



Department of
Agriculture and Food



GRDC Grains Research &
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20 years of soil acidity RD&E in WA—what have we learnt?

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A comparison

1994		2014
✓	Agriculture needs lime	✓✓
Limited	Understanding of current status	✓✓✓
Predicted	Long-term average benefit 10% or greater common	✓
Not required	Quick fix using innovative ways to incorporate	✓
Unthinkable	Change can take a generation	✓✓
Not required	Need to target lime application	✓✓✓

Agriculture needs lime

- 1 t/ha every 10 years
- 1–1.5 t/ha
- 2–8 t/ha to achieve appropriate levels

Time to Lime



Re-Lime
Time to Lime

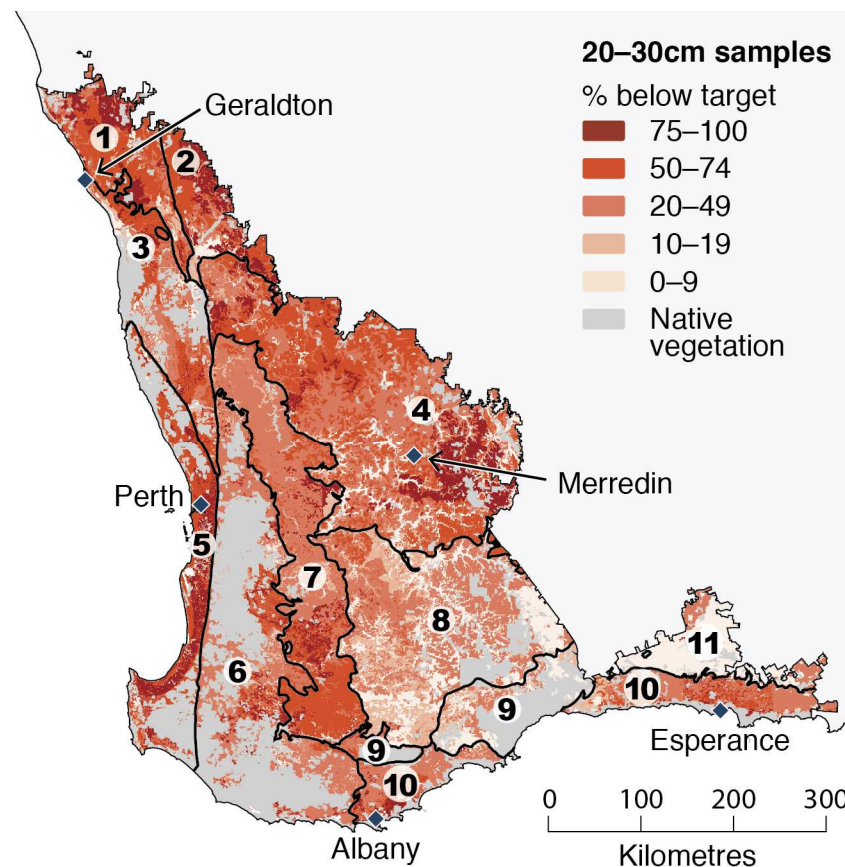


Running out of
Time to Lime



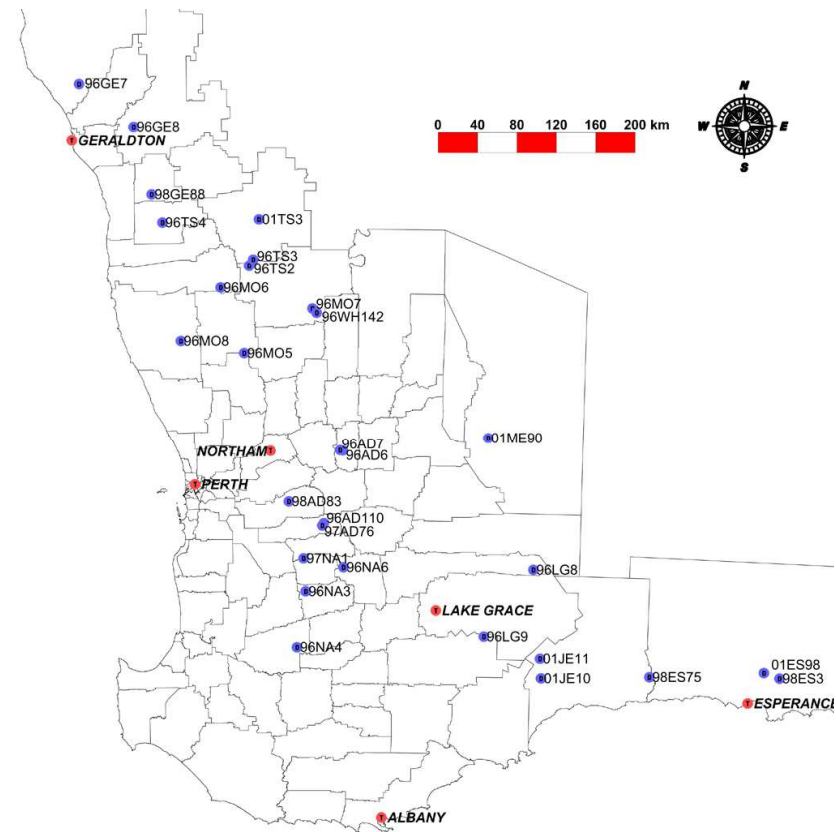
Current status Report Card

- Over the past 7 years project and commercial soil sampling **farmer** results confirm the status as poor
- 70% of surface < pH_{Ca} 5.5
- 50% of subsurface < pH_{Ca} 4.8



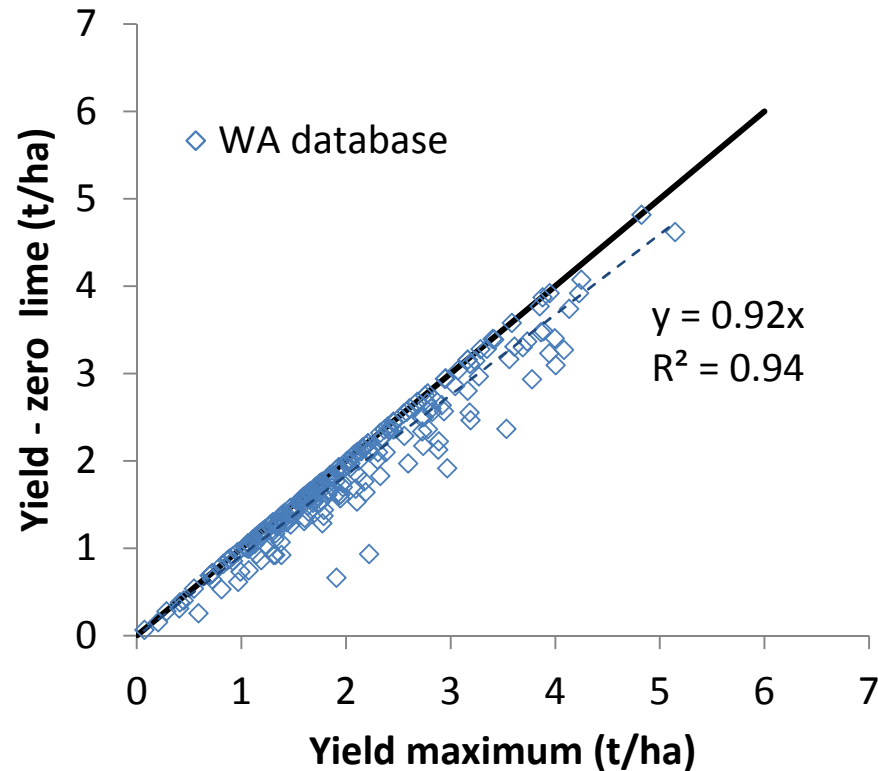
Long-term benefits

- 69 trials 1991–2012
- Wide range of crops, soils and seasons
- Good data sets of yield and pH change with lime application



