

# Soil Acidity and Liming Focus Group Workshops 3–5 August 2009





Désirée Futures  
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# Soil Acidity and Liming Focus Group Workshops 3–5 August 2009

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## Acknowledgements

These focus group workshops were conducted as part of the Wheatbelt NRM soil acidity project “Optimising Soil pH for Sustainable Farm Practices”, jointly delivered by the Department of Agriculture and Food, Western Australia and Precision SoilTech.

The workshops were developed by the project team (Mr Chris Gazey, DAFWA, Mr Joel Andrew and Dr Steve Carr, Precision SoilTech) in consultation with Dr James Fisher, Désirée Futures, who facilitated the workshop.

This report was compiled and written by Dr James Fisher.



Department of  
**Agriculture and Food**



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**wheatbelt**  
natural resource  
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## Contents

Acknowledgements.....	ii
Executive summary.....	1
Introduction.....	2
The workshops.....	2
Workshop participants.....	3
Soil sampling, pH and lime use.....	3
Limitations to carrying out liming.....	6
Workshop discussions.....	9
Discussion.....	11
Recommendations.....	13
References.....	14
Appendix 1.....	15
Appendix 2.....	20
Appendix 3.....	38

## Executive summary

Focus group workshops were conducted at three locations in the central and eastern wheatbelt of Western Australia. Twenty-four participants, 22 males and 2 females, aged from 21–30 to 61–70 attended the workshops. The focus groups involved presentation of soil-sampling data from the participants' farms. The main aim of the workshops was to determine whether there are any common barriers to the adoption of liming as a practice to manage soil acidity.

Deeper, subsurface soil sampling was valued by most, but not all of the workshop participants. Soil sampling to depth was mainly used to provide more information for liming decisions. The responses and comments of the participants highlighted the importance of economic factors (costs, returns and cash-flow) on the ability to carry out liming. Two groups of farmers were identified with differing, though related information needs. The first group is largely convinced of the value of liming. Their main information needs are for more detail in terms of lime requirements, responses to liming and the efficiency of liming to make the dollars spent on liming as effective as possible. The second group did not appear to be entirely convinced of the value of liming. The main information needs identified by this group fell into two categories. Firstly, fundamental information about lime, pH changes and rates. Secondly, further information about responses to liming, the rates required to achieve pH targets and the economics of liming.

Four recommendations come from this work:

1. Conduct further workshops or written questionnaires to confirm whether the results from these workshops are typical and representative of other growers.
2. Further, continued and more widespread extension of fundamental information about soil acidity and liming, such as has been compiled as part of SI002. The results of these focus groups suggest that this would be most effective through advisory networks such as consultants, fertiliser companies, 'leading growers' and even trucking contractors.
3. Further analyses of research and demonstration data and from models, such as Optlime, to try to identify any trends in variability in responses to lime with environmental and management factors. This is aimed at 'precision liming'. An important outcome of such work could be the identification of gaps in the current datasets as well as the level of specification that is possible within natural variability.
4. Establishment of demonstration sites, preferably with interested grower groups in targeted districts. These should be aimed to take advantage of the example set by 'leading growers' and also to address the interest in having localised results. It is recognised that these are expensive to establish and to maintain, so they would need to be well funded and targeted.

## Introduction

Data from the recent Avon Catchment Council Soil Acidity SI002 project have shown that the soil pH in the central agricultural area of Western Australia is lower than was suggested by previous estimates. Eighty percent of the top soil tested (18 000 samples) was lower than pH 5.5, and 45% of the subsurface soil tested (20 000 samples) were below pH 4.8 (Carr et al. 2008). This is a more extensive area of low pH, particularly in the subsurface soil, and is derived from a larger, more detailed and more contemporary set of data than was available previously. This situation adds weight to data from lime sales that suggest that, while lime use has increased from a drop in the early 2000s, it is still below the amount required to adequately treat existing and on-going acidification. This project was designed to identify, in a preliminary manner, whether there are common barriers to the use of lime amongst farmers in the central agricultural area of the Avon River Basin.

Focus group workshops were used to determine whether there are common barriers to the adoption of liming as a practice to manage soil acidity. Factors such as lack of knowledge of the status of pH on their farm (especially the subsurface), confusion regarding the best liming strategy, lack of recognition of the need for action to prevent yield loss, budgetary constraints or some combination of these were identified *a priori*, from anecdotal information, as likely to be contributing to the under-utilisation of lime on farms. These hypothesised reasons were tested against the responses from the participants at these workshops.

## The workshops

Focus group workshops involving farmers at three locations in the east of the central agricultural area were designed to provide insights from farmers into their use of and attitudes to liming. The three workshops were held at Beacon, Narembeen and Yealering between 3–5 August 2009.

Each workshop involved presentation of the soil testing results for the region and discussion of the results,

- to compare the data with farmers' attitudes and expectations regarding their soil pH, and
- to explore their use of lime and attitudes to lime use so as to identify any common barriers.

Questions about target pH, soil acidity as a problem, previous lime use and the limitations to carrying out liming stimulated discussion about needs for information and possible ways to address them. Responses from participants were recorded as a combination of responses to set questions using the Turning Point Audience Response system (Appendix 1) and comments made in discussion of the responses.

Participation of the farmers in the workshops was entirely voluntary and all information from the workshops has been reported anonymously. After the workshop, all participants were

sent a summary report of the focus group they attended for information and further comment.

In this report, the responses relating to soil testing, soil pH and lime use have been pooled, while the discussion of the limitations to liming is reported on the basis of the individual workshops.

## Workshop participants

A total of twenty-four participants were involved in the workshops, twenty-two males and two females. The participants were asked to record their age using age ranges in groups of ten years. The proportions of the participants in the age ranges 21–30, 31–40, 41–50, 51–60 and 61–70, namely 21%, 21%, 38%, 13%, 8% (Table 1) were similar to those reported from recent census data from the shires involved; namely 15%, 22%, 24%, 23% and 17% (ABS 2009).

Table 1: Demographic information for participants at three focus group workshops.

	Beacon	Narembeen	Yealering	Total
<b>No. of participants</b>	5	10	9	24
<b>Gender</b>				
Male	4	10	8	22
Female	1	0	1	2
<b>Age category</b>				
21–30	0	5	0	5
31–40	1	1	3	5
41–50	2	2	5	9
51–60	1	2	0	3
61–70	1	0	1	2

## Soil sampling, pH and lime use

Soil samples were collected from paddocks on farms that had been sampled previously as well as from paddocks on ‘new’ farms (from a sampling point of view) with soils of similar textural characteristics. The pH results from the topsoil and subsurface soil samples were presented with reference to the samples that had been collected 10 years previously. In general, the pH of the topsoil had increased slightly, while that of the subsurface soil showed a small increase or a decrease in pH (see slides of results of soil sampling presented at the workshops, Appendix 2, which were included in the follow-up reports to participants, Appendix 3).

The results of the soil testing were according to the expectations for 57% of the twenty-four participants, but worse than expected for 26% of them. The other 17% of the participants either did

not have expectations regarding the results as it was the first time that their soils had been sampled for pH or were unsure as they could not recall the previous results (since the day of the workshop was the first time that they had looked at the results). Comments from the participants about the soil testing results and their expectations reflected the results:

- “we have just bought the farm and suspected low pH, but (the result) was lower than expected”;
- “most results were as expected, but one paddock was a bit worse”;
- “it was good to see how (the pH) had changed over 10 years”;
- “I thought that more results should have been in higher pH range”;
- “some heavier soil was lower than expected e.g. some 5–6 pH but lower than thought”;
- “as expected—expected low and they were”;
- “the variability within a paddock was surprising”;
- “expected good based on soil type and they were”.

Participants were divided in their agreement with the statement that ‘there is a clear benefit or return to soil sampling to depth’ (Figure 1). Sixty-one percent agreed or strongly agreed with the statement, but 30% were unsure and 8% disagreed or strongly disagreed. Of the 91% who planned to do soil sampling in the coming year, 39% intended to sample topsoil and subsurface soil, a slight (8%) increase from those who had sampled to depth previously.

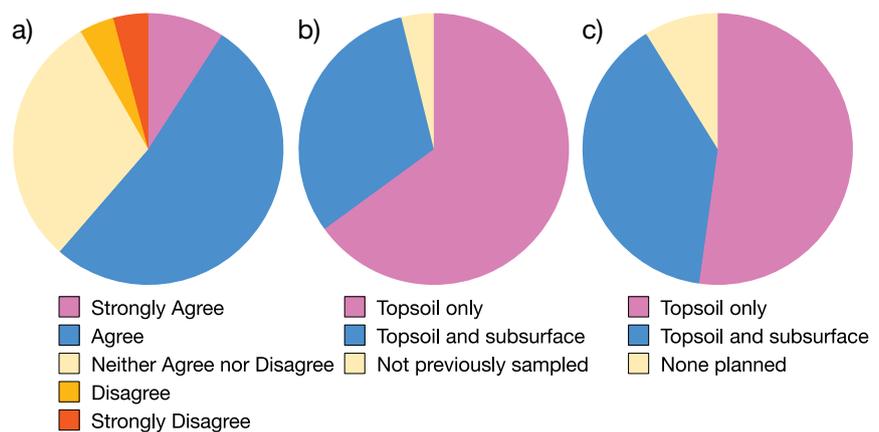


Figure 1: a) Responses to the statement ‘there is a clear benefit or return to soil sampling to depth’, b) previous soil sampling and c) intentions for the coming year. Values are the pooled responses of twenty-four participants at three focus group workshops.

Subsurface soil samples are taken mainly for knowledge about soil pH. Soil sampling to depth is seen as useful to help to target lime application and to provide a “bigger picture” for decisions. Subsurface soil samples were done “mainly to check pH in problem paddocks, to examine the reasons (for the problems)”.

Participants who were unconvinced of the value took the position of “trying to get the topsoil right before looking at subsurface problems on soils” or considered that there is “no yield response to spending money on soil sampling (to depth)”. It was noted by one participant, who valued sampling to depth, that “it is difficult to determine economically, but there is better information”.

The three most common levels of soil pH of topsoil and subsurface soil reflected the general situation identified by the soil sampling that was carried out by the project (Figure 2). The target pH levels reported by the participants generally reflected the levels that have been developed from research and have been recommended through the Avon Catchment Council Soil Acidity SI002 project. Interestingly farmers at one of the workshops (Yealering) reported a target of around half a pH unit higher than the recommended levels. When ask about this they responded that they aimed for a target that is a bit higher than is recommended to provide a buffer in case of hard times.

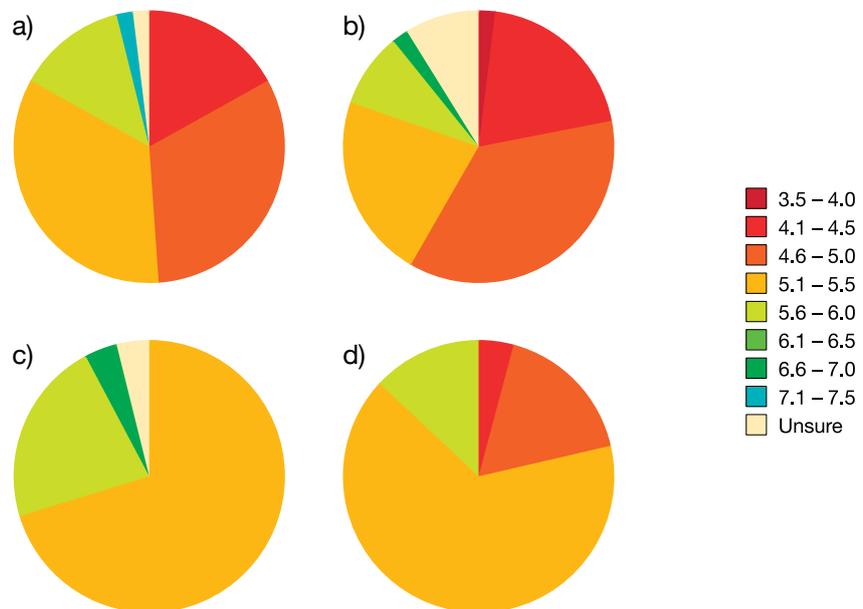


Figure 2 The three most common pH levels currently for a) topsoil and b) subsurface soil and the reported target pH levels for c) topsoil and d) subsurface soil. Values are the pooled responses of twenty-four participants at three focus group workshops.

Soil acidity was rated as ‘somewhat of a problem’ or ‘widespread and limiting production’ by 69% of the participants (Figure 3). It was considered ‘likely to be a problem in the near future’ by a further 13% of the participants. Only 9% of the participants rated it as ‘not a problem at present’ and the same proportion were unsure. Ninety-two percent of participants had applied lime previously. Limestone, dolomite, limesand and other liming products (e.g. burnt lime) had all been used at a typical application rate of 1 t/ha. All participants were aware of the Lime WA Inc. product information specification sheets, although some noted that suppliers did not always provide them unless asked (see comments).

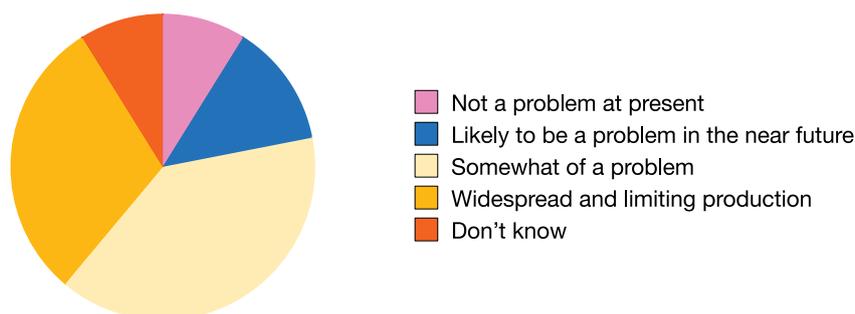


Figure 3: Assessment of soil acidity as a problem on-farm by twenty-four participants at three focus group workshops.

## Limitations to carrying out liming

The participants at each workshop identified up to ten key limitations to carrying out liming on their farm (Table 2). These were ranked by the participants in terms of their individual perception of the importance of each. Each ranked limitation was given a weighting (from 10 to 1 for the most to least ranked respectively) and then the average weighted ranking of each was calculated. The limitations identified in the workshops were similar, although the ranking of them varied in different districts (Figure 4).

Table 2: Limitations to carrying out liming on farms identified by twenty-four participants at three focus group workshops.

