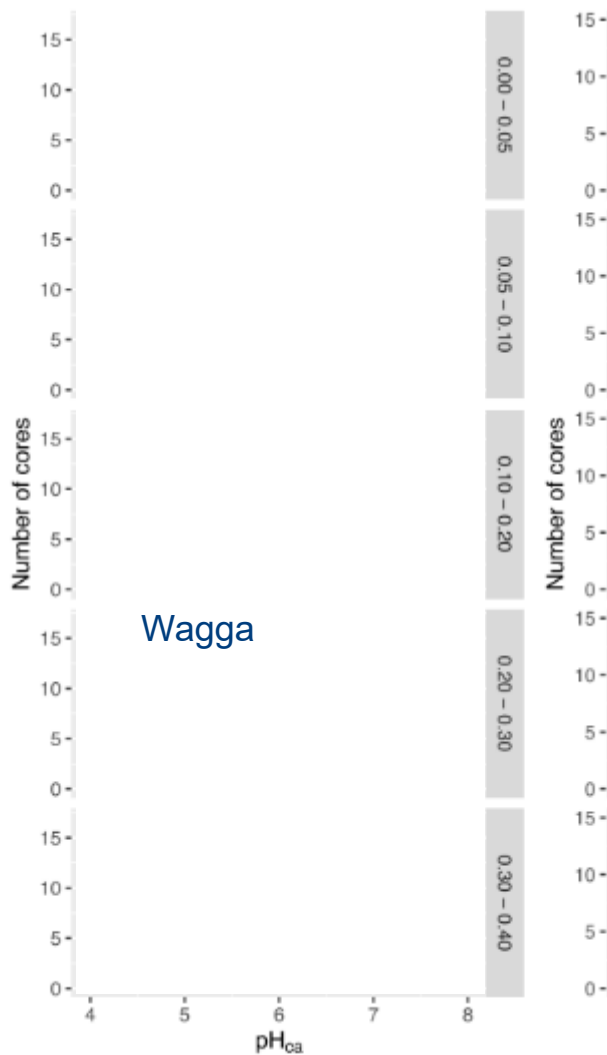


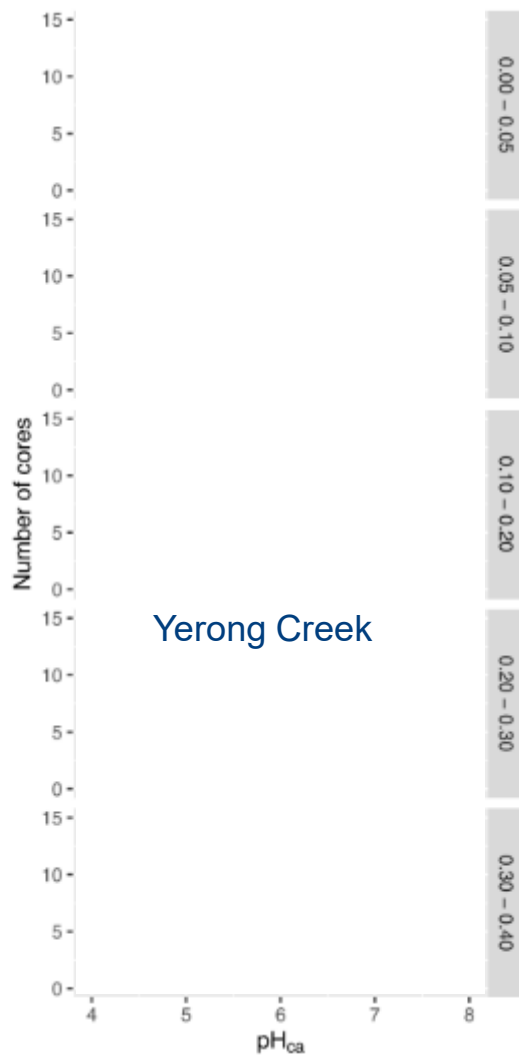
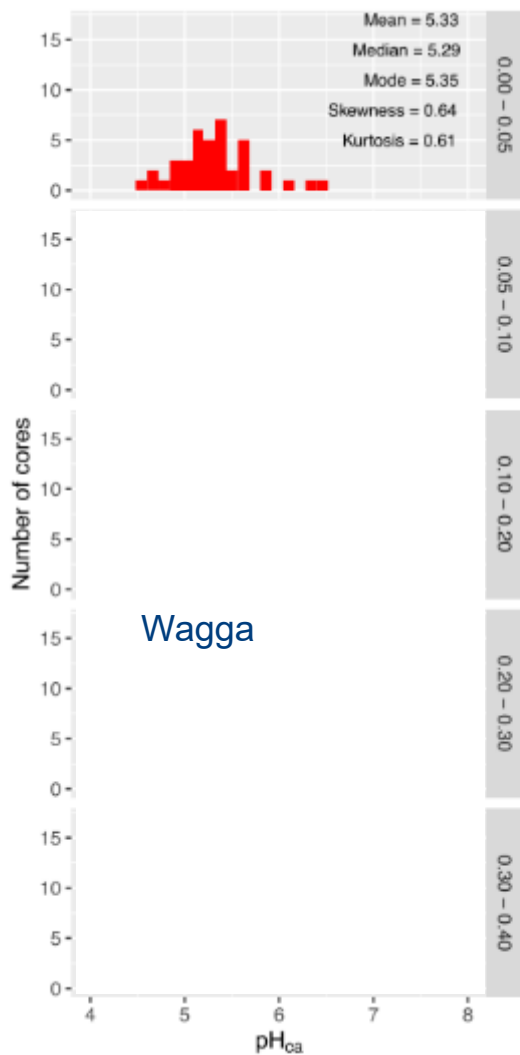
The nature of spatial variability of four soil chemical properties and the implications for soil sampling