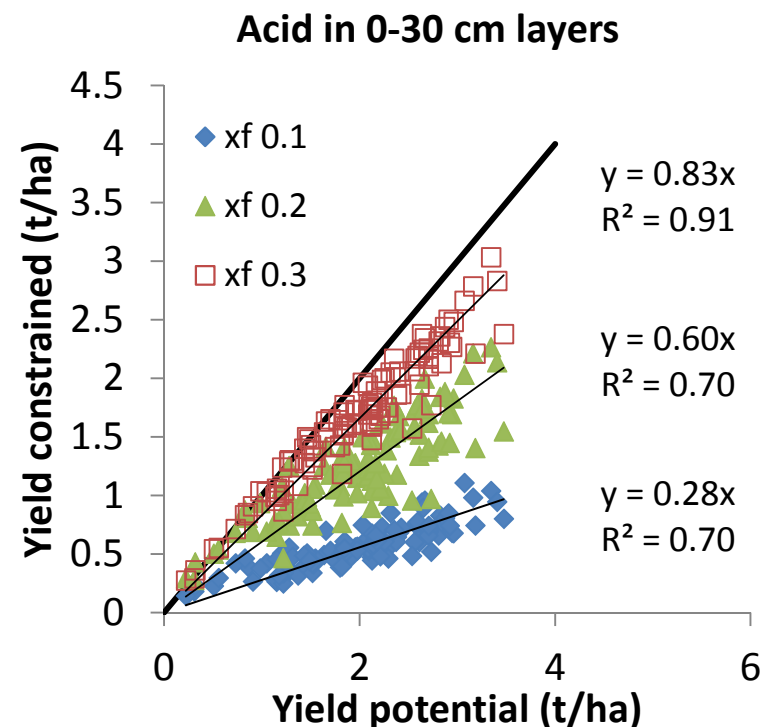
Long-term benefits

- 69 trials 1991–2012
- Two or more years after liming average response is 0.25 t/ha or 12%



Modelling the effect of soil acidity

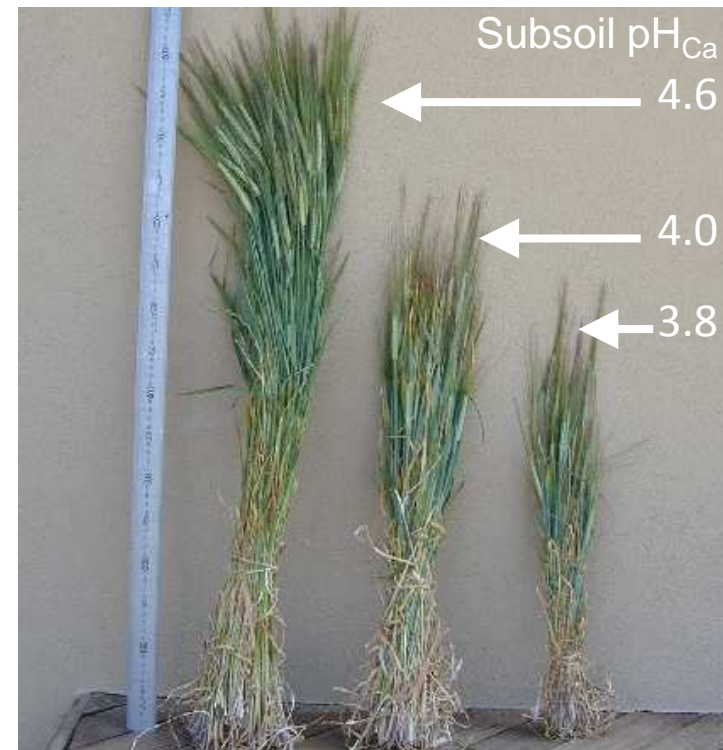
- APSIM can model acidity in layers by reducing rate of root growth
 - location, soil, depth and severity of acidic layer all reduce root growth
- Relate to % of yield potential
- Scatter associated with rainfall
 - demand for deep water



Understanding the yield increase

When would I expect to see a response?

- Sufficient **lime** and **time** have enabled the profile to be ameliorated to remove a soil acidity constraint
- Sensitive crop on a limed profile compared to a highly acidic profile



Barley at Kalannie in 2001

On responses to liming

When wouldn't I expect to see a response?

