



Centre for Land and Water



Winter Lectures 2010

Six informative lunchtime lectures in the
Green Shed: Fridays at 12 noon

Lecture 3

Soil pH:

Crop Responses

Soil Mapping Options

Stephen Trolove



Winter Lectures 2010

REGISTRATIONS REQUIRED

Phone: 06 650-4532 or Email greenshed@claw.net.nz

Small charge to cover expenses: \$25 inc GST per lecture
(\$100 inc GST for a Series Registration*)

You will receive a light lunch (if you register on time), a lecture and an invitation to stay and discuss the topic in more depth should you wish.

ACKNOWLEDGEMENTS:

The Centre for Land and Water thanks the Winter Lecturers who have generously given their time:



PAGEBLOOMER



NOTES:

- * We may cancel or vary presentations if speakers become unavailable or if registrations fail to meet minimum numbers.
- * If a speaker becomes unavailable, we may arrange a suitable replacement to cover the same or a similar topic.
- * Holders of a Series registration will be refunded for any cancelled lectures at \$20 inc GST per cancellation, up to \$100 inc GST total.

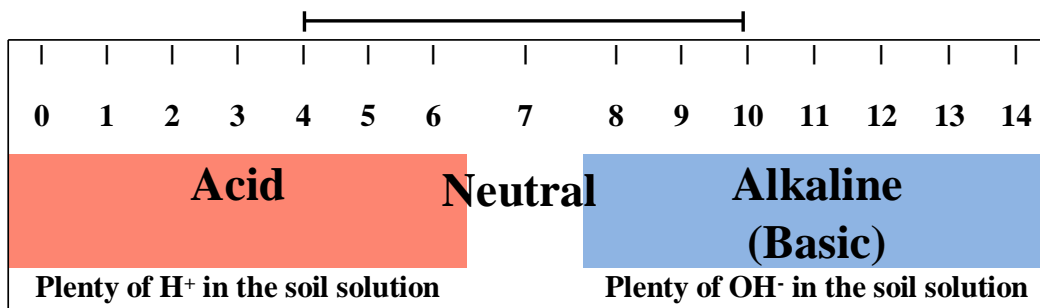


Soil pH variability

Stephen Trolove

Soil pH

Soil



Soil pH's typically fit within 4-10.

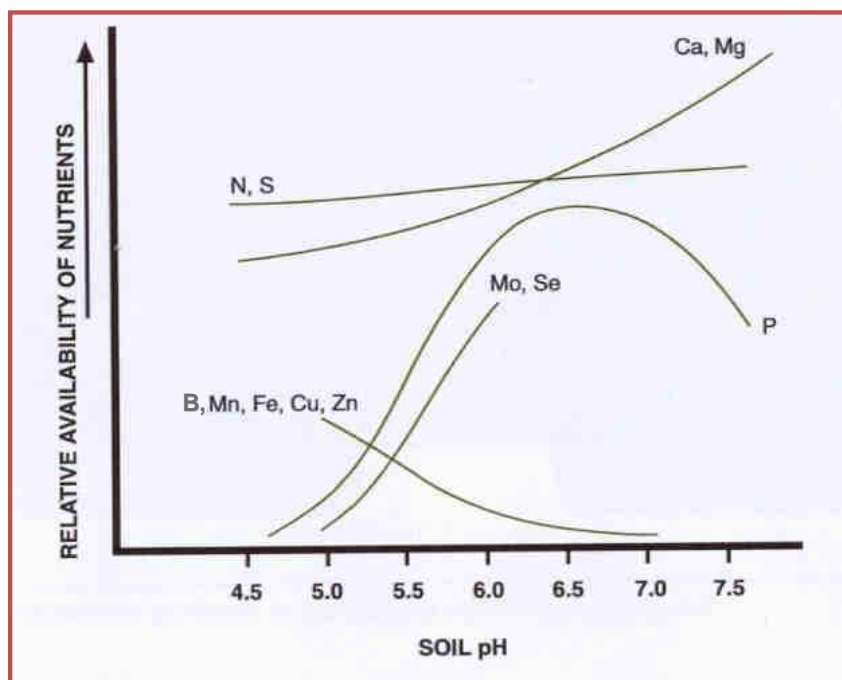
Most New Zealand soils have a pH value between 4.5-7.5



Why is soil pH important?

