Roberts Evaluation Pty Ltd

Soil Health Impact Survey

Goulburn Broken CMA

June 2013

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Last saved:	20-06-13
Name of client:	Goulburn Broken CMA

This report was produced by the Beyond SoilCare project 2011-13, which was funded through a competitive grant from the Australian Government's *Caring for Our Country* program.

CARING FOR OUR COUNTRY

Contents

1 Background

The aim of the project *Building long term community commitment to providing ecosystem services from soil*, also known as Beyond SoilCare, is to build long-term farmer commitment to soil health and providing ecosystem services from soils. Farmers have had the opportunity to learn about the capability of their soils by learning about soil types and features. The aim was to develop soil testing and interpretation skills through training workshops, field based activities and demonstration sites.

The objectives of the project were to:

1. Improve management practices for soil carbon and provision of associated ecosystem services on the Broken Plain.

2. Improve management practices to ameliorate acid soils and improve native grassland cover, composition and resilience in the Strathbogie Ranges.

A baseline study was conducted to measure and document farmer attitudes and practices regarding soil management as of June 2012. The results were used to inform the project delivery in terms of understanding preferred methods of learning, and also form the baseline for assessing the impact of the project.

This report presents the findings of the 2013 impact study and compares results on key variables to the 2012 baseline findings. A summary of results is also presented from the workshop feedback questionnaires and facilitator feedback.

2 Summary of Results

2.1 Survey results

2.1.1 Program

There were some very positive responses about the program overall. The rating of usefulness was high at 4.14 (out of 5). When asked what they found useful and what they enjoyed about the program, respondents referred to relevant content and learning opportunities. The value of peer learning and interacting with others is also evident from these responses. When asked what they did not enjoy, 70 out of 90 people responded that there was nothing or very little they did not enjoy. Similarly, 55 out of 91 responses stated that nothing or very little should be changed about the program.

2.1.2 Information and learning

In terms of gathering information on soils, most of the listed methods to choose from were more commonly used in 2013 compared to 2012 and there were more methods used by each individual. In particular, discussion with neighbours or friends was a much more common response in 2013, as was trial and error. Individuals also selected a greater number of sources of information on average in 2013. In terms of preferred methods of learning about soils and their management, there were similar responses to 2012, except for higher scores on workshops, discussion groups and written materials. Again, respondents selected a greater number of methods than in 2012.

From the qualitative responses it appears that there are some differences between pre- and post-participation surveys in the reasons for wanting to learn about soil health. However, "productivity and efficiency" was still the most commonly cited reason. When asked directly, 39% stated that their interest had changed due to participation in Beyond SoilCare. The most common changes were being aware of other options or aspects of soil health and generally just being more interested.

2.1.3 "On the Farm – The Good Dirt" articles

The project produced a publication called "On the Farm – The Good Dirt". This was a one page case study included each month in local newspapers, on the CMA website, and sent out via email lists. Less than a quarter of the respondents were aware of the articles. For those that were aware, they had read roughly half of them on average. The majority of these people did not actively go looking for the articles. Overall, these respondents thought that the articles were interesting and relatively useful.

2.1.4 Soil management knowledge and current practices

In 2013, there were generally higher reported levels of soil issues, knowledge, soil management practices and confidence in undertaking them. There were, however, a number of issues and practices where results were lower than the baseline. Each soil issue was reported by more people in 2013, especially acidity and biology. The level of knowledge of soil management issues was mostly rated as the same or higher. However, the reported knowledge for carbon and biology was lower than in the 2012 baseline study. With regard to the necessity of soil testing, respondents thought it was very important (mean = 4.44 out of 5) and this was higher than the baseline response (4.19).

In comparison to the baseline, there were higher levels of soil testing, applying soil conditioners and gypsum, and changes to pasture and fertiliser regimes. Deep ripping, stubble retention, and controlled traffic were less commonly used. On the other hand, confidence in applying soil management practices was higher for all practices except controlled traffic where it was essentially the same. Respondents reported the highest level of confidence in soil testing and applying soil conditioners.

2.1.5 Change in soil management practices over the past year

Overall, 84% of respondents had made a change in at least one of the practices listed and 57% had made changes in two or more. Across the nine categories, changed fertiliser regimes (46%) and changed pasture (46%) had the highest number of respondents stating that they had made a change in this type of soil management. Deep ripping (8%) and gypsum (14%) had the lowest amount of change reported by respondents.

