



Department of
Primary Industries

Managing soil acidity in the cropping zone

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Managing soil acidity in the cropping zone

Where we are currently

Where we need to be

How do we get there

Current management of acidity

Sample for pH 0-10cm (maybe 10-20 cm)

Apply lime when pH is below pH_{Ca} 4.8

Apply enough lime to bring pH_{Ca} just above 5 (remove Al^{3+})

Rate of lime = "rule of thumb" or Agfact table

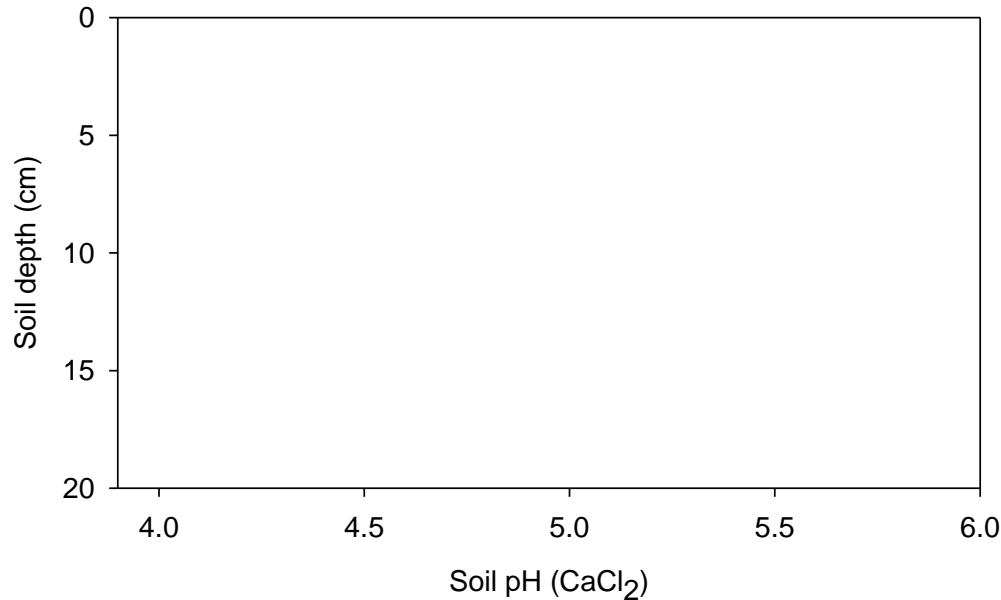
Soil test ECEC (meq/100 g)	Lime required (t/ha) to lift the pH of the top 10 cm:			
	from 4.0 to 5.2	from 4.3 to 5.2	from 4.7 to 5.2	from 5.2 to 5.5
1	1.6	0.8*	0.3*	0.2*
2	2.4	1.2	0.5*	0.4*
3	3.5	1.7	0.7	0.5*
4	3.9	2.1	0.9	0.6
5	4.7	2.5	1.1	0.7
6	5.5	3.0	1.2	0.8
7	6.3	3.3	1.4	1.0
8	7.1	3.8	1.6	1.1
9	7.9	4.2	1.8	1.2
10	8.7	4.6	1.9	1.3
15	12.5	6.7	2.8	1.9

*It is recognised that low rates of lime are impractical to apply, but over-liming can cause nutrient imbalances, particularly in these light soils.

KEY: Limestone rates per hectare						
0.5 t/ha	1.0 t/ha	1.5 t/ha	2.0 t/ha	2.5 t/ha	3 to 4 t/ha	Split applications advised

Current management of acidity

Outcome?