Workshop	Limitations to carrying out liming
Beacon	Time to response; Total cost; Yield variability (profitability); Cash flow; Return on investment; Timing of liming (time of year); Certainty of response; Freight; Which paddock to treat (priority); Priority of decision (lime c.f. other farm or non-farm costs)
Narembeen	How much to apply to reach targets; Return on investment; Cost; Don't see yield increase; Certainty of return; Knowing at which pH to start applying lime; Unclear/mixed messages on lime application rates; Waiting for acid tolerant crop varieties; Time taken to spread; Not the highest priority on farm
Yealering	Available dollars; Overall cost; Freight; Variability of returns; Large up front costs; Time constraints; Should I lime leased farm?; Can only do a fixed area/year; Economics of cropping

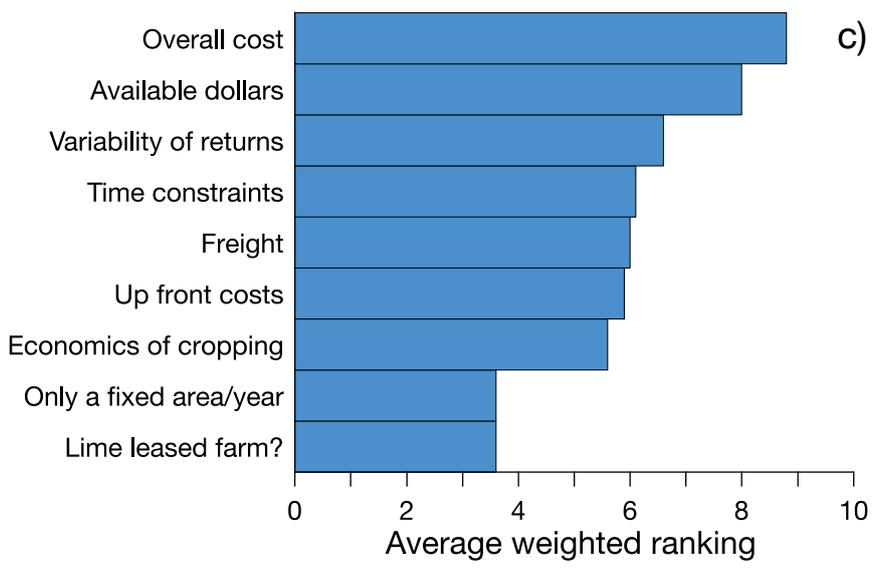
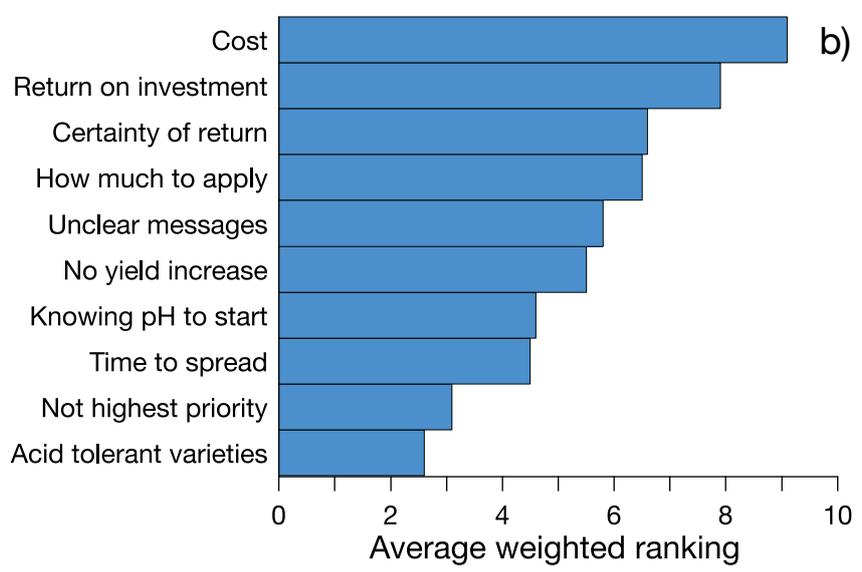
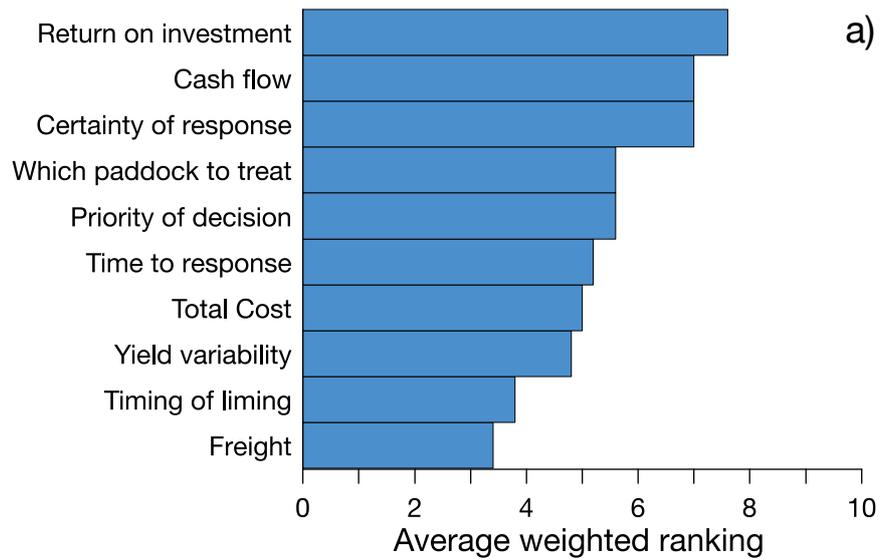
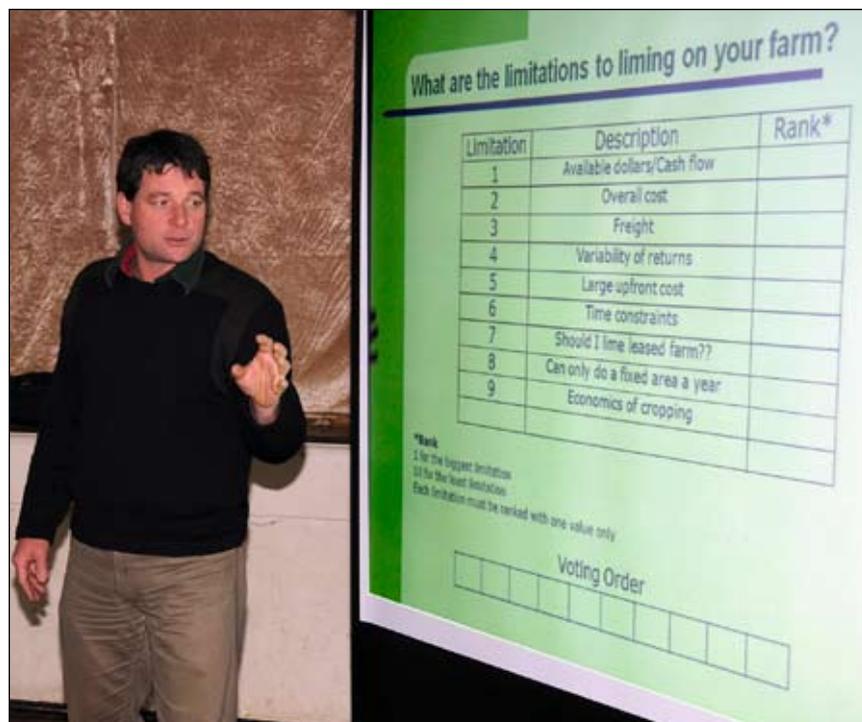


Figure 4: Ranking of limitations to liming by twenty-four participants at focus group workshops held at a) Beacon, b) Narembeen and c) Yealering. Limitations are shown in order from most important to least important.

There was considerable variability in the rankings between participants. At all three workshops aspects relating to the economics of farming and returns (e.g. cost, cash flow/available dollars, return on investment/certainty of return, certainty of response/variability of returns) were ranked highly by several participants and so received a high weighted rank. Other aspects related to decision-making and liming (which paddock to treat, priority of decision, how much to apply, unclear messages) were ranked as moderately important at Beacon and Narembeen. In contrast, for participants at the Yealering focus group, time constraints and additional aspects related to the economics of liming (freight, up front costs, economics of cropping) were ranked moderately important. The timing of liming (time of year), prioritisation of liming and other solutions such as acid tolerant varieties were not ranked highly by the participants. From the discussion, freight was not seen as a major limitation in its own right, but was considered to be part of the overall cost of the product.



Preparing to rank the group-generated limitations to liming at the Yealering focus group workshop.

At the conclusion of the workshops, participants were asked for their assessment of their confidence in managing soil acidity. Based on the information from the soil sampling conducted as part of the project, their individual experiences and taking account of the limitations to liming, all participants thought that soil acidity was manageable on their farms.

## Workshop discussions

During the workshop, comments, suggestions and questions from participants were recorded by project staff. A summary of these is given below.

### Comments

Some comments by participants related to liming and the type of lime used. These included:

#### Beacon:

- we now have a good idea of subsurface pH across the farm (from soil sampling) and will probably back off while things start to happen (from liming) and then look again in a few years;
- limestone for storage and handling was tried—“educated back to limesand”;
- location is sometimes a driver of which one to use;
- tend to ‘trust’ information from ‘you blokes’ but seeing it on your own place reinforces it;
- information (about soil acidity and liming) comes from DAFWA, you blokes (AgLime), GRDC;
- sources of information are DAFWA, GRDC trials, recent Kellerberrin (David Leake) and DAFWA trials;
- once worked out that 1 t/ha was working then was happy to move to 2 t/ha treatment;
- trials on my own place were very important;
- perhaps a good idea to lime ‘at this time of year’ so do it before looking at the budget(!);
- had not heard previously that yield returns around 10% and return on investment around the same—one participant commented that thought numbers could have been higher.

#### Narembeen:

- there is sufficient information about liming, if you are prepared to chase it up yourself;
- product information sheets are available, but are not given out routinely—you need to ask for them;
- the trucking contractor makes lime decisions (based on convenience to them!);
- lime use and rate as recommended by agronomist or soil analyst;
- lime is applied based on neutralising value (landed on farm); lime is applied on a three-year cycle, but it still costs \$40–50/ha on the treated paddocks each year;
- the paddocks with the lowest pH are targeted;
- eventually liming gets up the priority list to be the next issue that needs addressing.

#### Yealering:

- the general message now seems to be 2 t/ha as a starting amount;
- if you have problems with pH then you should loan money to afford the cost;

- must look at the economic response and go for it if you believe there is a response;
- lime used to be first off the budget but now maybe save a few \$ from reducing the fertiliser inputs and keep lime going out;
- the information on lime is fairly clear;
- with lime have to outlay for a response which may be a few years in the future;
- time constraints to actually get the job done—spreading is a slow process and contractors are another expense rather than using own time which is probably not costed properly;
- lime goes with canola (and barley follows) this way have program which can stick to which moves around the farm.



Discussing results at the Narembeen focus group workshop

### Questions

A number of questions about soil acidity were fielded by the project team. These questions related to soil pH, the effect of acidity, soil sampling and liming. The questions were answered during the workshop, so the answers are not reproduced here. Some of the questions that were asked were:

#### Beacon:

- what is an acceptable low pH (this person had been told pH 4.0 by a consultant);
- at what pH should we start putting out lime;
- what is the effect of acidity;
- what is the best way to rate lime quality;
- is it possible to put the lime where it is needed if surface is okay;
- value of applying lime in spring; when is the best time;
- if have two paddocks, one a 4.8. another at 5.2 which gets priority
- can you just spread on surface and let rain wash the lime in or do you need to incorporate/till?

#### Narembeen:

- how much lime is required to produce a certain change in pH;
- how much lime is required to reach targets;
- where is it best to apply lime within the paddock (varying lime application);
- is it possible to get pH change more quickly by deep liming?

**Yealering:**

- was the pH change at each site related to the amount of lime applied;
- is it better to apply a larger amount at once or less lime more often;
- on leased farms with low pH how to prioritise whether should lime or not?

**Suggestions**

The participants made several suggestions regarding information needs and suggestions for future research and extension relating to soil acidity and liming. These included:

**Beacon:**

- expected yield response to liming—need tighter information with certainty of response and pay-back;
- which paddocks to treat first—some guidance needed;
- need the message now about needing to apply 2 t/ha up front;
- seeing trial work in own area helps with decision.

**Narembeen:**

- clear information on how much lime to apply;
- translate pH into economic return to bottom line;
- need better economic recommendations;
- need better calculations of lime requirement;
- unclear and mixed messages need to be clarified (e.g. regarding how much lime to apply at one time).

**Yealering:**

- expected response as a yield % and what is the dollar value;
- where to put the lime to get best value;
- soil testing to understand the situation is important
- alternative (cheaper and local) sources of lime!

**Discussion****Limitations to liming**

Aspects related to the economic realities of farming were the main limitations to liming identified by participants at these three workshops. The participants independently nominated and rated as most important overall cost, returns (return on investment, certainty of return, certainty of response, variability of returns) and cash flow as the key constraints to applying sufficient lime to address soil acidity on their farms. These results suggest that, for the participants at these workshops, more lime would be applied under conditions of better cash flow or farm profitability. However, the apparent consistency of this summary result obscures the greater detail that is evident from the discussion that was conducted around the quantitative data from the Turning Point Audience Response system.

The discussion conducted during the workshop sessions, and reported in the comments above, identified two broad groups

of farmers with differing, though related information needs. One group can be classified as those who are largely convinced of the value of liming and are seeking to hone their inputs to maximise the returns from liming. For this group, the main information needs identified were further clarification about responses to liming in specific circumstances and the rates required to achieve pH targets.

The second group of farmers are those who did not appear to be entirely convinced of the value of liming. The main information needs of this group fell into two broad categories. Firstly, fundamental information about acidity and liming, expected pH changes and the rates required to achieve pH changes at the paddock scale. Secondly, this group is also interested in improving the returns from liming and so would also be able to make use of any information about responses to liming, the rates required to achieve specific pH targets and the economics of liming. This would be particularly the case once they were convinced of liming as a tool to manage soil acidity. Future extension should target these two groups, particularly if the results from these focus group are indicative of the larger population of farmers in WA (see limitations below).

Subsurface soil sampling was valued by most, but not all of the workshop participants. Soil sampling to depth was mainly used to provide more information for liming decisions and as such the value of soil sampling to depth was seen more by those who were convinced of the value of liming. The use of additional information from soil sampling to refine liming decisions and to better determine liming requirements is an aspect that was developed through the SI002 project. This is an essential part of future extension aimed at both increasing the efficiency of liming and lime application to address subsurface acidity.

Despite anecdotal suggestions to the contrary, the cost of freight per se was not considered to be a major limitation to liming by the participants at these workshops. The cost of liming is considered to be the overall cost including product, freight and spreading. It was also evident from these workshops that liming decisions are considered based on long-term benefits and so are treated completely differently from decisions related to short-term responses, such as nitrogen or herbicide application.