2.1.6 Likelihood of making changes to soil management practices in the next 12 months

In 2013 respondents were asked whether they were likely to make changes to their soil management practices in the next 12 months, on a scale of one to five, where one was not at all likely, and five was very likely.

Changed pasture was on average the type of soil management that respondents were most likely to change, with a mean likelihood of 2.89. Deep ripping was the practice that respondents were least likely to change, with a mean likelihood of 1.54.

2.1.7 Constraints and enablers

In 2013, affordability was rated as a constraint by more people, whereas half as many people reported time as a constraint. Knowledge was also seen as less constraining in 2013, with only 12% of people reporting this as a limitation to making changes to their soil management. This suggests that, at least for those involved in the soil health program, further knowledge per se is not necessary for practice change.

In terms of what would make it easier for participants to trial something new to improve soil health, there was a similar pattern of responses to the 2012 study, although all options were selected by more respondents. Particularly large increases were seen for “learning from others” and “talking in a group”. The latter went from the lowest of the main options in 2012 to the highest in 2013. While the other options are also rated highly, this indicates the importance of peer learning and the appropriateness of the group based approach taken in the workshop delivery.

2.2 Workshop feedback questionnaires

Overall, there were positive responses about the form and content of the workshops from participants. Most attendees agreed that the workshops covered what they were hoping to learn and that they were enjoyable, valuable and thought provoking. The pacing of the workshops was mostly felt to be appropriate and participants were comfortable to contribute to the discussion. Attendees reported that the workshops had improved their understanding and ability to interpret soil tests and manage soil pH. The majority of attendees said they could apply what they had learnt to their own farm, and most said they were either “likely” or “very likely” to make a change on their

land. The greatest interest in topics for further training were grazing management, soil biology and soil carbon.

2.3 Presenter feedback questionnaires

The presenters were very positive about the workshops and their role as presenters. Workshops and discussions were seen as highly appropriate methods of delivery and they reported that the structure was effective. The opportunity for discussion and interaction was noted as a particular strength of the workshop format. Presenters also made some suggestions for improvements.

3 Methodology for Impact Study

3.1 Developing the questions

The baseline questionnaire was developed in collaboration with staff from the Goulburn Broken CMA in order to capture the specific issues and to ensure appropriate wording. The questionnaire for the impact study was developed from the baseline study. Questions regarding learning, knowledge and soil management practices were replicated in order to provide a direct comparison between the two samples. Additional questions in 2013 addressed participants' involvement in the Beyond SoilCare activities.

3.2 Data collection

Contact details were provided by the Goulburn Broken CMA. All potential respondents had been involved in one or more project activities and had consented to be contacted for a follow up interview. Data were collected from landholders via a telephone survey.

For those who were unable to complete the interview over the phone there was also the option to complete the questionnaire online. Four participants answered in this way. A PDF version of the questionnaire was also available to give the option of completing the questions on paper and faxing or mailing it in (no responses were received this way).

In total, 95 respondents completed the questionnaire. Across the 22 Beyond SoilCare events there were 547 participants. The sample therefore reflects 17% of the total number of participants.

4 Impact Study Results

Qualitative data were analysed by clustering comments into categories and recording how many were in each category. The categories were not predetermined but emerged from the data, except in instances where there was a direct comparison to the 2012 baseline study. Quantitative data were analysed in a spread sheet (Microsoft Excel®) and initial statistics conducted in SPSS.

The percentages reported throughout are for those who responded to the particular question, not the total number of respondents in the survey and the number of responses is specified. As indicated below, for most questions respondents could select as many options as applicable. As such, percentages do not add to 100 across the questions but indicate the proportion who selected that option compared to those who did not.

4.1 Background information

4.1.1 Property size

Respondents were first asked the size of their property. This was answered by all 95 respondents. As can be seen in the table below the average property size of respondents was 375.47 hectares, with a combined total for the sample of 43 150ha.

Property size

	Hectares
Total	43 150
Average	375.47
Minimum	9
Maximum	4452

4.1.2 Enterprise type

Participants were also asked to select their main enterprise type from the list in the table below. Grazing was by far the most common enterprise. Two respondents who selected grazing specified that they were dairy enterprises. The total property size is also given for grazing and cropping.