No pH impact below 10cm

Acidity still be a problem

Even though \$ spent

▼ Lime < 5 yrs (n = 33)

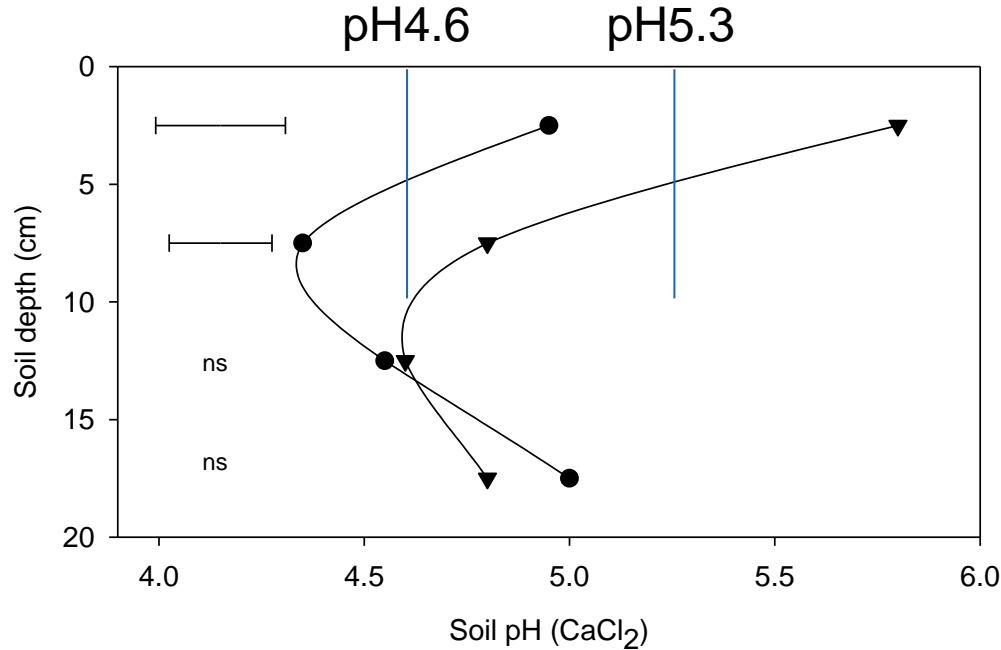
● Lime > 5 yrs (n=15)

Issues to address

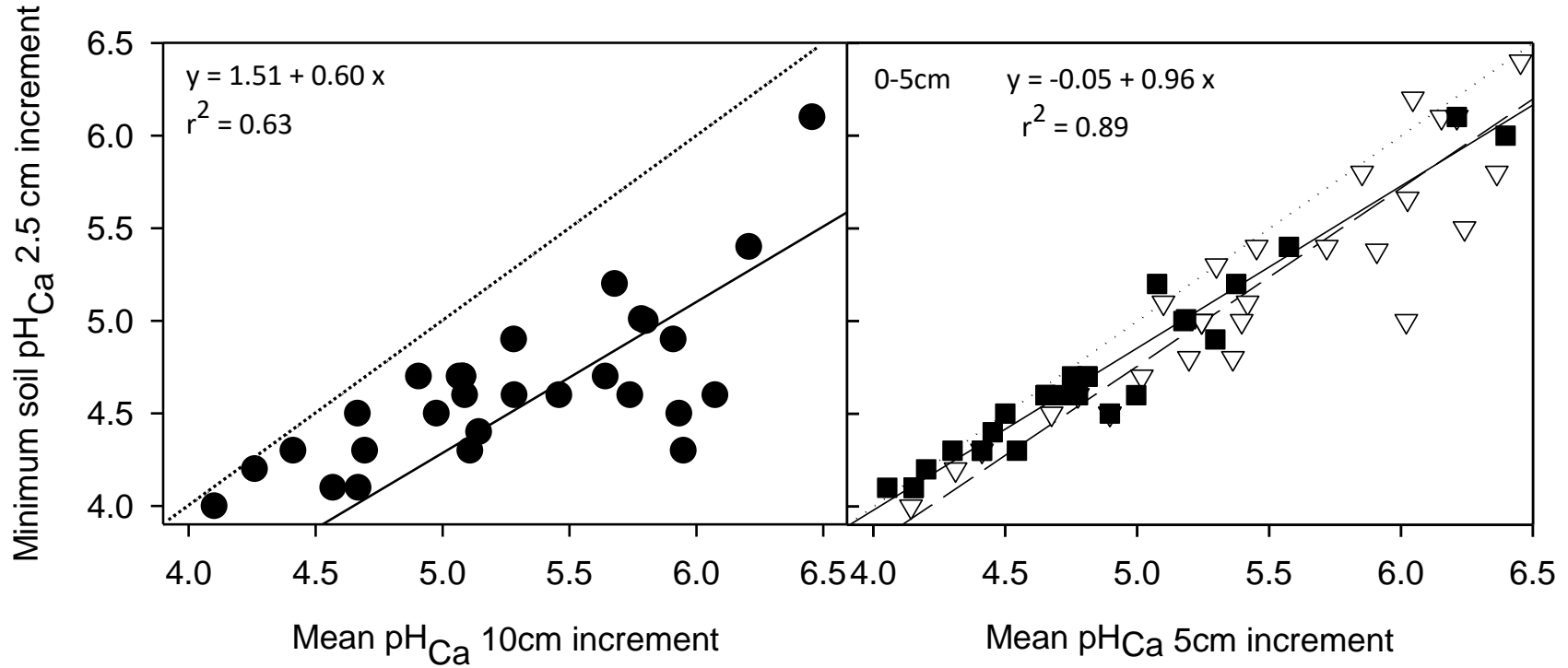
How to:

identify acid layers

deal with subsurface acidity



Identifying acid subsurface layers



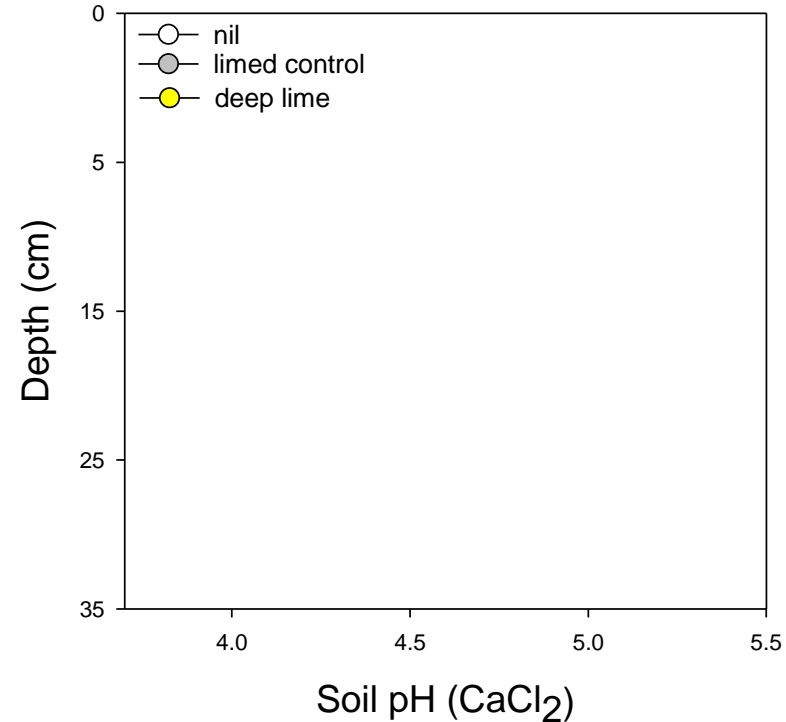
Dealing with subsurface acidity

Deep placement of liming materials



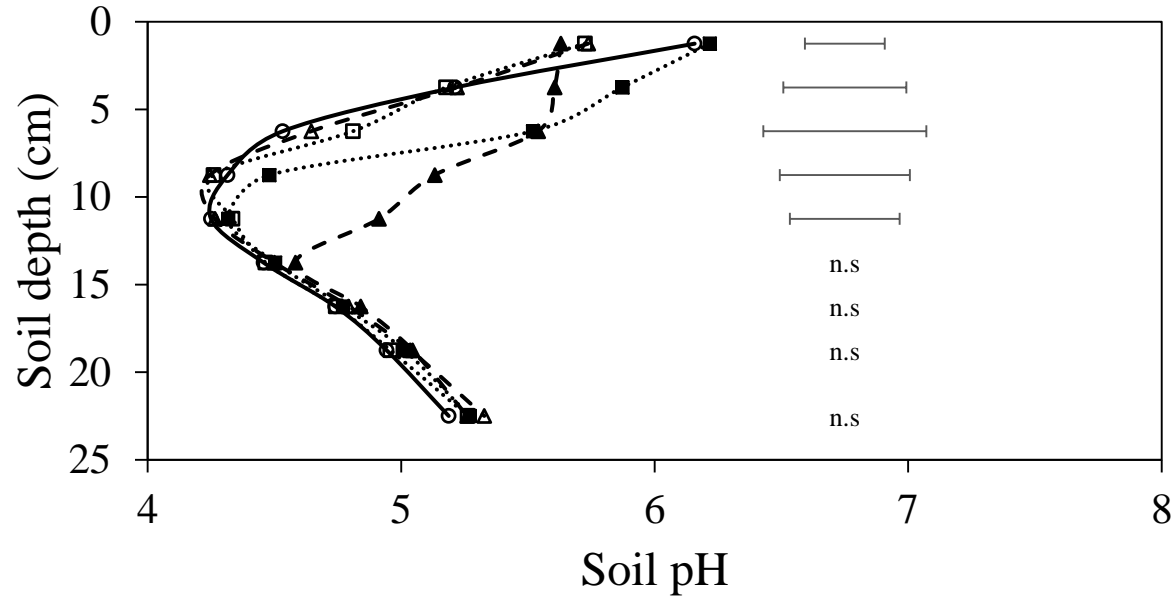
lime, organic matter, RPR, MgSi