During the workshop the facilitator and project staff sought responses from the participants regarding the best or preferred sources of information and methods of accessing information. Unfortunately, the responses tended to be general and to state the 'usual' methods, such as field days, consultants, and 'you blokes' with no clear preferences identified. One source that was stressed was the importance of local producers who are seen as 'leading farmers' and also the value of local trials and demonstrations as a means of impacting on a regional audience. There may be potential for farmers who are in the first group identified above (convinced of the value of liming) to be

canvassed to assist with taking the message about soil acidity and liming to other farmers.

### Limitations to this study

The focus group approach used in this study does not claim to provide data from a statistically representative sample of the population of interest (which in this case was broad-acre farmers in the central wheatbelt of Western Australia). That said, the facts that the age demography of the participants was reasonably diverse (and reflective of the age demography of the region), that the information from the focus groups represented a range of views about soil acidity and liming (from the convinced to the somewhat sceptical) and that the results match *a priori* expectations from previous, anecdotal information, suggest that the results could be transferable. The strength of the focus group approach is considered to be the advantages of discussions and synergism that are possible with small groups (Keown, 1983). Modified versions of the focus group methodology which integrate qualitative and quantitative techniques, such as was used in this study, have been found to increase the validity and ability to generalise from the results (e.g. Bennington and Cummane 1998).

### Recommendations

The results of these workshops lead to the following recommendations for future research and extension:

1. Conduct further workshops or written questionnaires to confirm whether the results from these workshops are typical and representative of other growers.
2. Further, continued and more widespread extension of fundamental information about soil acidity and liming, such as was compiled as part of SI002. The results of these focus groups suggest that this would be most effective through advisory networks such as consultants, fertiliser companies, 'leading growers' and even trucking contractors. This could also help to reduce mis-information from consultants and others, such as was mentioned at these focus groups.
3. Further analyses of research and demonstration data and from models, such as Optlime, to try to identify any trends in variability in responses to lime with environmental and management factors. This is aimed at 'precision liming'. An important outcome of such work could be the identification of gaps in the current datasets as well as the level of specification that is possible within natural variability.
4. Establishment of demonstration sites, preferably with interested grower groups in targeted districts. These should be aimed to take advantage of the example set by 'leading growers' and also to address the interest in having localised results. It is recognised that these are expensive to establish and to maintain, so they would need to be well funded and targeted.

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## Appendix 1

Slides of workshop questions to participants at the Beacon, Narembeen and Yealering Soil Acidity and Liming focus group workshops.  
(Narembeen questions and responses used as the example)

## Soil Acidity Project Workshops

Narembeen  
August 4<sup>th</sup> 2009



## Which teams do you support?



## Background to Project 2005-2009

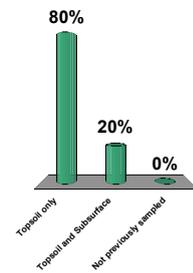
Soil acidity better managed (Avon River Basin)

- Incentives
  - Subsurface soil testing
- Specific studies
  - Gabby Quoi Quoi, Beacon, Narembeen, Yealering
- Extension
  - Rural media
  - Field days



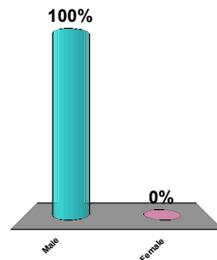
## Prior to this project Had you soil sampled?

1. Topsoil only
2. Topsoil and Subsurface
3. Not previously sampled



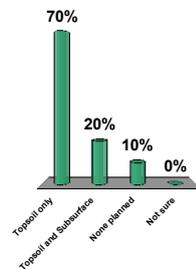
## Are you?

1. Male
2. Female



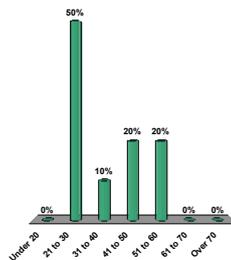
## Do you plan to soil sample on your farm next year?

1. Topsoil only
2. Topsoil and Subsurface
3. None planned
4. Not sure



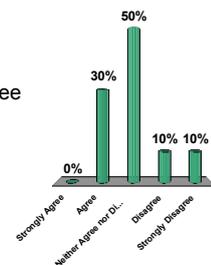
## To which age group do you belong?

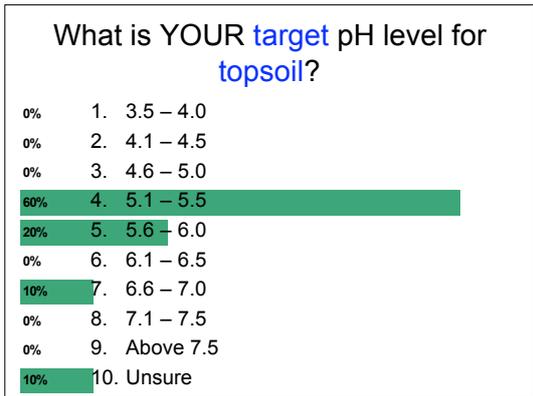
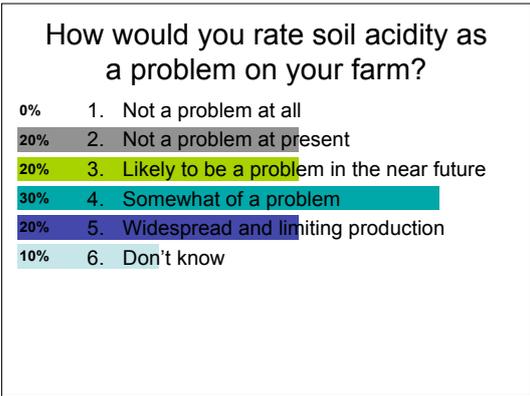
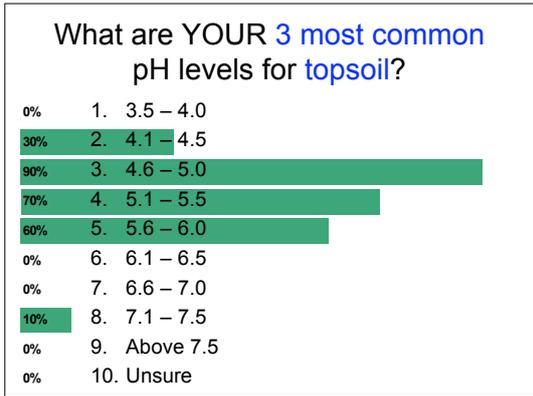
1. Under 20
2. 21 to 30
3. 31 to 40
4. 41 to 50
5. 51 to 60
6. 61 to 70
7. Over 70



## There is a clear benefit or return on \$ spent on sampling to depth

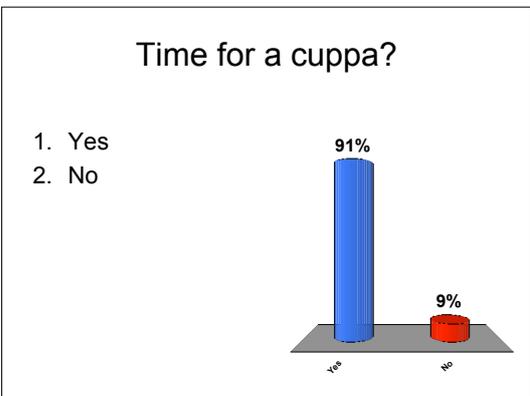
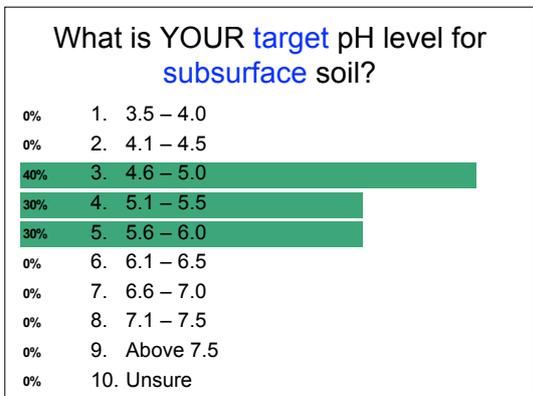
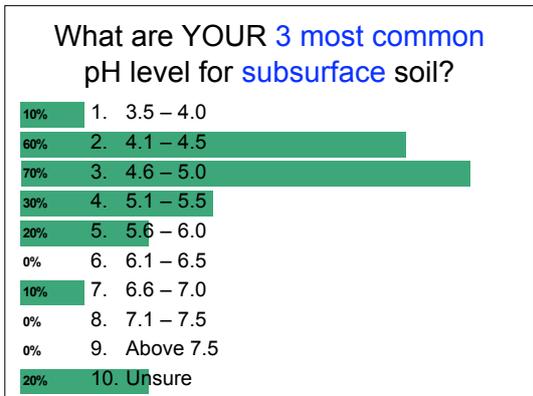
1. Strongly Agree
2. Agree
3. Neither Agree nor Disagree
4. Disagree
5. Strongly Disagree





## Presentation of local results

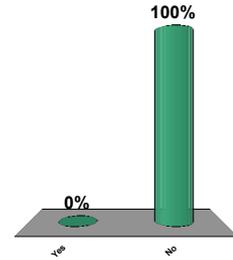
Joel Andrew  
Precision SoilTech



Afternoon tea

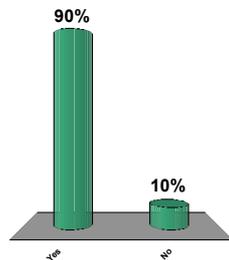
Are you applying enough lime to reach your soil pH targets?

1. Yes
2. No



Have you ever applied lime?

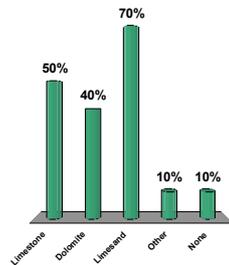
1. Yes
2. No



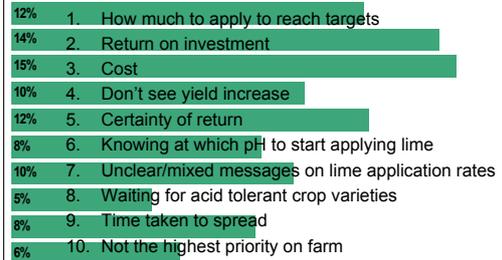
What are the limitations to carrying out liming on your farm?

Which type(s) have you used?

1. Limestone
2. Dolomite
3. Limesand
4. Other
5. None



Limitations to liming

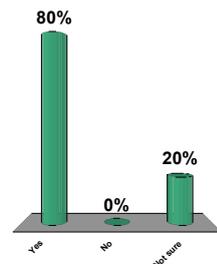


What was the typical application rate?

- |     |                  |
|-----|------------------|
| 10% | 1. Never applied |
| 0%  | 2. 0.5 t/ha      |
| 90% | 3. 1.0 t/ha      |
| 0%  | 4. 1.5 t/ha      |
| 0%  | 5. 2.0 t/ha      |
| 0%  | 6. 2.5 t/ha      |
| 0%  | 7. 3.0 t/ha      |
| 0%  | 8. 3.5 t/ha      |
| 0%  | 9. 4.0 t/ha      |
| 0%  | 10. 4.5 t/ha     |

Do you think that soil acidity is manageable on your farm?

1. Yes
2. No
3. Not sure

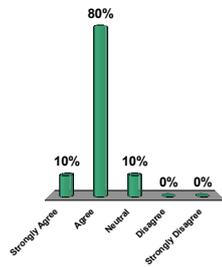


## Thankyou

A couple of final questions on the day

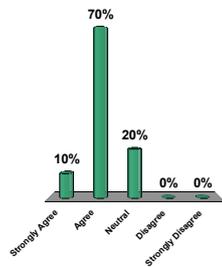
### The afternoon was interesting

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly Disagree



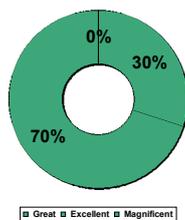
### What I learnt is useful to my farm business

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly Disagree



### The food was

1. Great
2. Excellent
3. Magnificent



## Appendix 2

Combined slides of workshop presentations at the Beacon, Narembeen and Yealering Soil Acidity and Liming focus group workshops.