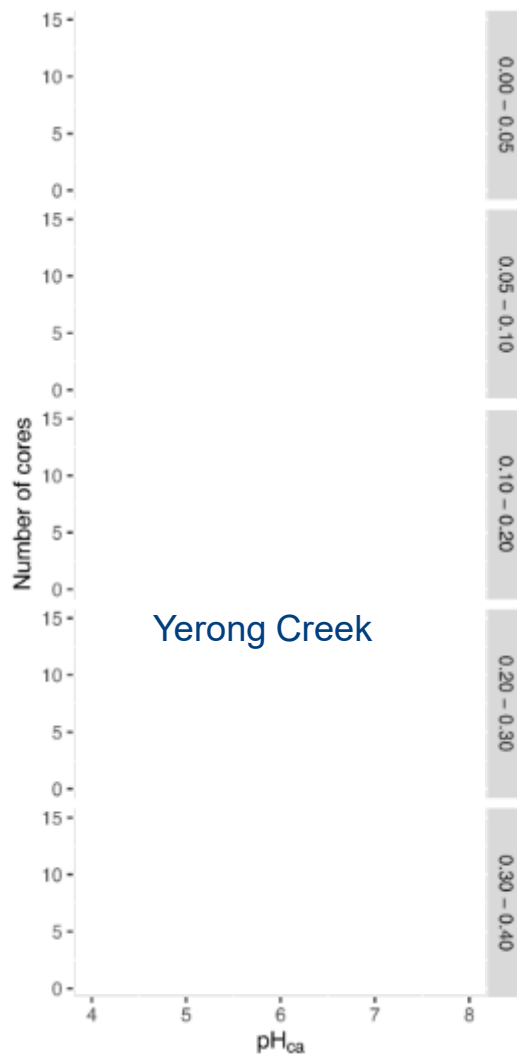
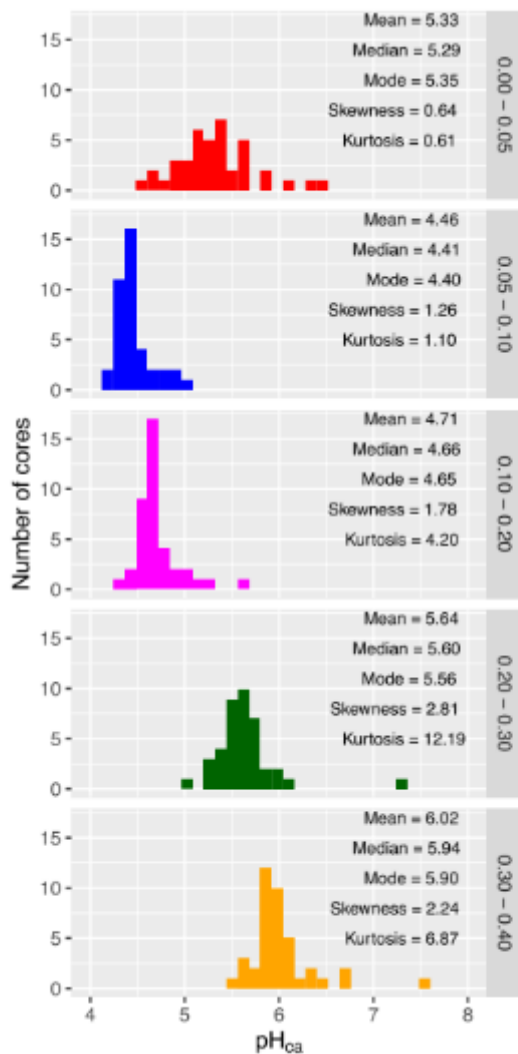
R. C. Hayes¹ • M. Rohan¹ • G. D. Li¹ • S. E. Orgill¹ • G. J. Poile¹ • A. A. Oates¹ • M. K. Conyers¹