- When pH profile meets or exceeds recommended targets
- When paddock yield is either very low or very high
- When lime applied is **insufficient** to treat an acidic profile due to **quantity**, **quality** or **time** or any combination
- When a crop or variety tolerant to acidity has been grown

Lime works!

Usually when someone tells me or reports that lime does not work one of these situations applies

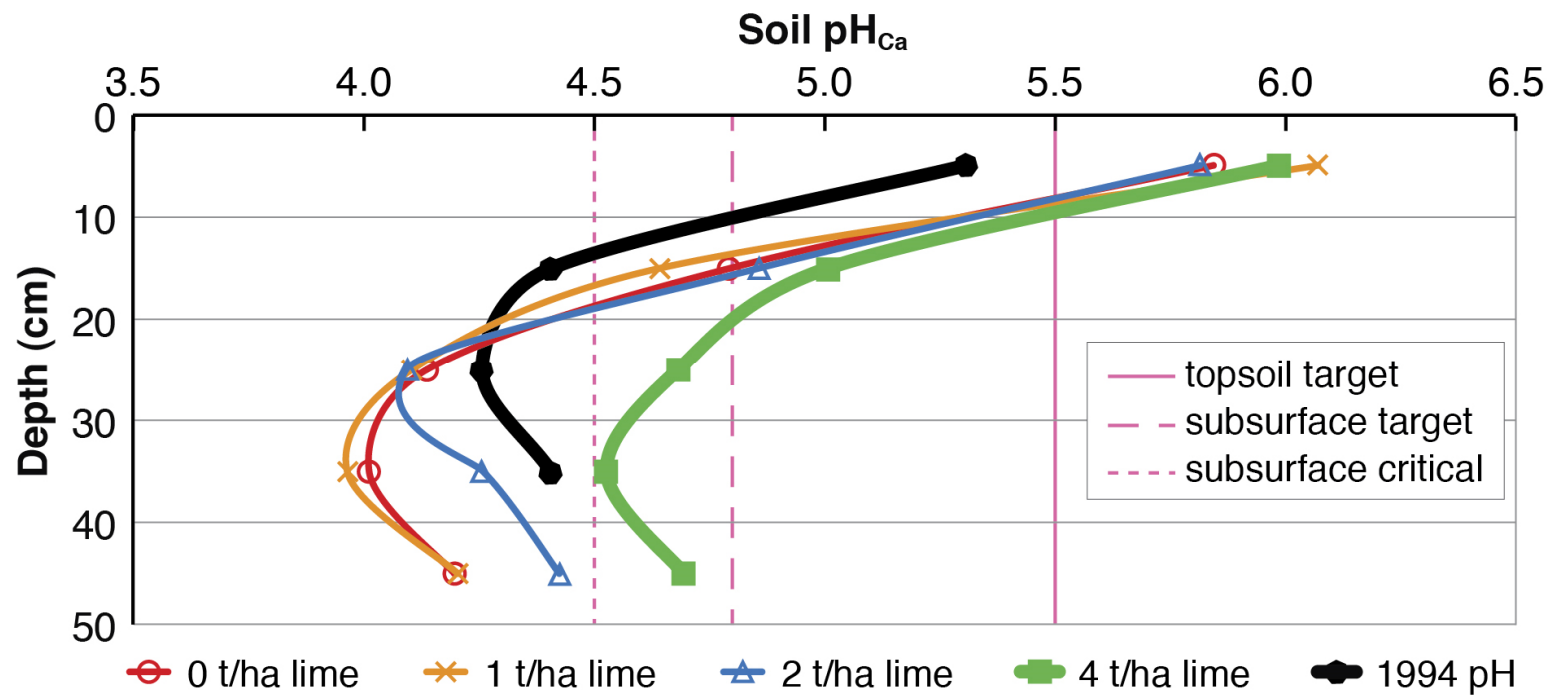
Mingenew Lime Trial 1994

- Lime rates
0, 1, 2, 4 t/ha
- Plus each
treatment
received
4 t/ha farmer-
applied lime