# Monitoring Soil Acidity

## Avon River Basin, Western Australia

Beacon, Narembeen & Yealering,  
Western Australia  
3rd, 4th & 5th August 2009

Joel Andrew  
**PRECISION SoilTech**

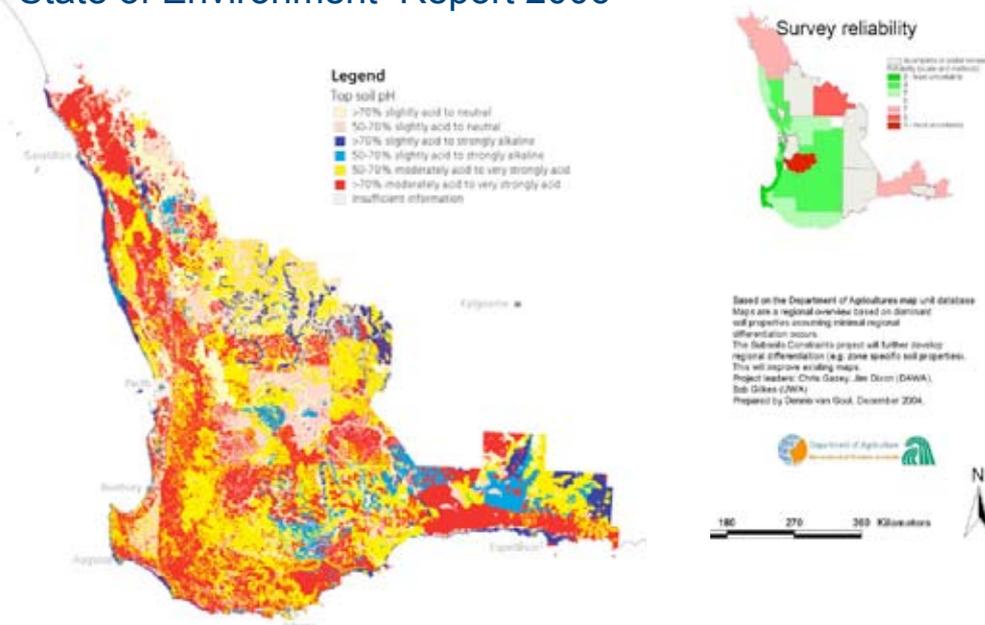


Department of  
Agriculture and Food



## Why a soil acidity project?

State of Environment Report 2006



## Avon River Basin

Avon Catchment Council is NRM organisation

Avon River Basin  
~ 11.8 M Ha  
~ 8.3 M Ha in agricultural region

Various rainfall zones and management practice



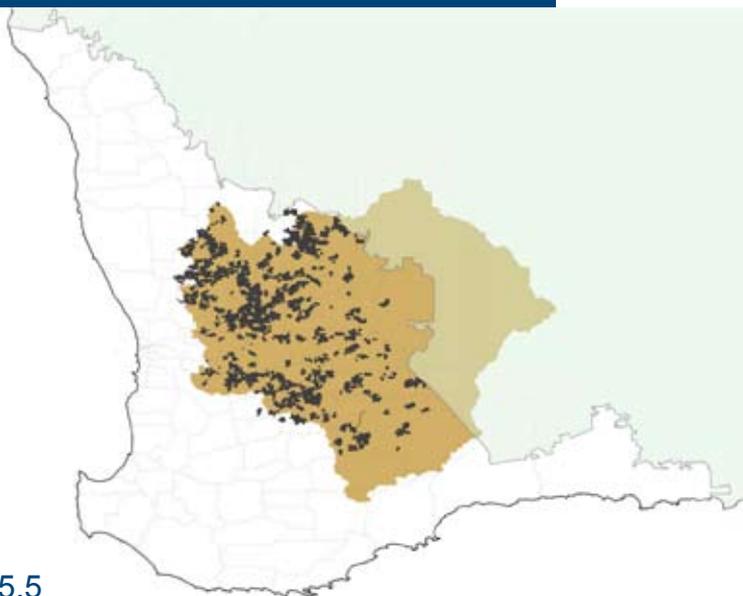
## Subsurface soil sampling incentive

Avon River Basin  
~ 8.3 M Ha

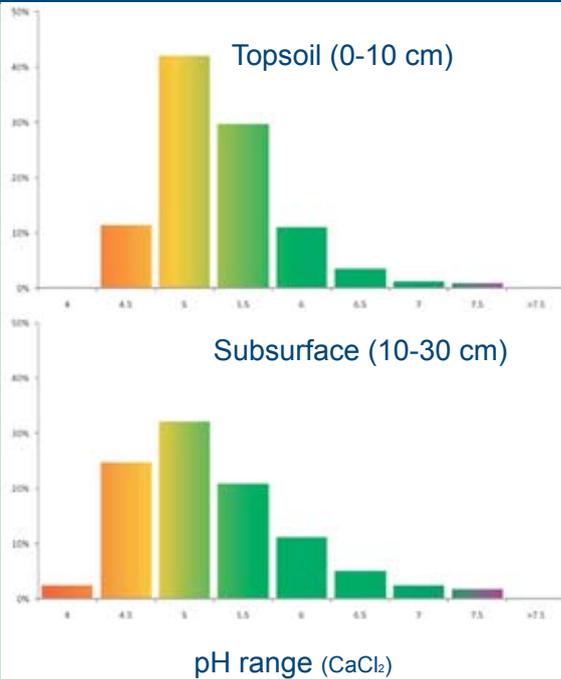
Samples collected  
Top ~ 18,073  
Mid ~ 13,693  
Sub ~ 8406

Participants cover  
780,000 Ha  
nearly 10%

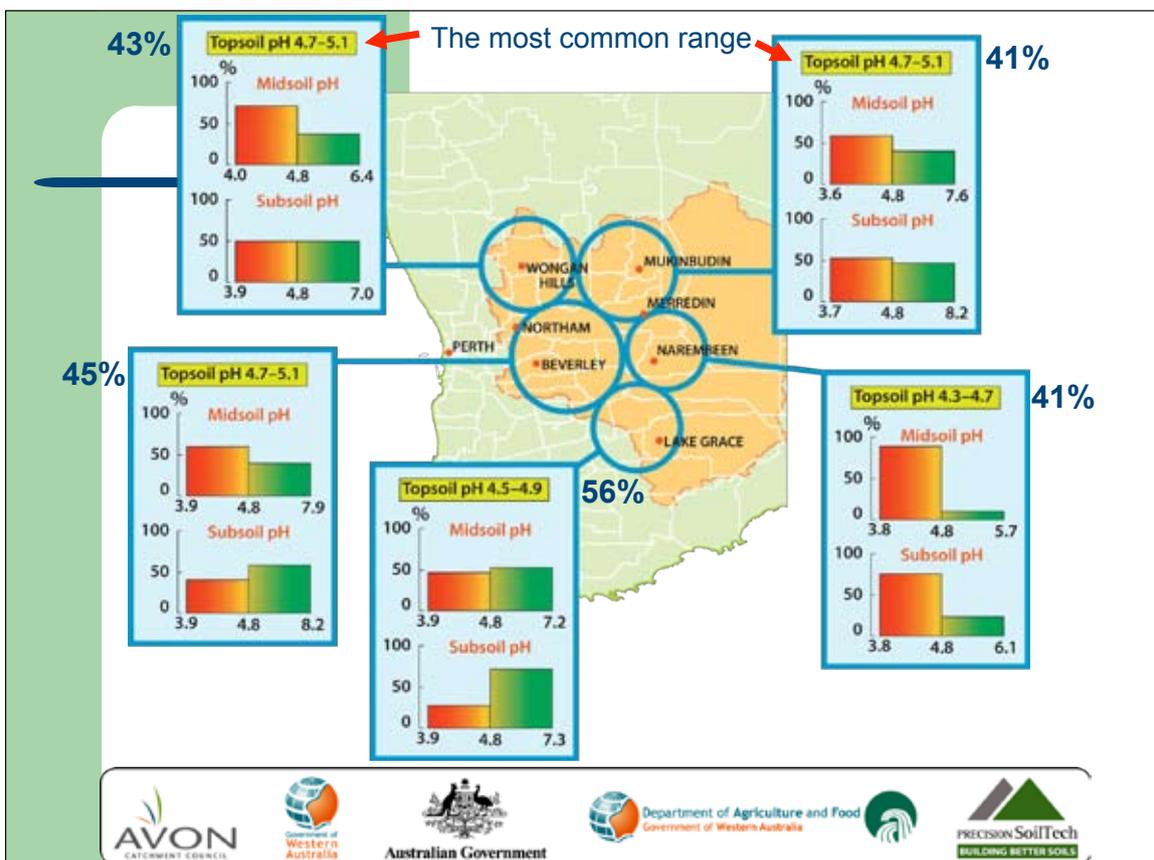
80% of topsoil pH <5.5  
45% of subsurface pH <4.8



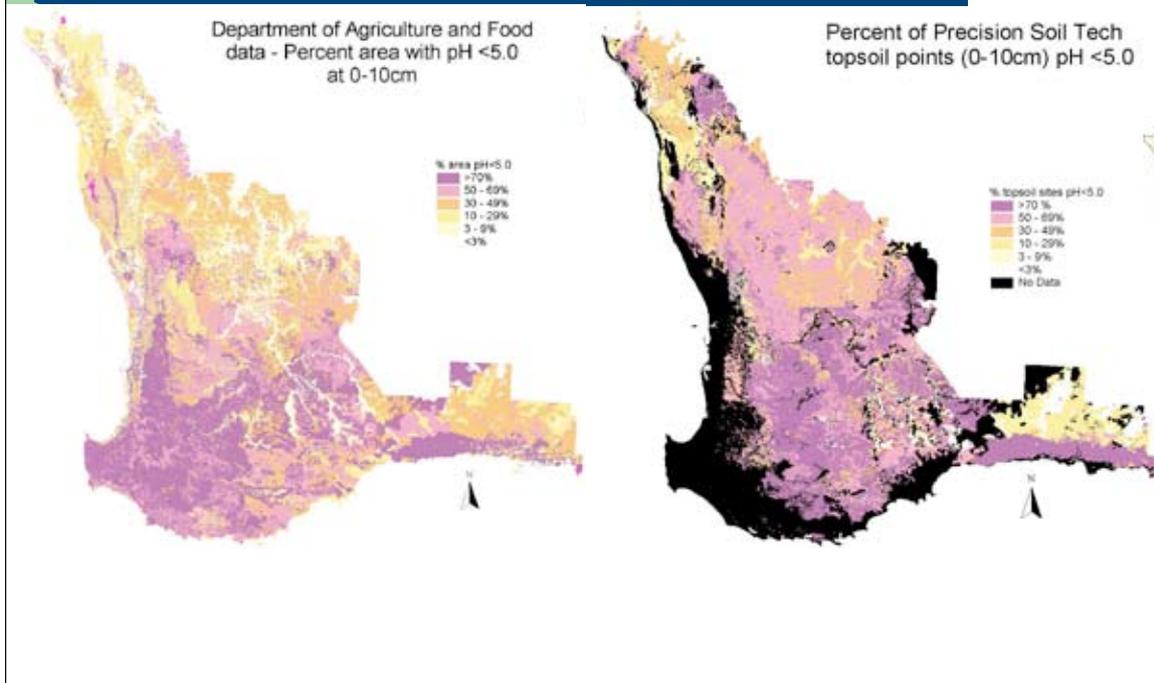
## Avon River Basin pH distribution



80% of topsoil pH <5.5  
45% of subsurface pH <4.8

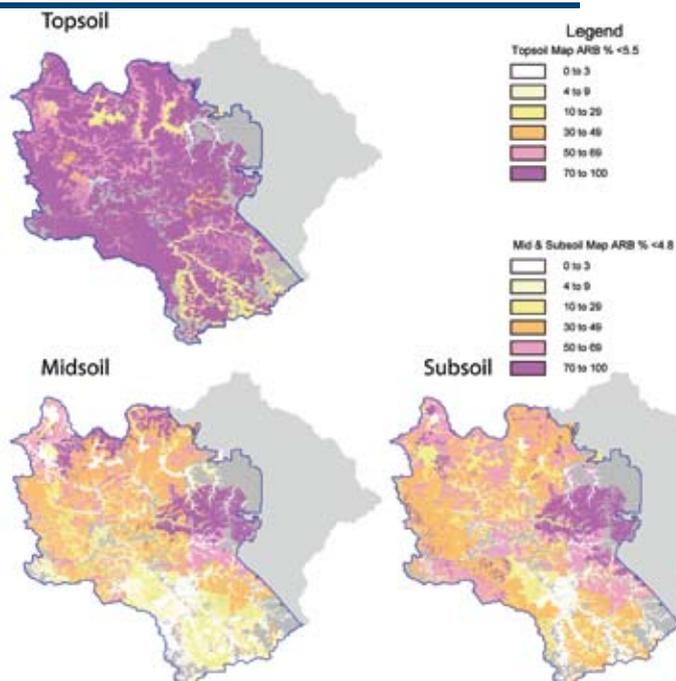


## Improving acidity estimations



## Acidity risk assessment maps

- Majority ( 80%) of topsoil below ACC target (pH 5.5)
- Half of subsurface below ACC target (pH 4.8)
- Identified 'acidity priority areas' to be further examined





**Purpose of regional studies:**

- Undertake intensive soil acidity survey in priority areas
- Determine if existing SoilTech sites could be used to monitor soil pH change

## Regional acidity project results

**General outcomes from all regions:**

- Overall slight soil pH increases observed in the topsoil and midsoil
- Range of soil pH changes recorded both positive and negative
- Effect of lime is hard to measure over large areas and different practices

## Regional acidity project results

General outcomes from all regions:

- Overall slight soil pH increases observed in the topsoil and midsoil

Location	Topsoil (0–10 cm) Avg. pH (n)	Midsoil (10–20 cm) Avg. pH (n)	Topsoil (0–10 cm) Avg. pH change	Midsoil (10–20 cm) Avg. pH change
Beacon	5.3 (221)	5.0 (217)	0.2	0.0
Konno	5.0 (287)	4.7 (265)	0.3	0.4
Narembeen	5.2 (228)	4.8 (185)	0.3	0.2
Yealering	5.1 (234)	5.0 (234)	0.3	0.2

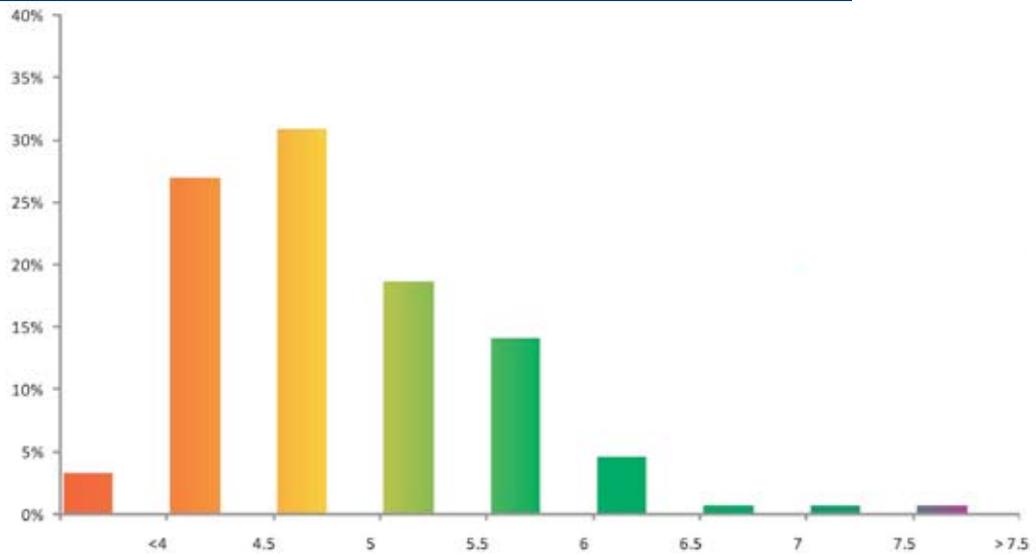
- Changes are small though significant (i.e. high 4's → low 5's)
- Average is a misleading assessment of regional soil condition

## ARB monitoring results

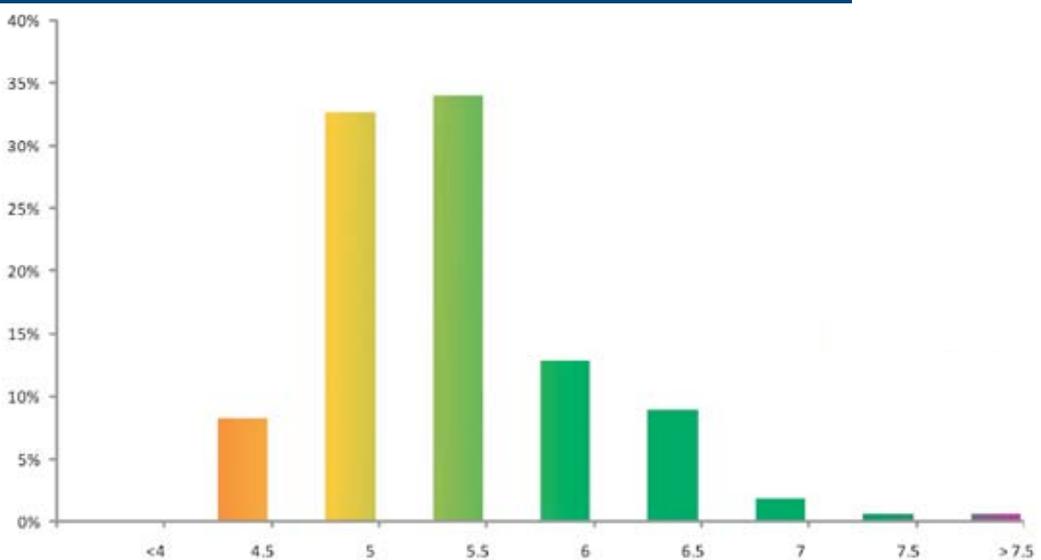
Location	New Grower Topsoil Avg. pH (n)	Old Grower Topsoil Avg. pH (n)	New Grower Midsoil Avg. pH (n)	Old Grower Midsoil Avg. pH (n)
Beacon	5.1 (102)	5.3 (156)	5.3 (102)	5.0 (155)
Yealering	5.1 (234)	5.1 (235)	5.1 (210)	5.0 (229)
Narembeen	5.4 (232)	5.2 (228)	5.2 (189)	4.8 (185)