Enterprise type

Enterprise	Responses	Hectares
Grazing	78	33 326
Cropping*	13	11 701
Lifestyle	6	
Other	3	

* A number of respondents selected more than one option. Five people who selected grazing as the main enterprise also selected cropping. The total size of these five properties was 2 398 hectares.

The three respondents who selected 'other' without choosing another category nominated 'horses' or 'breeding Thoroughbred horses' as the main enterprise.

4.2 Program

4.2.1 Activities

From the range of options provided most respondents had attended workshops, followed by field days.

Beyond SoilCare activities involved in

Activities	Responses
Workshop	72
Field day	50
Bus tour	16
Other	41

For those who mentioned 'other' activity most referred to the other options listed (only 8 did not also list one of the main activities). Of these, soil testing was the most common (23 responses). Others mentioned field days, farm visits or alternative fertiliser days.

4.2.2 Involved through a group

Respondents were asked whether they were involved in Beyond SoilCare as a member of a group such as Landcare or a production group and if so, which group. Landcare was the most common type of group (with a number of specific groups mentioned). 19 people were not involved through any group and 14 were involved via production groups. The specific groups are listed below.

Group involvement

Group	Responses
None	19
Landcare	61
Biological farmer group	1
CMA	1
Grazing group	2
Pastures for Profit	1
Better Beef	1
Prime lamb	3
BestWool BestLamb	4
Sustainable Wool Marketing Group	1
Other production group	2

4.2.3 Usefulness of the program

From the remainder of this section it can be seen that there were some very positive responses about the program overall. The rating of usefulness was high at 4.14 (out of 5). When asked what they found useful and what they enjoyed about the program, respondents referred to relevant content and learning opportunities. The value of peer learning and interacting with others is also evident from these responses. When asked what they did not enjoy, 70 out of 90 people responded that there was nothing or very little they did not enjoy. 55 out of 91 responses stated that nothing or very little should be changed about the program. The changes that were specified were mostly to do with more information or more targeted content. The positives and suggested changes are outlined in detail in the sections below.

Respondents were first asked to rate on a scale of 1 (not at all) to 5 (very), how useful they found participation in the Beyond SoilCare project. The mean score was 4.14, with most responses falling on 4 or 5. 18% of respondents chose the midpoint.

Usefulness of participation in Beyond SoilCare

	1	2	3	4	5	Total Responses	Mean score
Number	1	0	17	43	33	94	4.14
Percentage	1%	0%	18%	46%	35%	100.00%	-

For the one person who responded "not at all" they also noted that the program was not relevant to them at their stage of life. However they made very positive comments about the program:

"*I probably wouldn't put it to use, though the information was valuable. I'm semi-retired so if I was going to use it I would have done so years ago. It stimulates my thought process and it's educational. So there's positives. I wouldn't change the program. I would encourage more people to participate*."

4.2.4 What did you find useful about the program?

This was phrased as an open ended question to allow for a full range of responses. All 95 respondents answered this question. Their responses were clustered into themes to show the frequency of different categories of response. As many participants mentioned more than one element that they found useful, their responses could be coded into multiple themes. The three major categories that participants found useful were:

- Learning or improved understanding as a result of the program (44 responses)
- Delivery of the program (44 responses)
- Content of the program (40 responses)

Within each of these major categories, the responses have been further categorised and arranged in order of frequency. Again, each response could be coded into more than one sub-category. Therefore totals in each category may be smaller than the sum of totals for sub-categories. 12 responses fitted none of the three major categories have been listed under 'other'.

Learning / improved understanding (44 responses)

Improved understanding of soils (22 responses)

- Own soils (10)
- Soils in general (6)
- Unclear whether own soils or soils in general (6)

Improved understanding of soil testing (11 responses)

(*Note that soil testing is also the major response under the Content category*)

- Soil test interpretation (8)
- Testing soil / identifying problems (3)

General learning and reinforcement (11 responses)

- Learning new things (3)
- Reviewing prior knowledge (3)
- Building on prior knowledge (3)
- Reinforcing own ideas (2)
- Hearing what is presented to the public (1)

Improved understanding of soil management strategies (10 responses)

- Actions to take to manage soil health (8)
- Fertilizer (2)