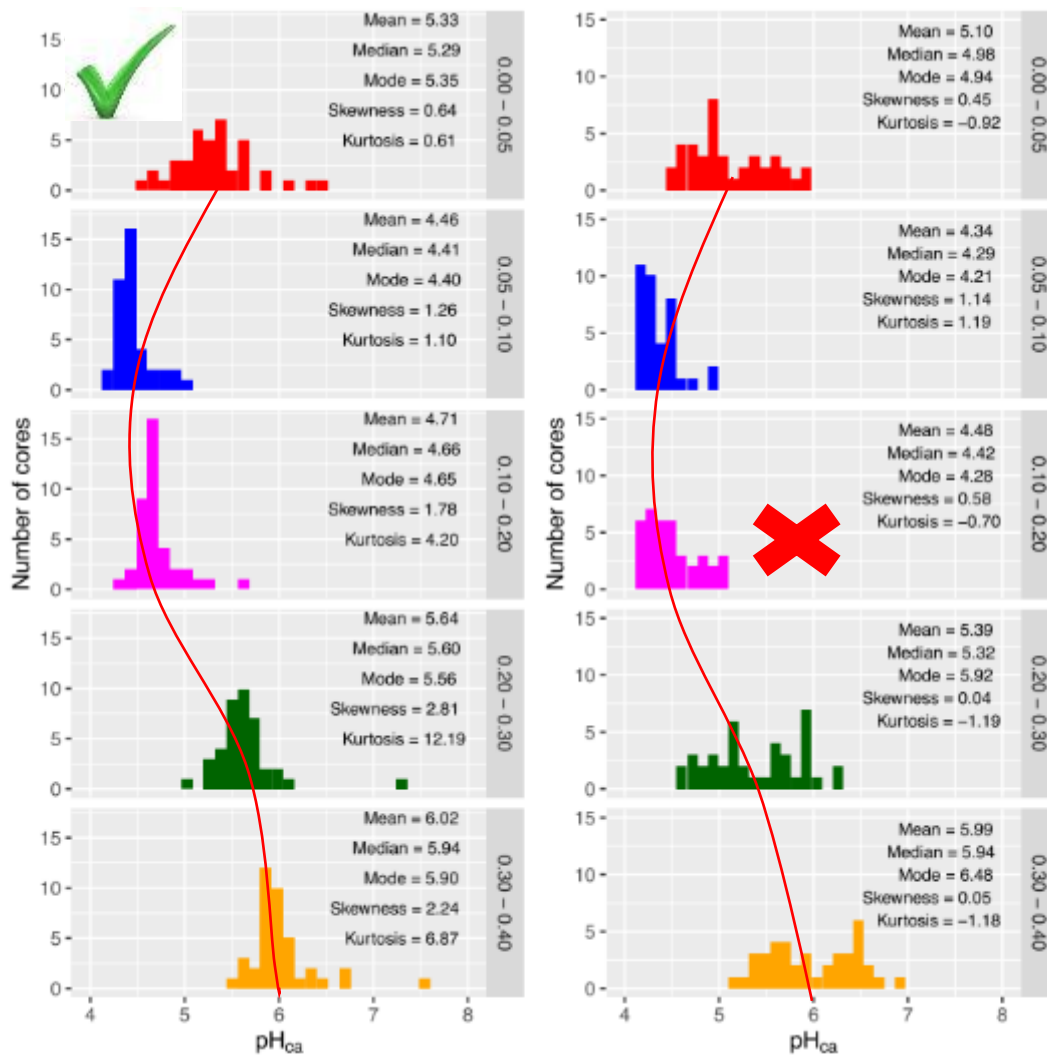
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Underestimates
acidity by 0.2
pH units

Sampling precision: Number required
(44 mm cores)

Sampling precision

- @ Colwell P 30 mg/kg; 15% precision = 4.5 mg/kg
 - Therefore, Colwell P 26 $\approx$ Colwell P 34
- @ pH_{Ca} 5.0; 5 % precision = 0.25 units
 - Therefore, pH_{Ca} 4.8 $\approx$ pH_{Ca} 5.2

Fewer soil cores = less precision

Take home messages

- We are all on the same tracks – destination acidity
- Soil sampling to manage/monitor acidity:
 - 5 cm depth intervals to identify stratification
 - Sample to ≥ 20 cm to identify subsurface acidity
 - Make allowance for error in soil test results
- New target pH 6.0 IF you want lime effect to move