- No difference was found between 'New' and 'Old' growers in the Beacon and Yealering regions
- Difference found in Narembeen
- Indicates that points in Precision SoilTech database can be used to represent soil pH for other regions

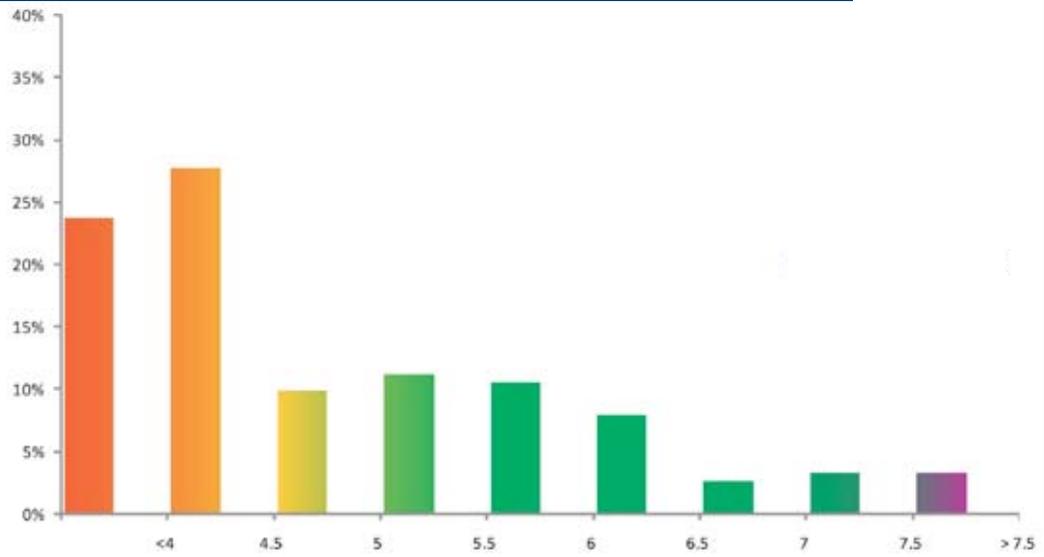
## Beacon topsoil 1999



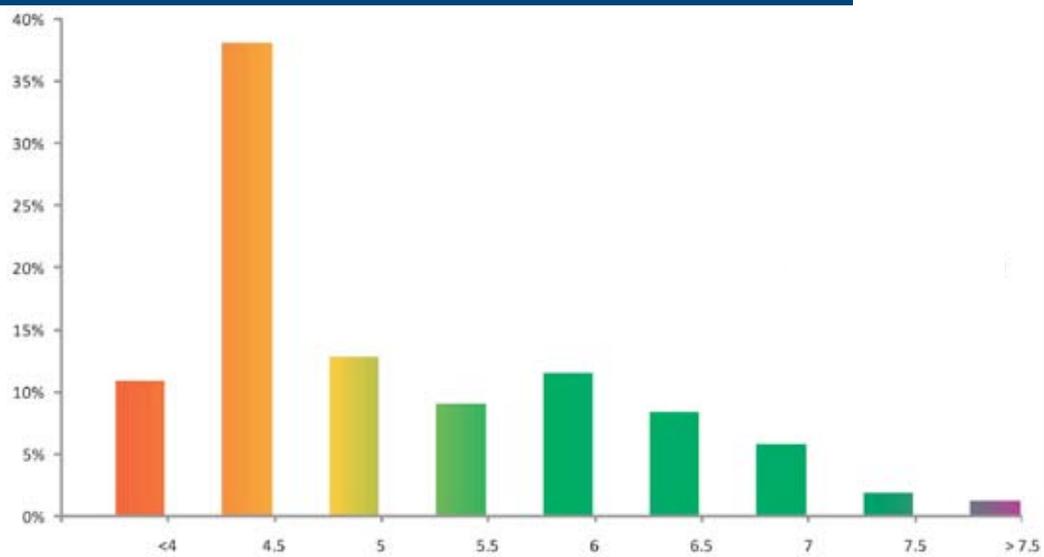
## Beacon topsoil 2009



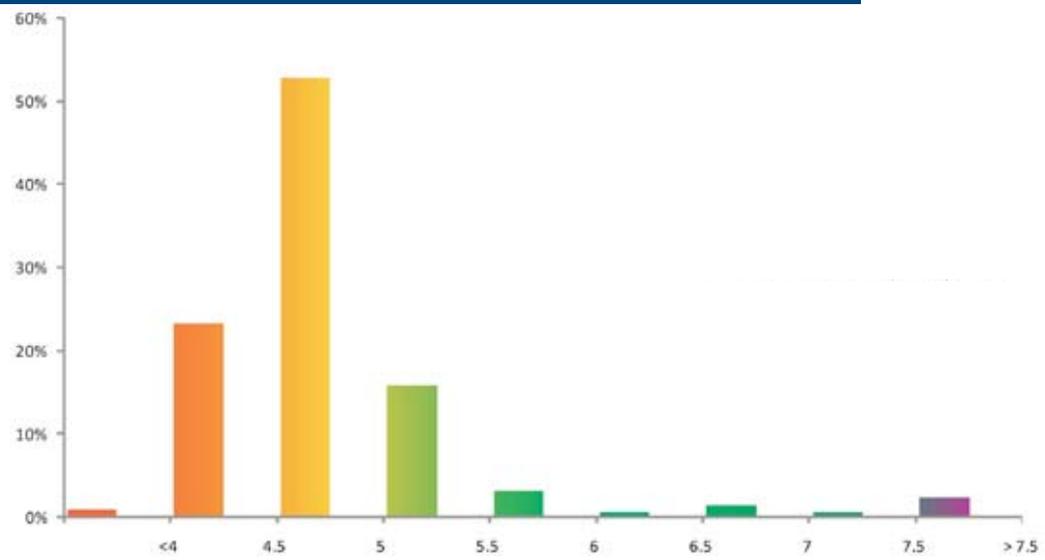
## Beacon midsoil 1999



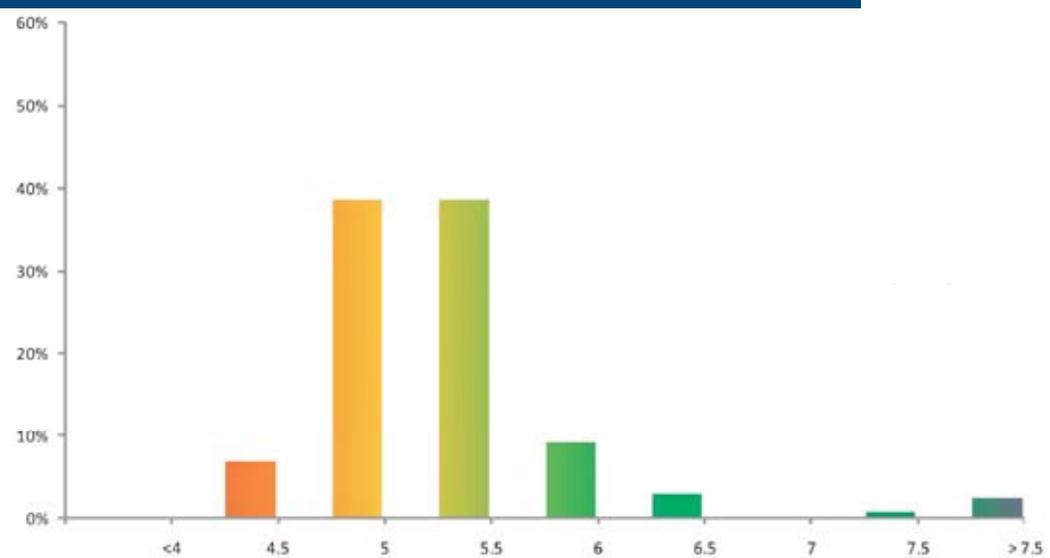
## Beacon midsoil 2009



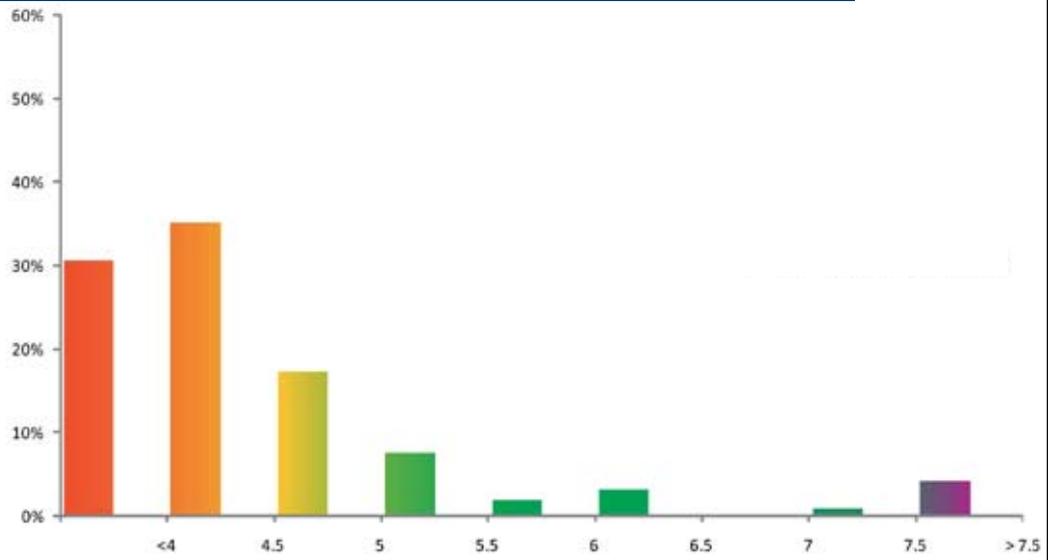
## Narembeen topsoil 1999



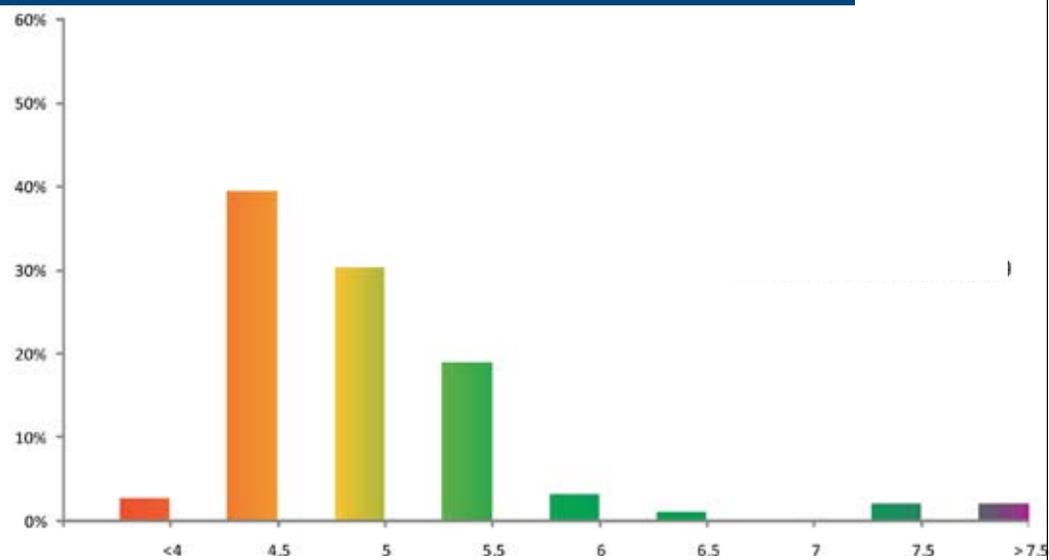
## Narembeen topsoil 2009



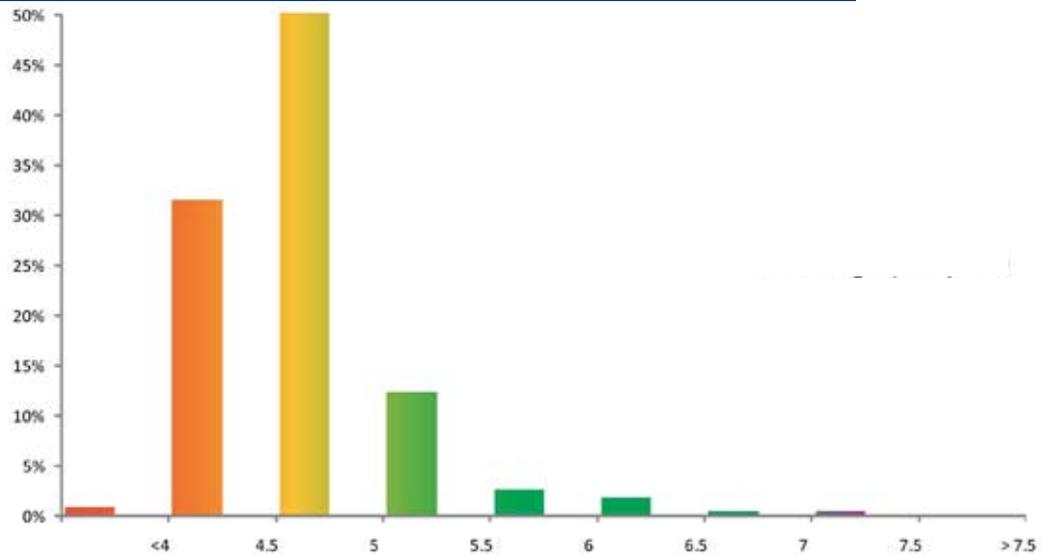
## Narembeen midsoil 1999



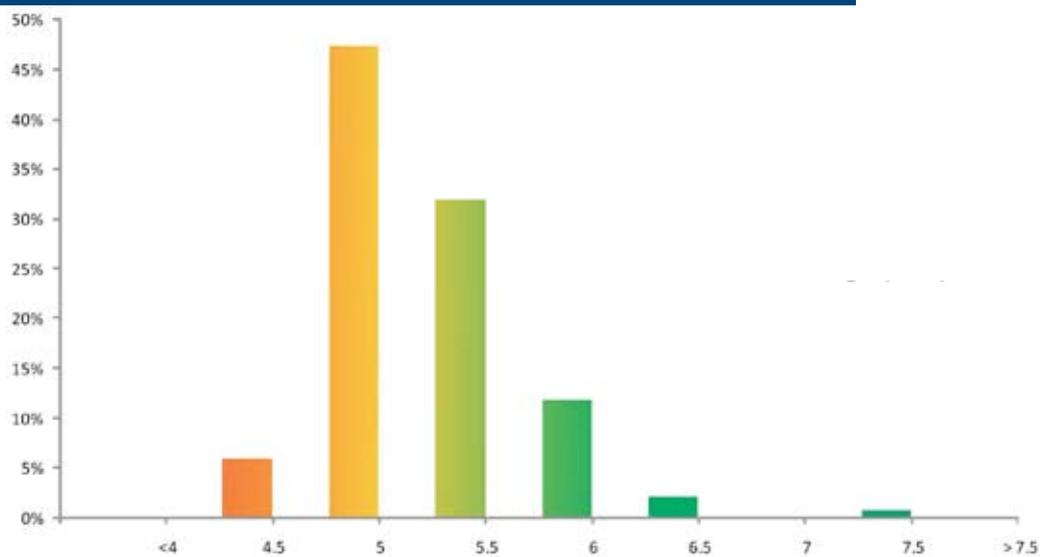
## Narembeen midsoil 2009



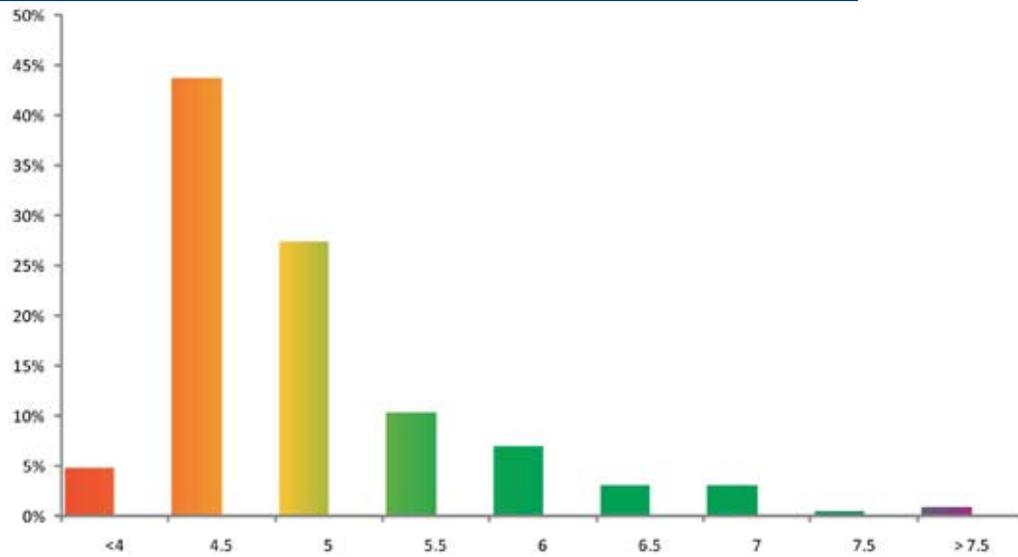
## Yealering topsoil 1999



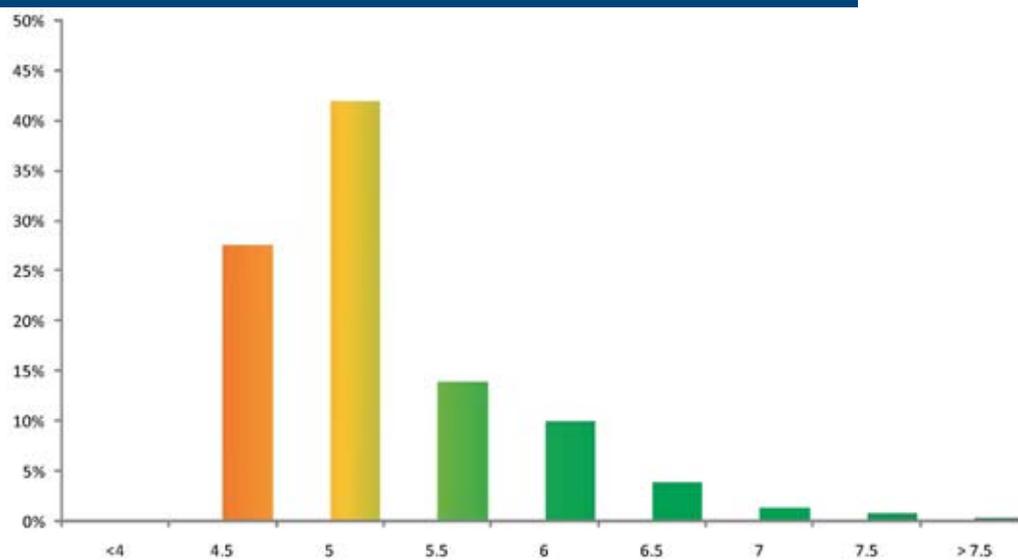
## Yealering topsoil 2009



## Yealering midsoil 1999

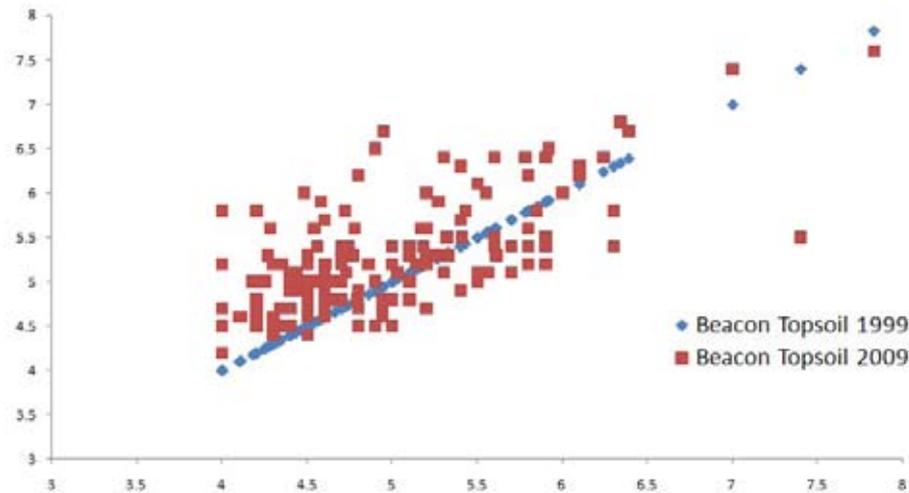


## Yealering midsoil 2009

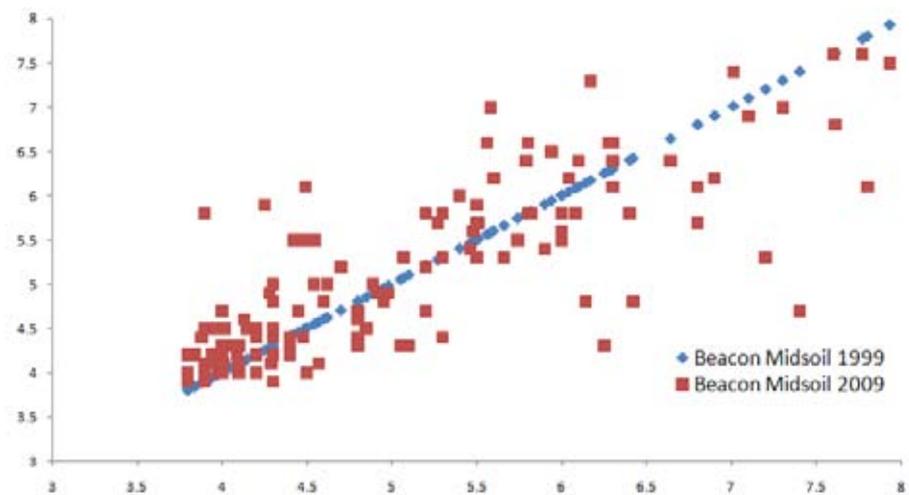


## Beacon topsoil pH change

- Range of soil pH changes recorded both positive and negative

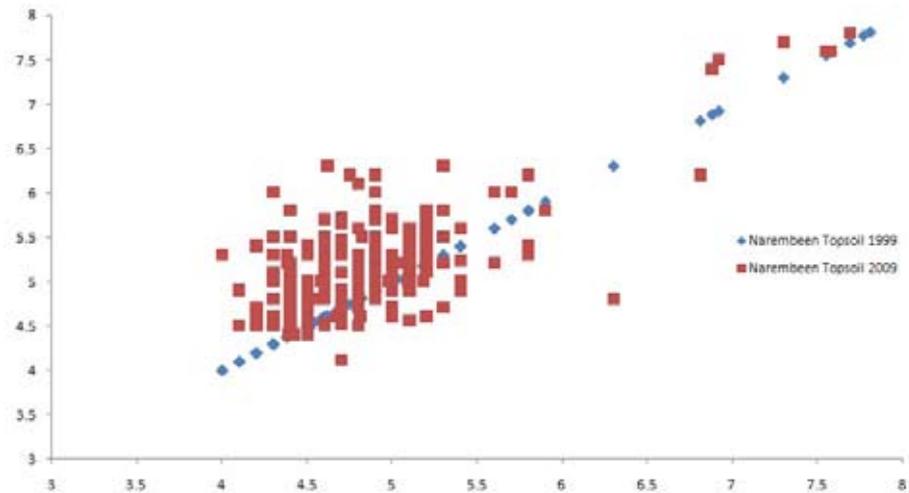


## Beacon midsoil pH change

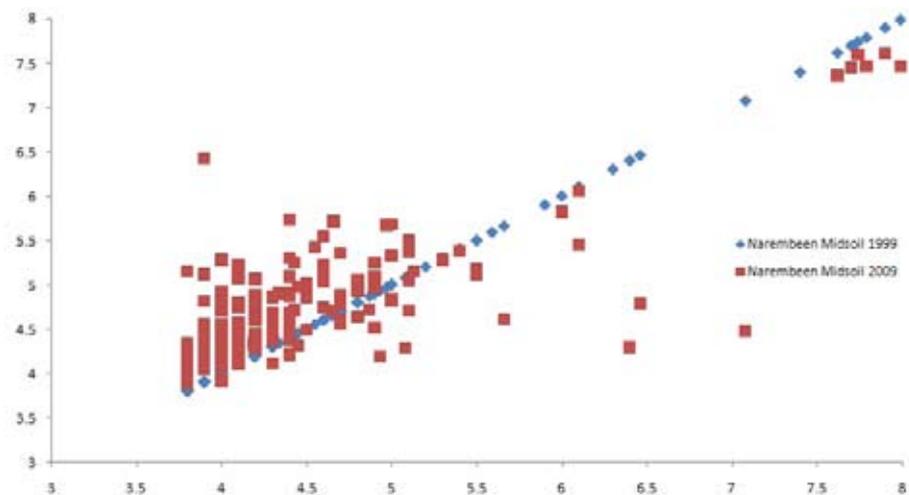


## Narembeen topsoil pH change

- Range of soil pH changes recorded both positive and negative

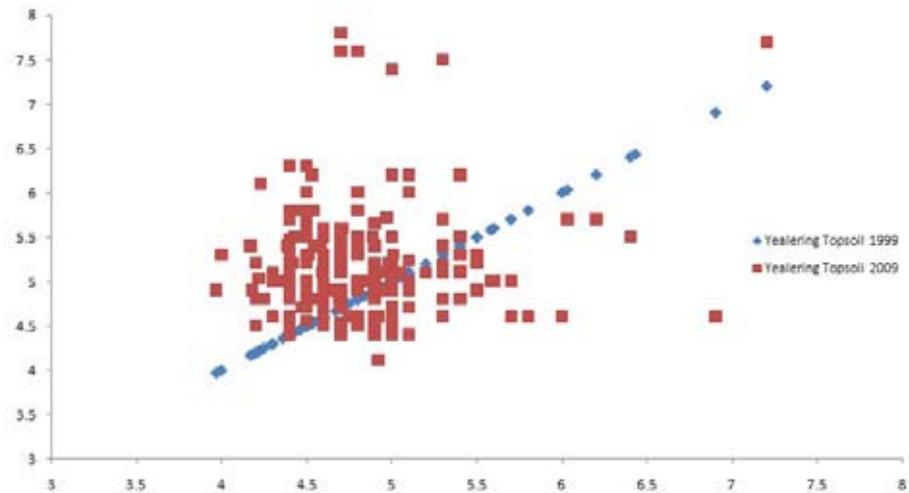


## Narembeen midsoil pH change

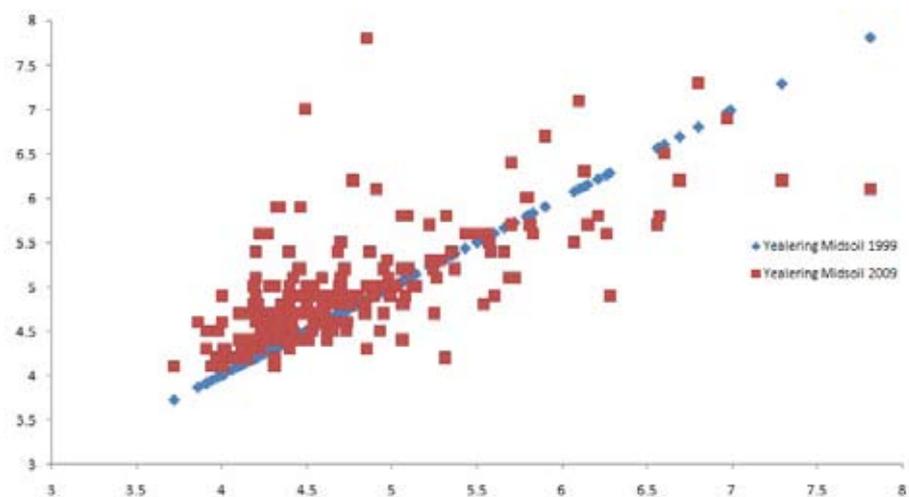


## Yealering topsoil pH change

Range of soil pH changes recorded both positive and negative



## Yealering midsoil pH change



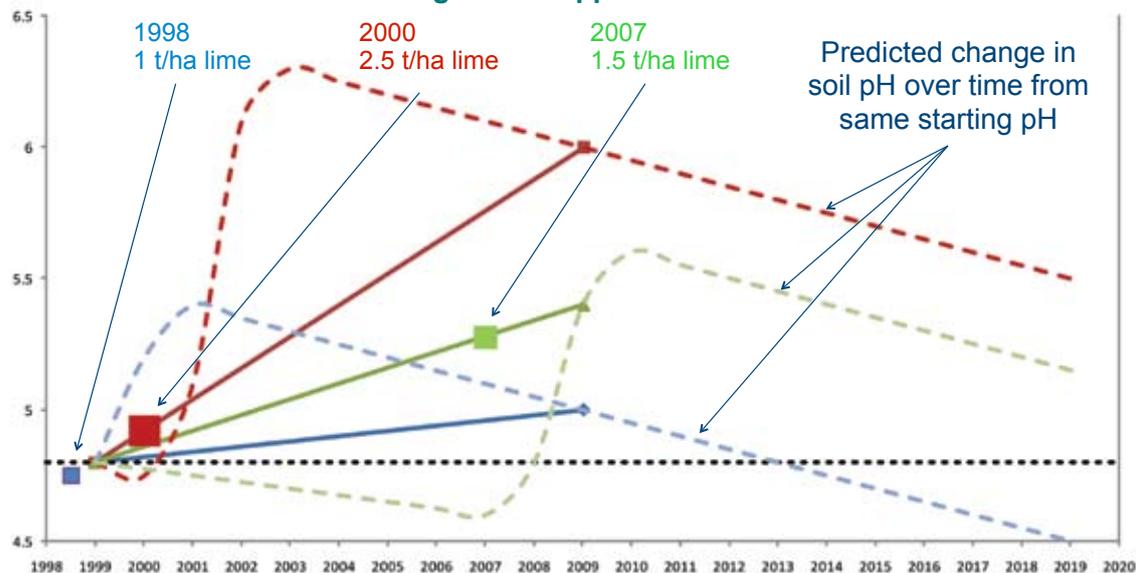
## Regional acidity project results

### General outcomes from all regions:

- Number of paddocks receiving lime\* (\*- not all paddock data available)
  - 17 of 40 recorded paddocks limed in Beacon
  - 5 of 25 recorded paddocks limed in Narembeen
  - 12 of 33 recorded paddocks limed in Yealering
- Rate of lime application
  - All lime applied at 1 t/ha in Beacon
  - Rates varied from 0.5 – 3 t/ha in Narembeen
  - Rates varied from 0.3 – 1 t/ha in Yealering
- Effect of lime is hard to measure over large areas and different management practices
- Hard to show overall change in soil pH as lime x many factors
  - Starting pH, soil type, lime source, lime rate, time since application

## Lime use Vs pH change

Final soil pH is dependent on the amount and timing of lime application



## Summary

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- Overall soil pH has slightly increased
- Positive and negative changes were recorded
- Liming increases soil pH though needs to be applied regularly
- SoilTech points can be used as baseline pH for monitoring if appropriate numbers and soil type and land use representation

## Project staff contact details

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**PRECISION SoilTech**

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0429 917 743  
[joel@aglume.com.au](mailto:joel@aglume.com.au)

## Appendix 3

Report to Participants at the Beacon, Narembeen and Yealering Soil  
Acidity and Liming focus group workshops.

# Soil Acidity and Liming Workshops

## Report to Participants

**BEACON, 3RD AUGUST 2009**

### **Introduction**

A series of focus groups were conducted with invited growers who had participated in subsurface soil testing for pH as part of the Avon Catchment Council Soil Acidity SI002 project. Each focus group involved discussion of the soil sampling data from the region and the participating farmers' use of and attitudes to liming in the light of this information. The information from the workshops will be used to determine if there are any common barriers to the use of liming as a practice to manage soil acidity and to help to guide future research and extension in soil acidity and liming.

This document is a brief summary report of the focus group workshop and is presented to the participants for information and any further comment.

### **The Workshop**

The Beacon workshop involved five participants, four males and one female with ages ranging from 31–40 to 61–70.

The workshop involved presentation of the soil testing results for the region and discussion of the results compared to the expectations of the participants. Questions about target pH, soil acidity as a problem, previous lime use and limitations to carrying out liming stimulated discussion about needs for information and/or awareness and possible ways to address these. Responses from participants were recorded as a combination of responses to set questions using the *Turning Point Audience Response* system and comments made in discussion about the questions. All information was recorded anonymously.