Delivery (44 responses)

Discussion with others (19 responses)

- Sharing practices / knowledge / information /ideas (11)
- Discussion with others - no reason given (4)
- Opportunity for comparison (3)
- Of soil testing and results (2)
- Of targets and benchmarks (1)

Presentation (10 responses)

- Quality /expertise of presenters (5)
- Clarity and simplicity of explanations (2)
- Opportunity to seek advice (2)
- Relaxed setting (1)

Content (40 responses)

Soil testing (19 responses)

- Soil testing informing soil management practices (10)

- Soil testing (8)
- Analysis / interpretation (7)
- Free of charge (5)
- Results (3)
- Explanations of soil testing (2)

Information provided (16 responses)

- In general (13)
- How to act on soil tests (1)
- Up to date information (1)
- Ways to save money (1)

Other content (6 responses)

- Alternative fertilizer or alternative fertilizer trials (4)
- Field days (2)
- Site trials (1)

Other (12 responses)

- Unclear from interviewee's comments what was useful (3)
- Everything was useful (2)
- Putting it into practice (2)
- Unlikely to use the information – close to retirement (2)
- Unsure which activities were part of Beyond SoilCare (2)
- Building networks (1)

4.2.5 What did you enjoy about the program?

There were 87 responses to this open-ended question. These have been coded and grouped into categories of similar responses. The main themes, in descending order of frequency, were:

- Interaction with others (40 responses)
- Opportunity for learning (28 responses)
- Presentation and delivery (17 responses)
- The atmosphere (6 responses)
- Everything/nothing/unclear (6 responses)
- Personal satisfaction (4 responses)

The total here exceeds 87 because many participants named more than one element that they enjoyed. For the same reason, totals for the sub-categories below may exceed the number of responses in a particular category.

Interaction with others (40 responses)

- Discussion and learning (24)
- Interaction with others – no reason given (15)
- Social aspects (6)
- Networking (2)

Opportunity for learning (28 responses)

- In general (10)
- About our soils (3)
- About soil (3)
- Information (3)
- About soil management (2)
- About fertilizers (2)
- Useable knowledge (2)
- Opportunity to ask questions/seek advice (2)
- Help with soil test interpretation (2)
- Hands on practice - soil testing, analysis, decision making (1)

Presentation and delivery (17 responses)

- Quality / expertise of presenters (10)
- Clarity of explanations (2)
- Diversity of presenters and views presented (2)
- Mode of presentation (1)
- Modular structure (1)
- Small group size (1)
- Timing and convenience(1)

Practical applications (7 responses)

- Useful, useable information (3)
- Soil tests (2)
- Saved money (1)
- Helped with decision making (1)

The atmosphere (6 responses)

- The atmosphere (comfortable/relaxed/good) (4)
- Food / drink (2)
- Generating excitement about soil health (1)
- Friendly presenters (1)

Everything/Nothing/Unclear (6 responses)

- Unclear from response what this person enjoyed (3)
- Enjoyment was not the point (2)
- Everything (1)

Personal satisfaction (4 responses)

- Learning my soil was healthy (1)
- Satisfaction of planting trees (1)
- Reinforcement of ideas (1)
- Ignorance of other farmers (1)

4.2.6 What did you not enjoy about the program?

There were 90 responses to this question. Of these, 70 stated that there was nothing or very little that they did not enjoy about the Beyond SoilCare program. Of the people who did name something they had not enjoyed, some named more than one element. Their responses have been coded into more than one category below. Thus the sum of the sub-totals exceeds the total number of responses.

The major categories of response to this question were:

- Nothing or very little (70 responses)
- Elements of content (13 responses)
- Timing and logistics (8 responses)
- Stressful experiences (2 responses)
- After the program (2 responses)

The sub-categories of these themes are listed below in descending order of frequency.