50cm row spacing, no change between



Dealing with subsurface acidity

Prilled lime in drill row

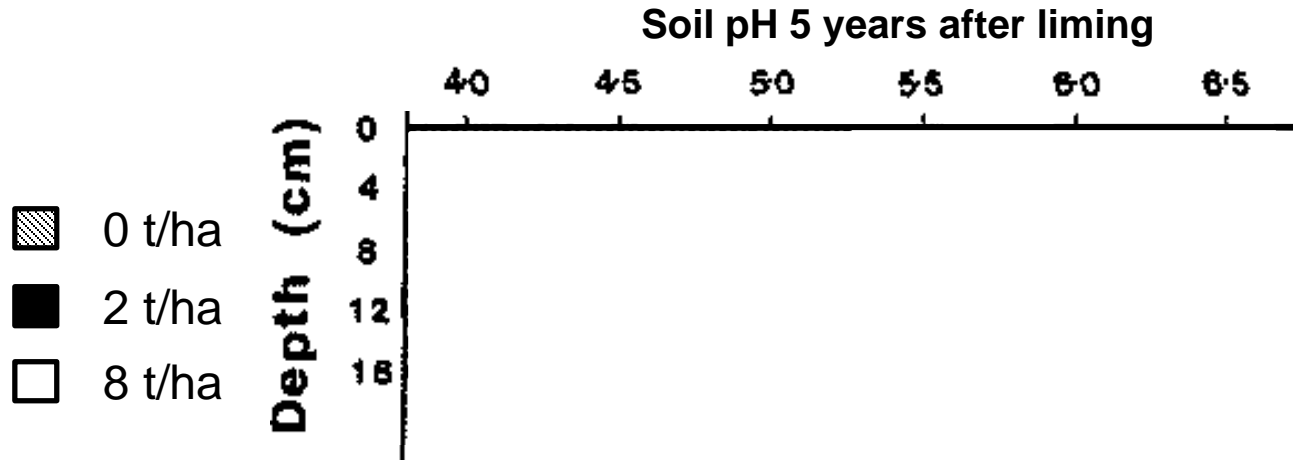


Dealing with subsurface acidity

Rely on lime movement

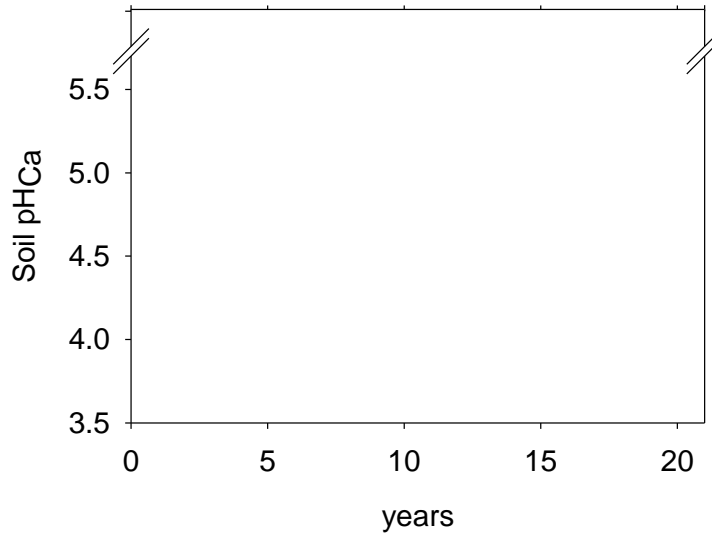
Liming to remove Al^{3+}
doesn't move alkali