Managing Soil Acidity: putting Theory into Practice

Theory

Richard Hayes
NSW DPIRD

Practice

John Jeffries
Delegate Station

Background Information

- Long history of improved pasture, super sub, est 1930's.
- More arable paddocks hay history.
- Early 2000's noticeable productivity differences within paddocks, cause??
- Lack of legume growth (super not working ??), acid species tolerate dominate.
- Soil acidity identified as potential problem pH low 4's, al 5-15%.
- Lime program to target 5.2 pH late 2008 – 2020. Surface spread lime - 4 years crop - sown down.
- Met target 5.2pH, al now 0, excellent crops, modest pasture response. General lime rates 1-2 t per ha.
- Potassium variability within paddock identified 2015, begin to apply VR lime and K.
- By 2020 all arable areas limed.
- 2023 begin to target pH 6 0-10, some monitoring segmented testing down to 30 cm.
- Soft pastures now not woody (high nutrient cycling). pH, K, Boron addressed.
- Big part of heavy lifting now done (capital outlay), cost of maintenance under high production??

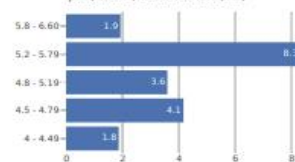
Paddock Variation pH



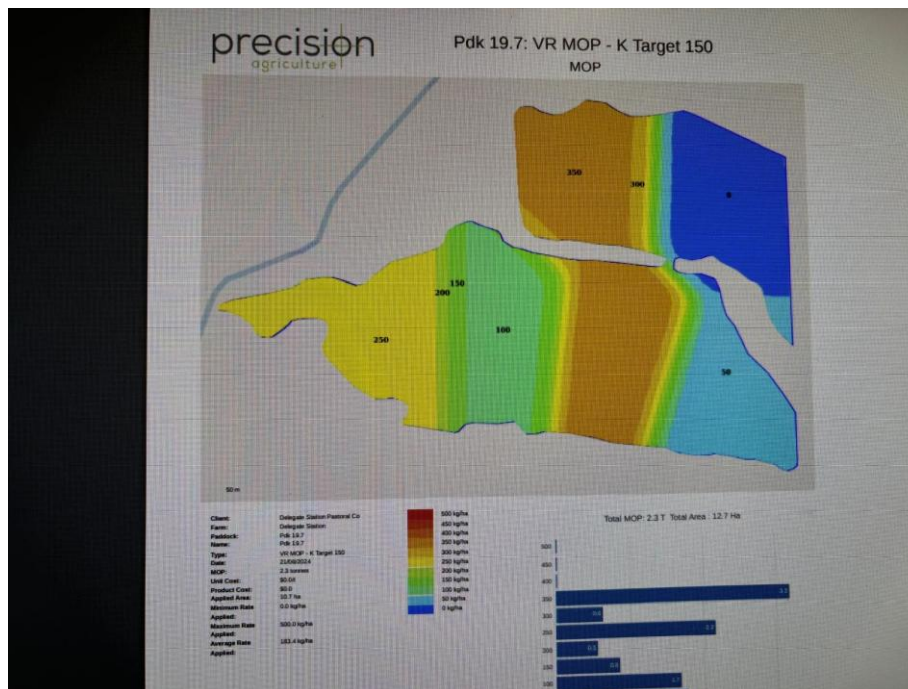
Client: Delegate Station (John Jeffreys)
Farm: Delegate Station
Paddock: Paddock 7
Name: Paddock 7
Type: Soil Test
Date: 16/12/2021
Min: 4.40 pH
Max: 6.60 pH
Avg: 5.21 pH

Above 5.8 pH
 5.2 - 5.79 pH
 4.8 - 5.19 pH
 4.5 - 4.79 pH
 Below 4.49 pH

pH (CaCl2) Distribution (Ha)



Potassium



New Program to maintain pH above 5.5



- Soil test, lime, 3-4 grazing crop cycle, soil test (correct to 6pH 0-10 if required), sow pasture
- Operations soil test, Chisel, Lime, disk chain, sow,
- Crop rotation (all Feb Sown), DP Canola, DP Wheat, Fodder Fallow, Fodder Fallow & Pasture (min 6 years).

Next limitation likely to emerge



Wooley segmented testing

Segment band (cm)	2018	2023	2025
0-5	4.4	5.2	5.8
5-10	4.4	5.2	5.4
10-15			5.3
15-20			4.7
20-25			4.5
25-30			5.0

- 2018: 1.8 t/ha lime (surface)
- 2023: 3t/ha lime (surface)

Return on investment??



Lesson on cutting corners, pasture fail



End game

- Legume dominate pastures
- High production (kg lamb per ha)
- Long term low cost sustainable farm system
- Soils productivity / health improving over time as opposed to slowly slipping away.



Questions?