***The results of soil sampling for the three study regions presented at the workshops are attached for your information***

### **Answers to each question**

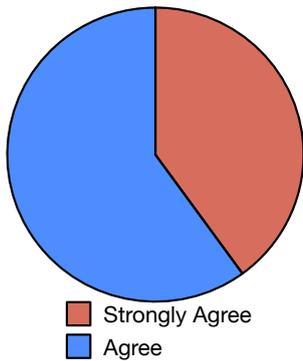
#### **Soil sampling, pH and lime use**

The results of the soil testing were according to the expectations for four of the participants, but worse than expected for one of them. This related to the samples being from a new farm and, although low pH was suspected, the results were lower than expected.

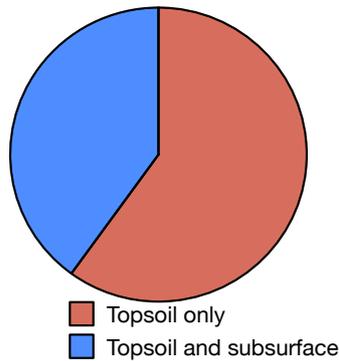
All participants agreed or strongly agreed that there is a clear benefit or return to soil sampling to depth and more people intended to sample to depth next year. Soil sampling to depth was seen as useful for both fertiliser and acidity management. The main limitation to soil sampling is the availability of contractors.

Soil acidity was rated as 'likely to be a problem in the near future' by one participant, 'somewhat of a problem' by another and 'widespread and limiting production' by the other three. Four participants had applied lime previously.

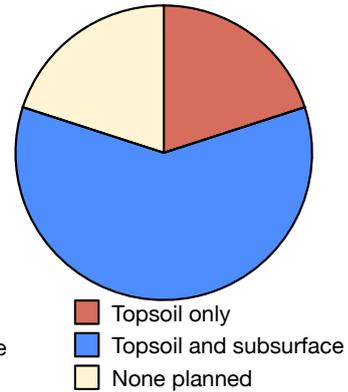
**Clear benefit or return to \$ spent on soil sampling to depth**



**Soil sampling before project**



**Soil sampling intention next year**



Limestone, dolomite and limesand had all been used at a typical application rate of 1 t/ha.

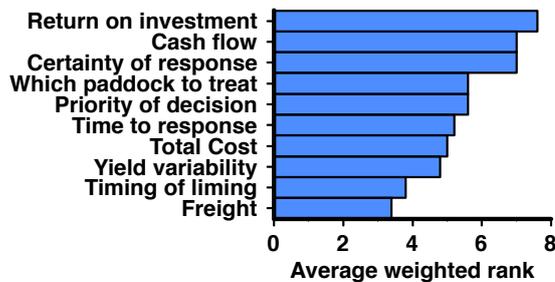
- Time to response
- Total Cost
- Yield variability (profitability)
- Cash flow
- Return on investment
- Timing of liming (time of year)
- Certainty of response
- Freight
- Which paddock to treat (priority)
- Priority of decision (lime c.f. other farm or non-farm costs)

### Limitations to carrying out liming

The participants identified ten limitations to carrying out liming on their farm

**At right: ranking of limitations to liming**

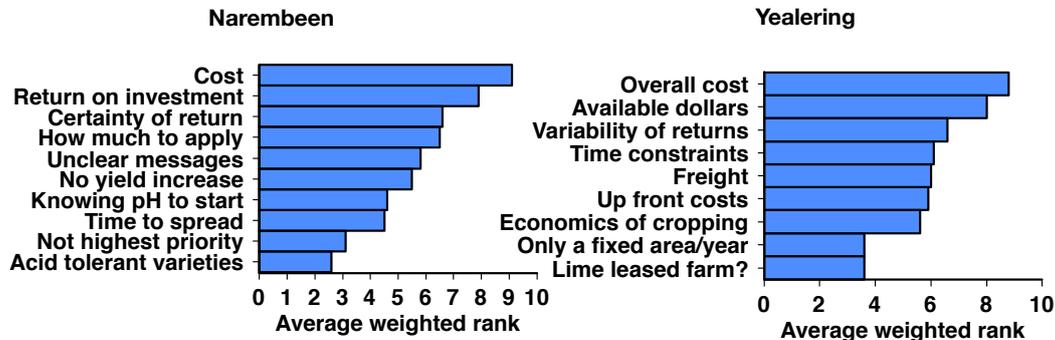
Limitations are shown in order from most important to least important



These were ranked by the participants in terms of their individual perception of the importance of each. Each ranked limitation was given a weighting (from 10 to 1 for the most to least ranked respectively) and then the average weighted ranking of each was calculated.

There was considerable variability in the rankings between participants. Aspects that were ranked highly by several participants and so received a high weighted rank were return on investment, cash flow and certainty of response. It was noted by the participants that several of the limitations related back to costs or returns. Other

aspects related to decision-making and liming (which paddock to treat, priority of decision) were ranked as moderately important. The timing of liming (time of year) and yield variability (profitability) were not ranked highly by the participants. It was noted that it can be difficult to find the time to apply lime as people want to/need to have a break. There was general agreement of the over-riding impact of cash flow – “after poor years you basically shut down and become non-receptive to new information”. From the discussion, freight was not seen as a major limitation in its own right, but



**Above: Ranking of limitations to liming at Narembeen and Yealering workshops**

Limitations are shown in order from most important to least important

was considered to be part of the overall cost of the product.

The limitations identified in this workshop were similar to those that were identified at the other two workshops, although the ranking of them varied in different regions.

Based on the information from the soil sampling conducted as part of the project, their individual experiences and taking account of the limitations to liming, all participants thought that soil acidity was manageable on their farms.

### Comments from participants

During the workshop, comments, suggestions and questions from participants were recorded by project staff. A summary of these is given below.

#### Comments

Some comments by participants related to liming and the type of lime used. These included:

- we now have a good idea of subsurface pH across the farm (from soil sampling) and will probably back off while things start to happen (from liming) and then look again in a few years;
- limestone for storage and handling was tried - “educated back to limesand”;
- location is sometimes a driver of which one to use;
- tend to ‘trust’ information from ‘you blokes’ but seeing it on your own place reinforces it;
- information (about soil acidity and liming) comes from Ag Dept, you blokes (AgLime), GRDC;
- sources of information are DAFWA, GRDC trials, recent Kellerberrin (David Leake) and DAFWA trials;
- once worked out that 1t/ha was working then was happy to move to 2 t/ha treatment;