But high rates do ($\text{pH} > 5.5$)



Conceptual example here

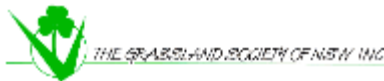
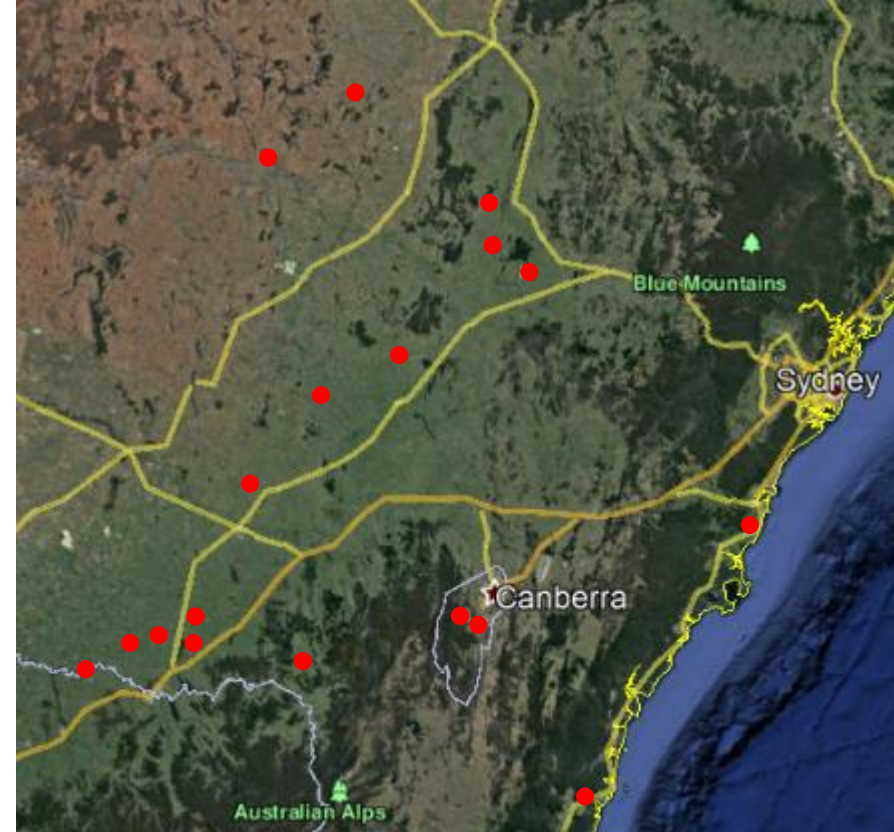
Li et al. (2019) long term data- MASTER trial



New acid soil management

Liming to maintain pH_{Ca} above 5.5

But what is the best way to get there?