Nothing or very little (70 responses)
- Nothing (62)
- Very little (7)
- 'No comment' (1)

Content (13 responses)
- Not relevant to my circumstances (4)
- Too basic (3)
- Too complex (3)
- Insufficient evidence for or critiquing of information presented (1)
- Insufficient focus on economics (1)
- Not enough soil tests (1)

Timing/logistics (8 responses)
- Timing of meeting (5)
- Time commitment required (2)
- Need to travel (1)

Stressful experiences (2 responses)
- A negative interaction with another participant (1)
- Having to talk in front of a group (1)

After the program (2 responses)
- Can't afford to carry out suggestions (1)
- Doing the evaluation survey (1)

4.2.7 What would you change about the program and activities?

91 participants responded to this open ended question. Of these 55 stated that they would change nothing, or very little, or did not know what they would change. Of the remaining responses there were nine that did not make clear what the participant would like to change. Some of the responses included more than one suggestion for change. In these cases, responses have been coded into more than one category.

The major categories of response were:

- Nothing / very little / don't know (55 responses)
- Changes to soil management information (9 responses)
- More targeted content (8 responses)
- Extend the program (7 responses)
- Changes to soil testing (4 responses)

- Increase attendance / publicity (3 responses)
- Other (3 responses)

Nothing/very little/don't know (55 responses)
- Nothing (48)
- Very little (5)
- Don't know (2)

Changes to soil management information (9 responses)
- More information on soil health management strategies (4)
- Less expensive / more affordable suggestions (2)
- More diverse suggestions for soil health management (2)
- More evidence to back up suggestions (1)

More targeted content (8 responses)
- Target content to knowledge level of participants (4)
- Target content to participants' needs and interests (2)
- Take more account of local climate (1)
- Coordinate content with DPI soil care training (1)

Extend the program (7 responses)
- Offer follow up / extension (4)
- Make it longer (3)
- Offer more sessions (1)

Changes to soil testing (4 responses)
- Provide soil test results sooner (2)
- More soil tests (2)

Increase attendance / publicity (3 responses)
- Publicise more widely (2)
- More people attending (1)

Other (3 responses)
- More clarity on who is responsible for delivery and funding (1)
- Offer alternatives to attending meetings (1)
- Presenters - greater diversity of backgrounds/experience (1)

Unclear from comment what participant would like to change (6 responses)

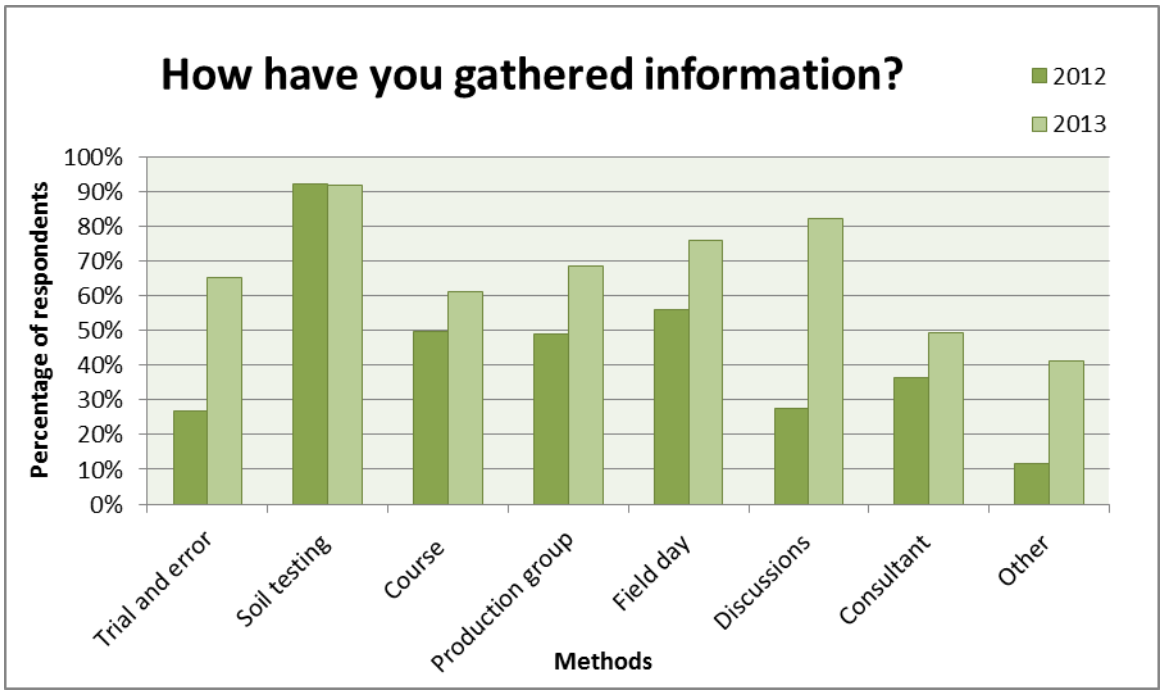
4.3 Changes in information gathering and learning preferences