Thanks to Stuart Smart and Kim Fley, Erragulla Plains

Soil pH_{Ca} 2013



Plus 4 t/ha lime farmer-applied

Soil pH_{Ca} 1994

- pH became more acidic with increased years of farming
- pH became lower deeper in the profile with increased years after farming

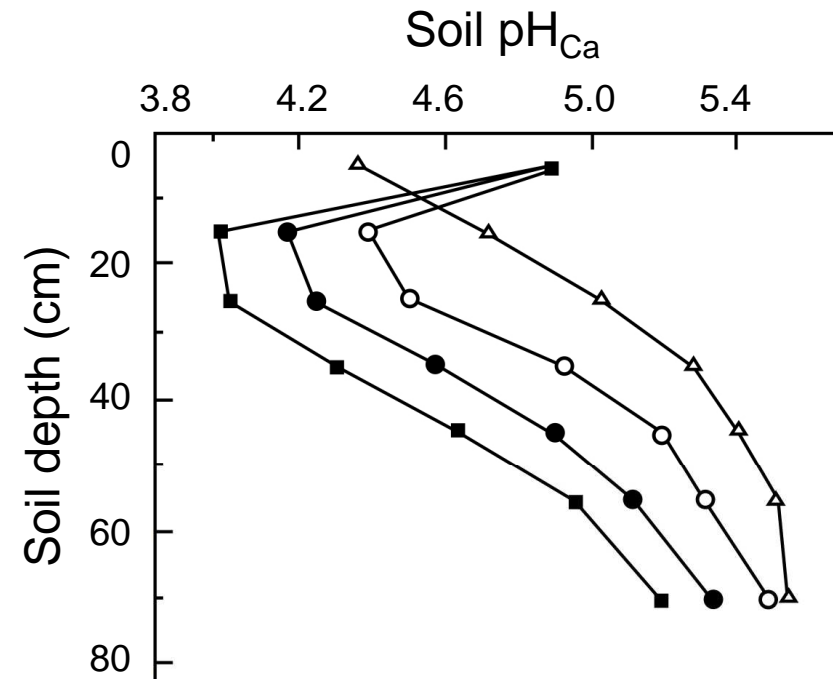
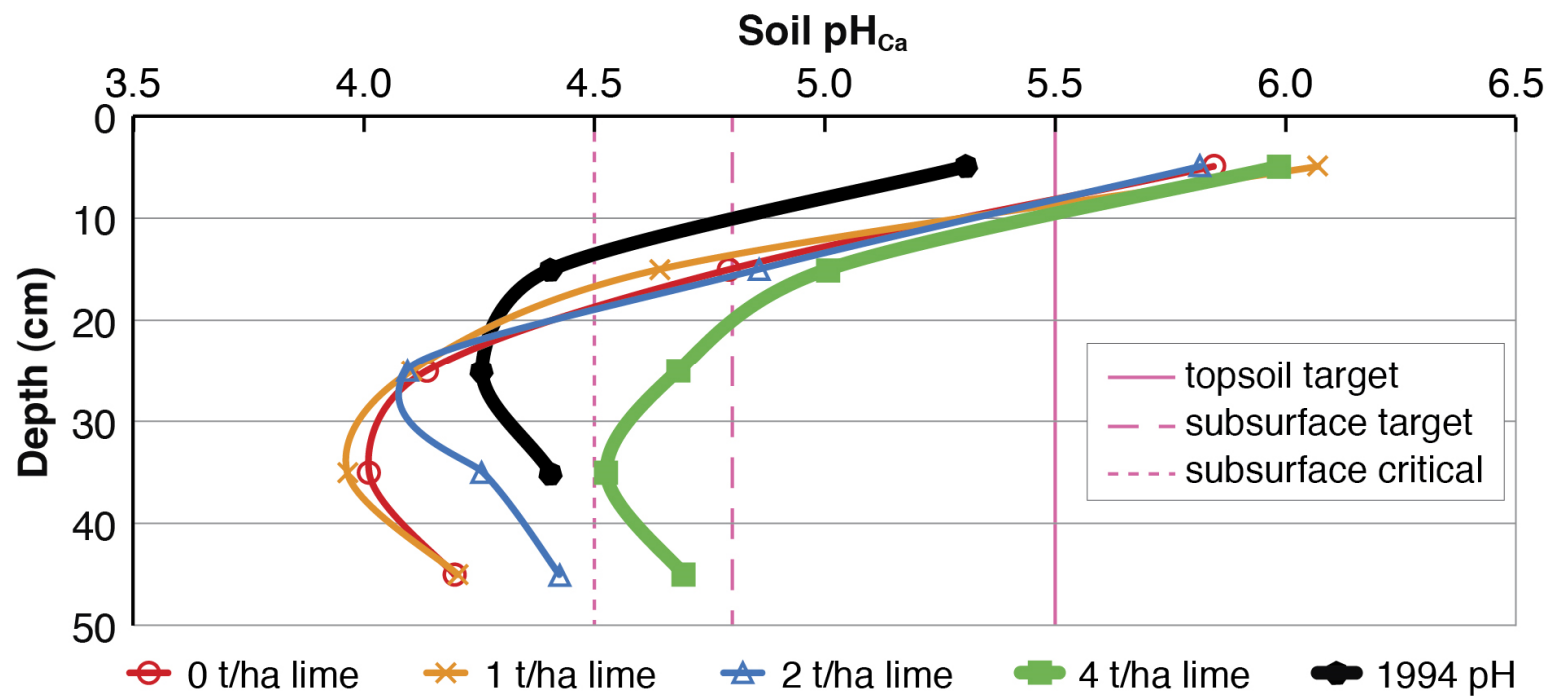