- trials on my own place were very important;
- perhaps a good idea to lime 'at this time of year' so do it before looking at the budget(!);
- had not heard previously that yield returns around 10% and return on investment around the same— one participant commented that thought numbers could have been higher.

### Questions

A number of questions about soil acidity were fielded by the project team. These questions related to soil pH, the effect of acidity, soil sampling and liming. The questions were answered during the workshop, so the answers are not reproduced here. Some of the questions that were asked were:

- what is an acceptable low pH (this person had been told pH 4.0 by a consultant);
- at what pH should we start putting out lime;
- what is the effect of acidity;
- what is the best way to rate lime quality;
- is it possible to put the lime where it is needed if surface is okay;
- value of applying lime in spring; when is the best time;
- if have two paddocks, one a 4.8. another at 5.2 which gets priority
- can you just spread on surface and let rain wash the lime in or do you need to incorporate/till?

### Suggestions

The participants made several suggestions regarding information needs and suggestions for future research and extension relating to soil acidity and liming. These included:

- expected yield response to liming—need tighter information with certainty of response and pay-back;
- which paddocks to treat first - some guidance needed;
- need the message now about needing to apply 2 t/ha up front;
- seeing trial work in own area helps with decision.

### Conclusion

The participants at this workshop were largely convinced of the value of liming. The main information needs identified were further information about responses to liming and the rates required to achieve pH targets. In addition, the value of local trials and demonstrations was stressed as a means of impacting a regional audience.

### Workshop facilitation and production of this report

Dr James Fisher, Désirée Futures



# Soil Acidity and Liming Workshops

## Report to Participants

**NAREMBEEN, 4TH AUGUST 2009**

### **Introduction**

A series of focus groups were conducted with invited growers who had participated in subsurface soil testing for pH as part of the Avon Catchment Council Soil Acidity SI002 project. Each focus group involved discussion of the soil sampling data from the region and the participating farmers' use of and attitudes to liming in the light of this information. The information from the workshops will be used to determine if there are any common barriers to the use of liming as a practice to manage soil acidity and to help to guide future research and extension in soil acidity and liming.

This document is a brief summary report of the focus group workshop and is presented to the participants for information and any further comment.

### **The Workshop**

The Narembeen workshop involved ten participants, all males with ages ranging from 21–30 to 51–60.

The workshop involved presentation of the soil testing results for the region and discussion of the results compared to the expectations of the participants. Questions about target pH, soil acidity as a problem, previous lime use and limitations to carrying out liming stimulated discussion about needs for information and/or awareness and possible ways to address these. Responses from participants were recorded as a combination of responses to set questions using the *Turning Point Audience Response* system and comments made in discussion about the questions. All information was recorded anonymously.

***The results of soil sampling for the three study regions presented at the workshops are attached for your information***

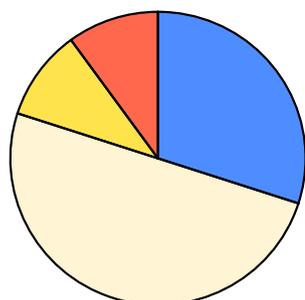
### **Answers to each question**

#### **Soil sampling, pH and lime use**

The results of the soil testing were according to the expectations for six of the participants, but worse than expected for four of them. In general, for the paddocks that had been measured ten years previously, the pH of the topsoil had increased, while that of the subsurface soil had decreased. Comments from the participants about the soil testing results and their expectations reflected the results:

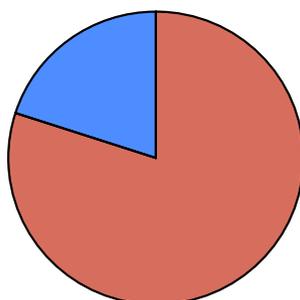
- “most results were as expected, but one paddock was a bit worse”;
- “it was good to see how (the pH) had changed over 10 years”;
- “I thought that more results should have been in higher pH range”;
- “some heavier soil was lower than expected e.g. some 5–6 pH but lower than thought”;
- “as expected—expected low and they were”;
- “the variability within a paddock was surprising”;
- “expected good based on soil type and they were”.