- The availability of plant nutrients, especially trace elements, changes with pH
- The pH where nutrients are most available is usually about 6.0 (5.8 – 6.5)
- Toxic aluminium becomes more available to plants as the soil becomes more acid (pH decreases)
- Some diseases can be avoided by changing soil pH, e.g. Scab in potatoes

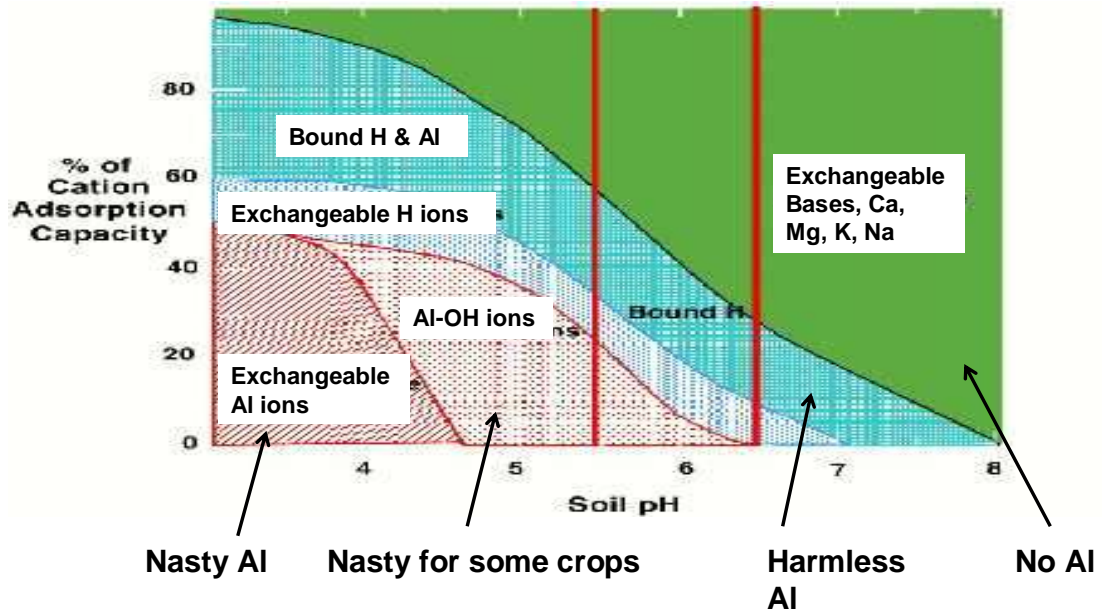
The effect of soil pH on nutrient availability



Source: *Soil Quality Management System Manual, Crop & Food*

As the pH decreases, you get more nasty forms of aluminium (Al) in the soil

Source: Cornell University <http://www.nysaes.cornell.edu/hort/faculty/pool/NYSite-Soils/phandal.jpg>



Optimal pH for crops

Crop	Optimal pH	Comments
Apples	5.8 – 6.8	At pH below 6.5 calcium disorders are more common
Grapes	5.8 – 6.8	pH should not be lower than 5.5
Squash	5.8 – 6.7	
Maize	5.6 – 6.2	Should be above 5.0
Tomatoes	5.6 – 6.7	
Wheat	5.7 – 6.2	Should be above 5.3
Ryegrass	5.7 – 6.2	
Clover	5.7 – 6.2	
Onions	5.6 – 7.0	
Peas	5.1 – 6.0 6.0 – 7.0	HortResearch, though recommend 40 kgN/ha. Hill Labs, though Fe and Mn deficiencies are common
Peaches	6.0 – 6.7	
Potatoes	5.4 – 6.0	pH nearer 5.4 reduces the risk of scab

Why do soils become acid?

Soils become acid when we use ammonium fertiliser or legume nitrogen, and the nitrogen cycle gets broken.