New acid soil management

Replicated trials

- control
- lime to pH 5.2
- lime to pH 5.9 (maintain pH>5.5)

- lime to pH 5.9 (maintain pH>5.5) only 5cm (less lime, more often)
- incorporation (where possible)
- once in a generation (deep incorporation)



New acid soil management

Examining:

- Movement of liming effect
- Acidification and re-acidification rates
- Production impacts of acid soil management
- Improved lime models and DSS tools

Is it worth doing? - NSW production outcomes of liming

Note gross margins are those at the time of research and does not account for current commodity prices



SUMMARY

- Current practices (rates, targets) do not address the deeper problem
- 10 cm sampling intervals mask acidic subsurface layers – 5cm intervals find them
- Maintain $\text{pH}_{\text{Ca}} > 5.5$
- Set $\text{pH}_{\text{Ca}} 5.5$ as re-lime trigger point
- Still doing the research for best strategy - Monitor to manage



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Many thanks to

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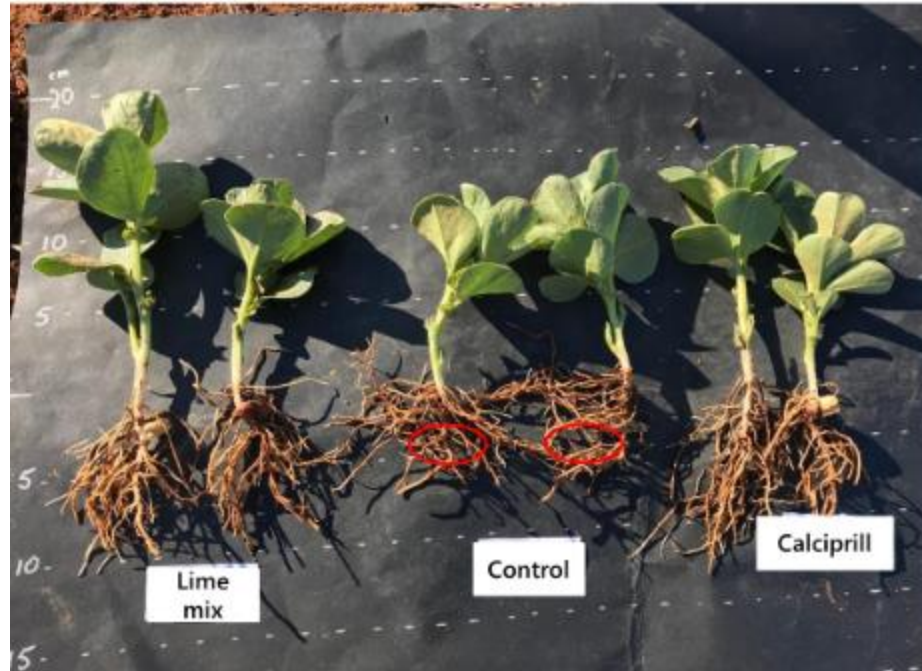
Dr Helen Smith (SE LLS)

Richard Lowrie, Andrew Price, Peter Tyndal, Anne-Maree Farley (NSW DPI)