**Clear benefit or return to \$ spent on soil sampling to depth**



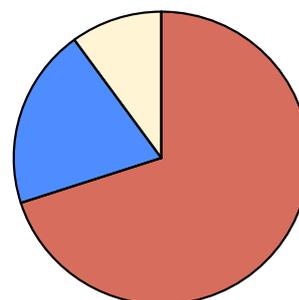
■ Agree  
■ Neither Agree nor Disagree  
■ Disagree  
■ Strongly Disagree

**Soil sampling before project**



■ Topsoil only  
■ Topsoil and subsurface

**Soil sampling intention next year**



■ Topsoil only  
■ Topsoil and subsurface  
■ None planned

Participants were divided in their agreement with the statement that ‘there is a clear benefit or return to soil sampling to depth’ and there was no difference in the number of people who intended to sample to depth next year compared with previous years. Soil sampling to depth was viewed by some as useful and has been done “mainly to check pH in problem paddocks, to examine the reasons (for the problems)”. Others are “trying to get the topsoil right before looking at subsurface problems on soils” or considered that there is “no yield response to spending money on soil sampling (to depth)”. Half of the participants were undecided regarding the value of soil sampling to depth.

Soil acidity was rated as ‘likely to be a problem in the near future’ by two participants, ‘somewhat of a problem’ by three participants and ‘widespread and limiting production’ by another two. Two participants rated it as ‘not a problem at present’ and one was unsure. Nine participants had applied lime previously. Limestone, dolomite, limesand and other liming products had all been used at a typical application rate of 1 t/ha.

### Limitations to carrying out liming

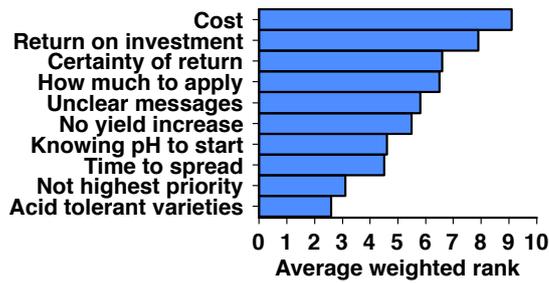
The participants identified ten limitations to carrying out liming on their farm.

- How much to apply to reach targets
- Return on investment
- Cost
- Don’t see yield increase
- Certainty of return
- Knowing at which pH to start applying lime
- Unclear/mixed messages on lime application rates
- Waiting for acid tolerant crop varieties
- Time taken to spread
- Not the highest priority on farm

These were ranked by the participants in terms of their individual perception of the importance of each. Each ranked limitation was given a weighting (from 10 to 1 for the most to least ranked respectively) and then the average weighted rank was calculated.

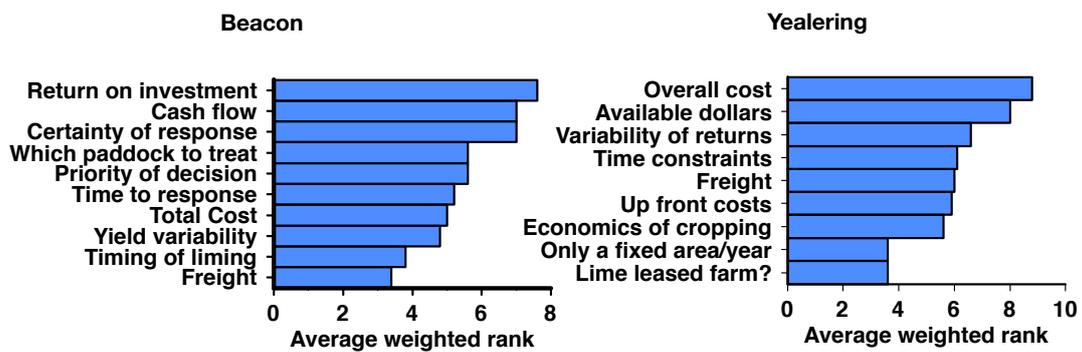
There was considerable variability between participants in the rankings of many of the limitations. Aspects that were ranked highly by most or all participants and so

**At right: ranking of limitations to liming**  
 Limitations are shown in order from most important to least important



received a high weighted rank were cost, return on investment and certainty of return. The product is cheap, but the cost of freight is high, so the overall cost landed on farm is considered. Other aspects related to information about liming (how much to apply and unclear messages) were also ranked as important. The prioritisation of liming and other solutions such as acid tolerant varieties were not ranked highly by the participants. The need for more, clearer information about how much lime to apply and expected responses came out strongly in the discussion (see comments below).

The limitations identified in this workshop were similar to those that were identified at the other two workshops, although the ranking of them varied in different regions.



**Above: Ranking of limitations to liming at Narembeen and Yealering workshops**  
 Limitations are shown in order from most important to least important

Based on the soil sampling information and taking account of the limitations to liming, eight of the participants thought that soil acidity was manageable on their farms, while two were unsure.

### Comments from participants

During the workshop, comments, suggestions and questions from participants were recorded by project staff. A summary of these is given below.

#### Comments

Some comments by participants related to liming and the type of lime used. These included;

- there is sufficient information about liming, if you are prepared to chase it up yourself;

- product information sheets are available, but are not given out routinely—you need to ask for them;
- the trucking contractor makes lime decisions (based on convenience to them!);
- lime use and rate as recommended by agronomist or soil analyst;
- lime is applied based on neutralising value (landed on farm);
- lime is applied on a three-year cycle, but it still costs \$40–50/ha on the treated paddocks each year;
- the paddocks with the lowest pH are targeted;
- eventually liming gets up the priority list to be the next issue that needs addressing.

### Questions

A number of questions about soil acidity were fielded by the project team. These questions related to soil pH, the effect of acidity, soil sampling and liming. The questions were answered during the workshop, so the answers are not reproduced here. Some of the questions that were asked were;

- how much lime is required to produce a certain change in pH;
- how much lime is required to reach targets;
- where is it best to apply lime within the paddock (varying lime application);
- is it possible to get pH change more quickly by deep liming?

### Suggestions

The participants made several suggestions regarding information needs and suggestions for future research and extension relating to soil acidity and liming. These included;

- clear information on how much lime to apply;
- translate pH into economic return to bottom line;
- need better economic recommendations;
- need better calculations of lime requirement;
- unclear and mixed messages need to be clarified (e.g. regarding how much lime to apply at one time).

### Conclusion

The participants at this workshop did not appear to be entirely convinced of the value of liming. The main information needs identified by the group fell into two broad categories of fundamental information about lime, pH changes and rates as well as further information about responses to liming, the rates required to achieve pH targets and the economics of liming.

### Workshop facilitation and production of this report

Dr James Fisher, Désirée Futures



# Soil Acidity and Liming Workshops

## Report to Participants

YEALERING, 5TH AUGUST 2009

### Introduction

A series of focus groups were conducted with invited growers who had participated in subsurface soil testing for pH as part of the Avon Catchment Council Soil Acidity SI002 project. Each focus group involved discussion of the soil sampling data from the region and the participating farmers' use of and attitudes to liming in the light of this information. The information from the workshops will be used to determine if there are any common barriers to the use of liming as a practice to manage soil acidity and to help to guide future research and extension in soil acidity and liming.

This document is a brief summary report of the focus group workshop and is presented to the participants for information and any further comment.

### The Workshop

The Yealering workshop involved nine participants, eight males and one female, with ages ranging from 31–40 to 61–70. One participant arrived after the first break, so some results relate to eight participants only.

The workshop involved presentation of the soil testing results for the region and discussion of the results compared to the expectations of the participants. Questions about target pH, soil acidity as a problem, previous lime use and limitations to carrying out liming stimulated discussion about needs for information and/or awareness and possible ways to address these. Responses from participants were recorded as a combination of responses to set questions using the *Turning Point Audience Response* system and comments made in discussion about the questions. All information was recorded anonymously.

***The results of soil sampling for the three study regions presented at the workshops are attached for your information***

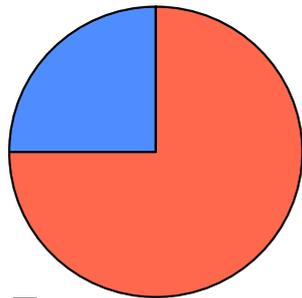
### Answers to each question

#### Soil sampling, pH and lime use

The results of the soil testing were according to the expectations for three of the participants, but worse than expected for one of them. The pH of the subsurface soil was better than expected for one participant. The other participants either did not have expectations regarding the results as it was the first time they had been sampled or were unsure as they could not remember the previous results (and the day of the workshop was the first time seeing the results).

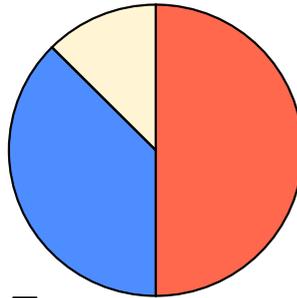
All participants agreed or strongly agreed that there is a clear benefit or return to soil sampling to depth. More people intended to sample to depth next year, although the same number as previously intended to sample the surface only. Soil sampling to depth is useful as having results from deeper sampling in addition to the surface ones helps to target lime application and provides a bigger picture for decisions. It was noted that it is difficult to determine economically, but there is better information. Subsurface soil samples were done mainly for knowledge about soil pH.

**Clear benefit or return to \$ spent on soil sampling to depth**



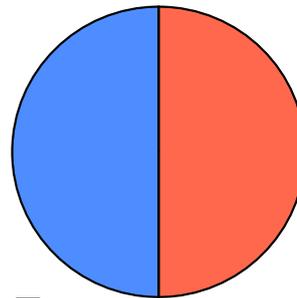
■ Agree  
■ Neither Agree nor Disagree

**Soil sampling before project**



■ Topsoil only  
■ Topsoil and subsurface  
■ Not previously sampled

**Soil sampling intention next year**



■ Topsoil only  
■ Topsoil and subsurface

Soil acidity was rated as 'somewhat of a problem' by five participants and 'widespread and limiting production' by another two. One participant was unsure (only eight participants present). All participants had applied lime previously. Limestone, limesand and other sources (in this case one trial of burnt lime) had been used at a typical application rate of 1 t/ha. All participants were aware of the Lime WA Inc. product information specification sheets.

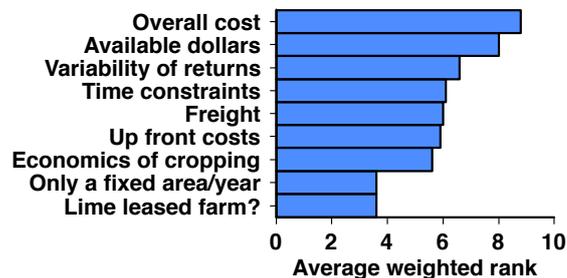
### Limitations to carrying out liming

The participants identified nine limitations to carrying out liming on their farm

- Available dollars
- Overall cost
- Freight
- Variability of returns
- Large up front costs
- Time constraints
- Should I lime leased farm?
- Can only do a fixed area/year
- Economics of cropping

These were ranked by the participants in terms of their individual perception of the importance of each. Each ranked limitation was given a weighting (from 10 to 2 for the most to least ranked respectively) and then the average weighted ranking of each was calculated.

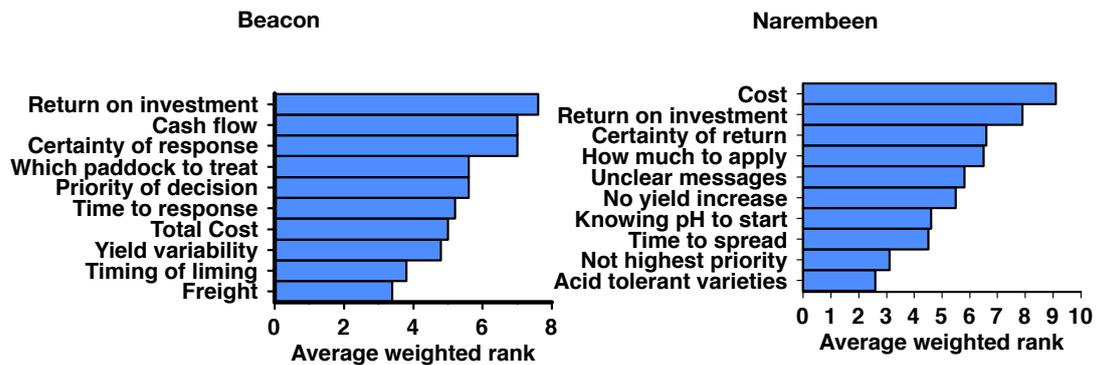
**At right: ranking of limitations to liming**  
 Limitations are shown in order from most important to least important



There was considerable variability between participants in the rankings of many of the limitations. Aspects that were ranked highly by most or all participants and so

received a high weighted rank were overall cost, available dollars and variability of returns. Other aspects related to the economics of liming (freight, up front costs, economics of cropping) as well as time constraints were also ranked as important. Therefore there was general agreement within the group of the over-riding impact of economic aspects. For this group, more lime would be spread if the cash flow allowed.

The limitations identified in this workshop were similar to those that were identified at the other two workshops, although the ranking of them varied in different regions.



**Above: Ranking of limitations to liming at Narembeen and Yealering workshops**  
Limitations are shown in order from most important to least important

Based on the soil sampling information and taking account of the limitations to liming, all participants thought that soil acidity was manageable on their farms.

### Comments from participants

During the workshop, comments, suggestions and questions from participants were recorded by project staff. A summary of these is given below.

#### Comments

Some comments by participants related to liming and the type of lime used. These included;

- the general message now seems to be 2 t/ha as a starting amount;
- if you have problems with pH then you should loan money to afford the cost;
- must look at the economic response and go for it if you believe there is a response;
- lime used to be first off the budget but now maybe save a few \$ from reducing the fertiliser inputs and keep lime going out;
- the information on lime is fairly clear;
- with lime have to outlay for a response which may be a few years in the future;
- time constraints to actually get the job done—spreading is a slow process and contractors are another expense rather than using own time which is probably not costed properly;
- lime goes with canola (and barley follows) this way have program which can stick to which moves around the farm.

## Questions

A number of questions about soil acidity were fielded by the project team. These questions related to soil pH, the effect of acidity, soil sampling and liming. The questions were answered during the workshop, so the answers are not reproduced here. Some of the questions that were asked were;

- was the pH change at each site related to the amount of lime applied;
- is it better to apply a larger amount at once or less lime more often;
- on leased farms with low pH how to prioritise whether should lime or not?

## Suggestions

The participants made several suggestions regarding information needs and suggestions for future research and extension relating to soil acidity and liming. These included;

- expected response as a yield % and what is the dollar value;
- where to put the lime to get best value;
- soil testing to understand the situation is important
- alternative (cheaper and local) sources of lime!

## Conclusion

The participants at this workshop were largely convinced of the value of liming. The main limitations to liming related to the economic realities of farming, hence their main information needs were for more detail in terms of lime requirements, responses to liming and efficiency of liming to make the dollars spent on liming as effective as possible.

## Workshop facilitation and production of this report

Dr James Fisher, Désirée Futures