The nitrogen cycle is commonly broken by:

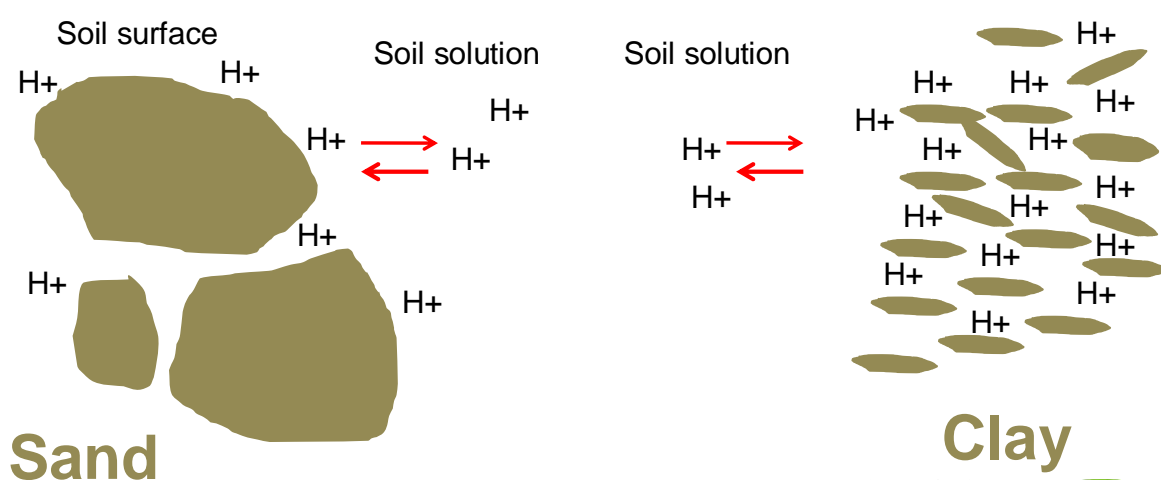
- Crop removal
- Leaching of nitrate

Elemental sulphur fertiliser



The effect of soil texture on acidity reserves

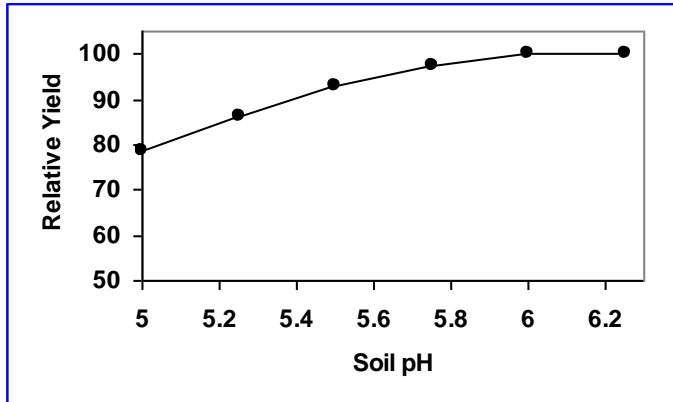
- We only measure the amount of acidity (H^+) in the soil solution. Yet a large reserve of acidity is stored on soil surfaces. Sand has a lot less surface area than clay, so the pH drops more quickly on sandy soils than clay soils.
- Conversely, the pH also rises faster on sandy soils than clay soils when lime is applied.



Economics of liming

Source: Michael White. Analytical Research Labs (ARL)

Pasture (all soils)



Depends on gross margin

5.8-6.0 – Dairy

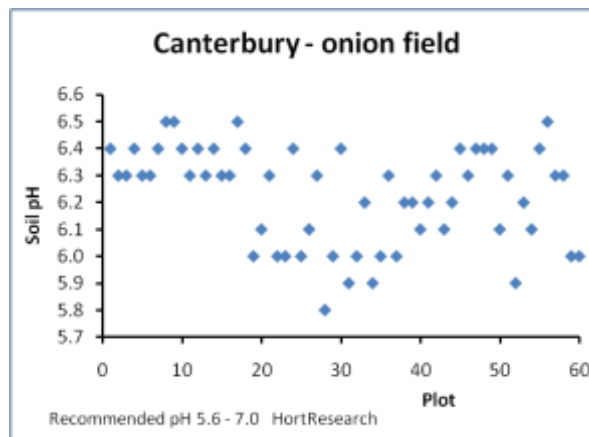
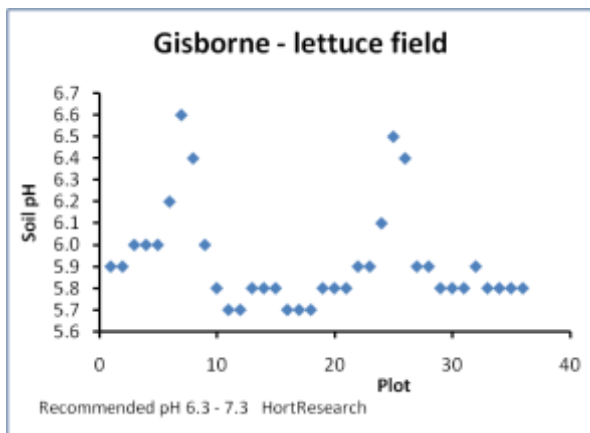
Up to 5.8 – Sheep & Beef
(depends on intensity)