The many land managers that host our trial sites



J-rooting



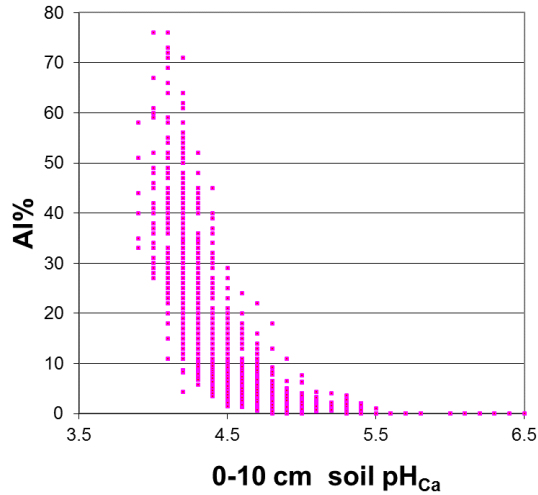
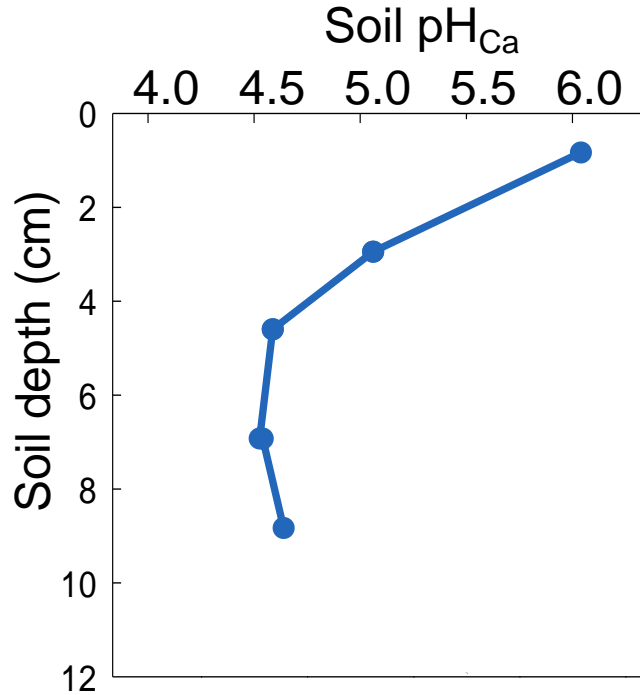
Identifying acid subsurface layers



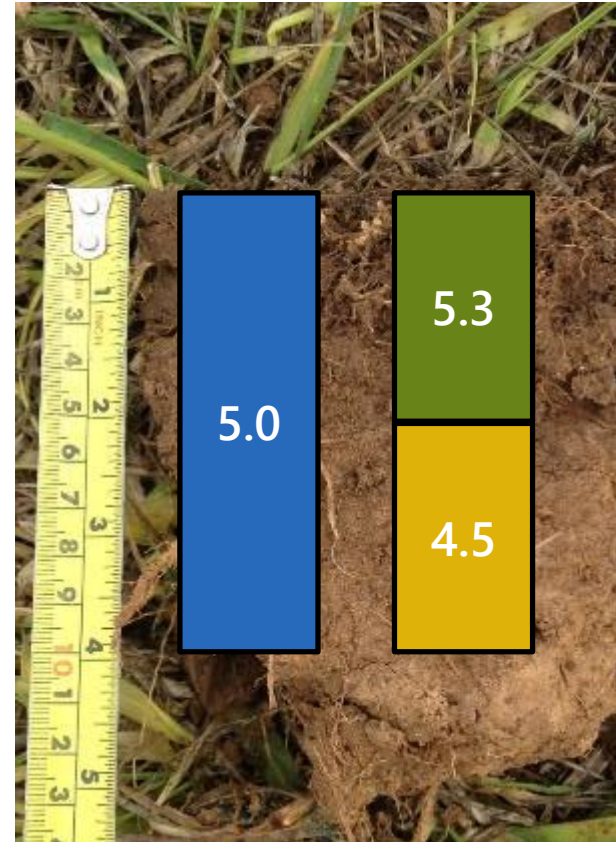
Digstick
pH colour kit



Identifying acid subsurface layers



Source: Karl Anderson



How to manage? – start by measuring the actual soil

Measuring a highly variable property

More subsamples = less noise
25-30 is good for pH