Figure 5.1.1 Effect of depth and time since clearing on soil pH_{Ca}[‡] (△ mean of uncleared sites; ○ 12, ● 50, and ■ 74 years after clearing; from Figure 1, Dolling and Porter 1994).

Soil pH_{Ca} 2013



Plus 4 t/ha lime farmer-applied

Grain Yield 2013

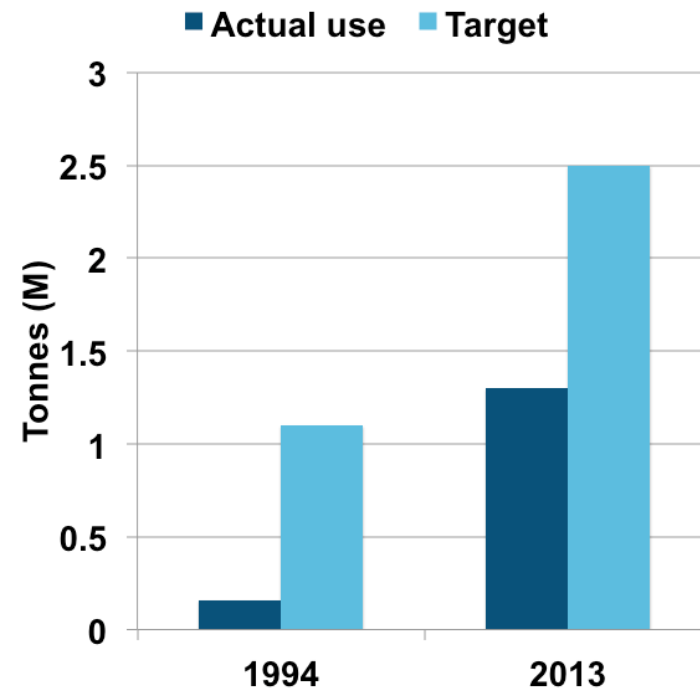
1994 Lime treatment	Wheat grain yield (t/ha)
0	4.43 a
1	4.56 ab
2	4.69 b
4	4.85 c
Lsd (p=0.05)	0.14

10% response again

Plus 4 t/ha lime farmer-applied

Lime use and practice

- Soil acidity recognised as moderate or greater problem
- 90% of surveyed growers consider it to be manageable
- Principle barriers—economic
- Clear increase in adoption of sampling subsurface soils



Key messages

- Soil test to depth—understand the situation
- Apply the appropriate rate—don't half do it
- Cultivation to incorporate lime may now be required where subsurface acidity is severe





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Questions?

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