Crops: gross margins are
generally always high
enough for it to
be economic to lime

What variation in pH can I expect in my field?

- NZ data
- US Data

Soil pH variation in NZ fields



Plant & Food
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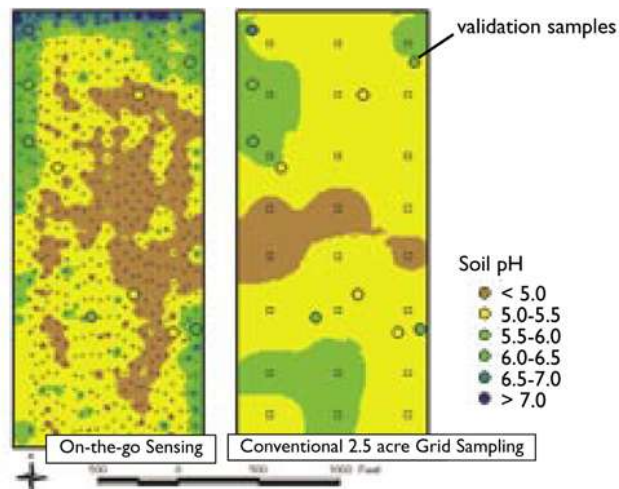
Soil pH sampler Nebraska- Lincoln University



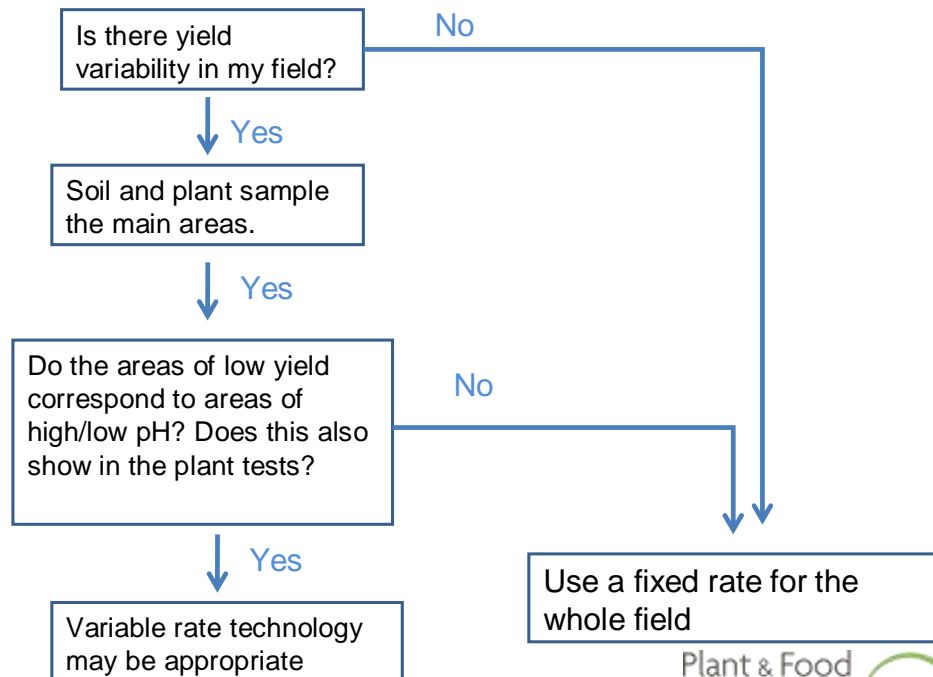
cropwatch.unl.edu/web/ssm/ssmphfaq

A comparison between on-the-go sampling and grid sampling on a 24 hectare field in Kansas

Source: University of Nebraska-Lincoln
cropwatch.unl.edu/web/ssm/ssmphfaq



Should I use variable rate technology?



I have pH variation in my field. Should I apply variable lime rates?

- First need to establish the reason for the variation in pH.
 - If it's lower on the sandier parts, then I possibly **don't** need to apply variable rates
 - If it's due to higher crop off-take in some parts, or uneven fertiliser/lime application, then I possibly **do** need to apply variable rates
- Ian Yule said in his initial work the variation in soil pH did not really relate to variation in crop yield



Some closing thoughts

- Soil pH is not one of the more likely factors to cause variability in crop yield
- Because plants grow well at a range of pH values precision application of lime is probably not that important
- It should be sufficient to tell the truck to miss some sections or do a double pass of other sections





Centre for Land and Water

WELCOME

Welcome to the Centre for Land and Water, a venue supporting sustainable agriculture through training, research and consultancy.

The Centre provides professional offices, meeting and seminar facilities and land for research and training.

We currently have rental offices available. Terms by agreement - phone, fax, copy and print facilities available on-site.

The Green Shed seminar venue is available for training, meetings or for general event hire. Contact us: Phone: 06 650-4532 or Email greenshed@claw.net.nz

The Centre is located on a 4 ha site with easy access and plentiful parking. Entry is from Ruahapia Road, accessed from Karamu Road (SH2) at Waipatu or Pakowhai Road at Chesterhope. It is 4 km (8 minutes) from the Hastings CBD, 17 km (20 minutes) from Napier CBD and 18 km (20 minutes) from Hawke's Bay Airport.

COMING SOON

CLAW Short Seminars:

Communications: Preparing a media release

Communications: Writing popular articles

Communications: Writing technical reports and manuals

Communications: Preparing and delivering public presentations

Irrigation: System calibration theory and practice

Irrigation: How much water do I really need?

CLAW Short Courses

NZQA Certified Irrigation Evaluator

The Micro Cropping Farm for Research and Technology Transfer

Contact us to become involved in this exciting new initiative



Centre for Land and Water

WINTER LECTURES 2010

1. NIWA Virtual Climate Station Network: Friday 16 July

Speaker: Andrew Tait, NIWA

The Virtual Climate Station Network provides daily climate estimates at 5km intervals across N.Z. Andrew will explain how the data is estimated, and how the network can be accessed.

2. Nitrogen Testing and Sample Preservation: Friday 23 July

Speaker: Peter Lorentz, Analytical Research Laboratories

Peter will explain the different soil nitrogen tests, outline correct soil nitrogen sampling methods, and describe the steps needed to make sure the samples you take in the field get to the lab in good condition for analysis.

3. Soil pH - Crop Response & Soil Mapping Options: Friday 30 July

Speaker: Stephen Trolove, Plant and Food Research

Stephen will discuss crop responses to pH, including critical pH ranges for key Hawke's Bay crops, and will describe a process for farmers to determine whether the expense of a detailed soil pH survey may be warranted.

4. Vehicle Tracking and Fleet Management: Friday 6 August

Speaker: John Brew, Astrata

Astrata designs systems combining GPS, wireless communications and GIS to monitor machinery or other assets. John will talk about applications for agriculture, asset management, fleet & personnel tracking and health & safety.

5. Fuel Use Mapping and Bio-Fuel update: Friday 13 August

Speakers: Dan Bloomer, LandWISE and Tomo Reed, EECA

Dan will explain how to capture engine data and create maps of fuel consumption by tractors and present 'proof of concept' results from fuel mapping. Tomo will up-date us on bio-fuels and how to make bio-fuel available in Hawke's Bay.

6. Surfactants; types, actions and combinations: Friday 20 August

Speakers: Gordon Harris, Zelan, and David Manktelow, AR&T

Gordon and David will outline the types of surfactants available, how they work, and will give guidance for growers contemplating multiple product mixes as part of their spray programme.