In terms of gathering information on soils, most of the methods were more commonly used in 2013 compared to 2012 and there were more methods used by each individual. In particular, discussion with neighbours or friends was a much more common response in 2013, as was trial and error. Responses for sources of information were also higher than in the 2012 study and individuals also selected a greater number of sources on average in 2013. In terms of preferred methods of learning about soils and their management, there were similar responses to 2012, except for higher scores on workshops, discussion groups and written materials. Again, respondents selected more methods than in 2012.

From the qualitative responses it appears that there are some differences in the reasons for wanting to learn about soil health. However, "productivity and efficiency" was still the most commonly cited reason. When asked directly, 39% stated that their interest had changed due to participation in Beyond SoilCare. The most common changes were being aware of other options or aspects of soil health and generally just being more interested.

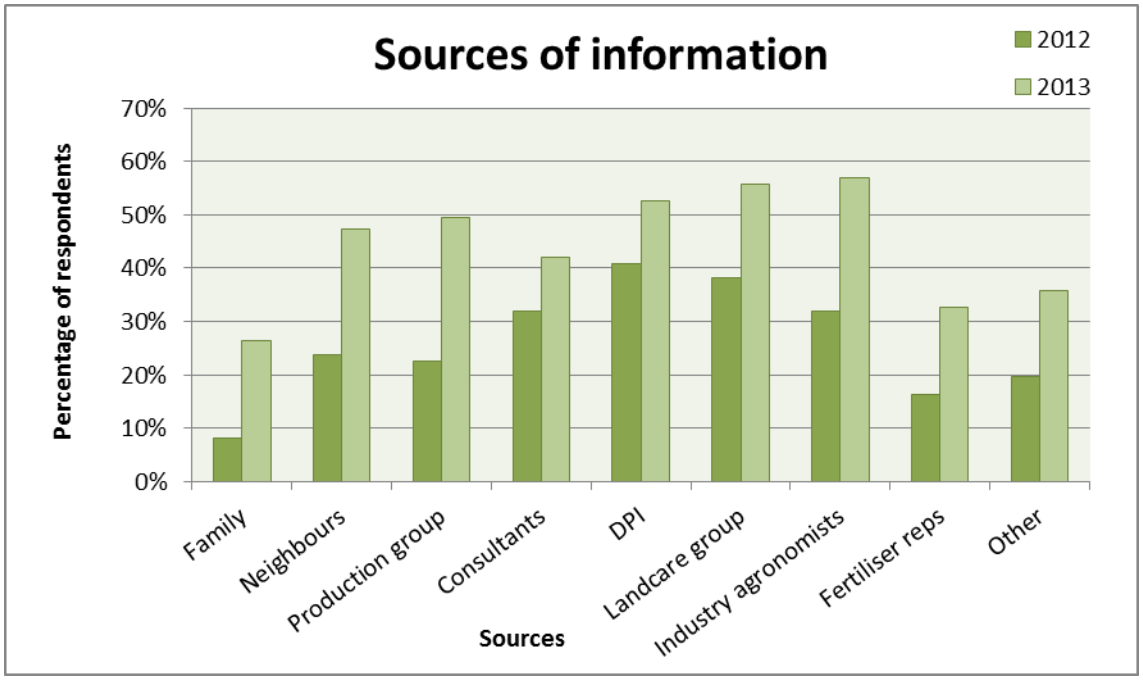
4.3.1 Information gathering

Respondents were asked to indicate how they had gathered information on the soils in their area. There was a similar pattern of responses to the 2012 baseline. Soil testing was again the most common method cited with over 90% of people choosing this as a method of gathering information on soils. There was no change reported in this question compared to the baseline (however, there was a difference in the rate of soil testing when asked directly. See section 0). All other responses were higher in 2013 compared to 2012. In particular, discussion with neighbours or friends was a much more common response in 2013, as was trial and error. Overall, individuals also selected a greater number of methods on average in 2013 (mean = 5.95) compared to 2012 (mean = 2.94).



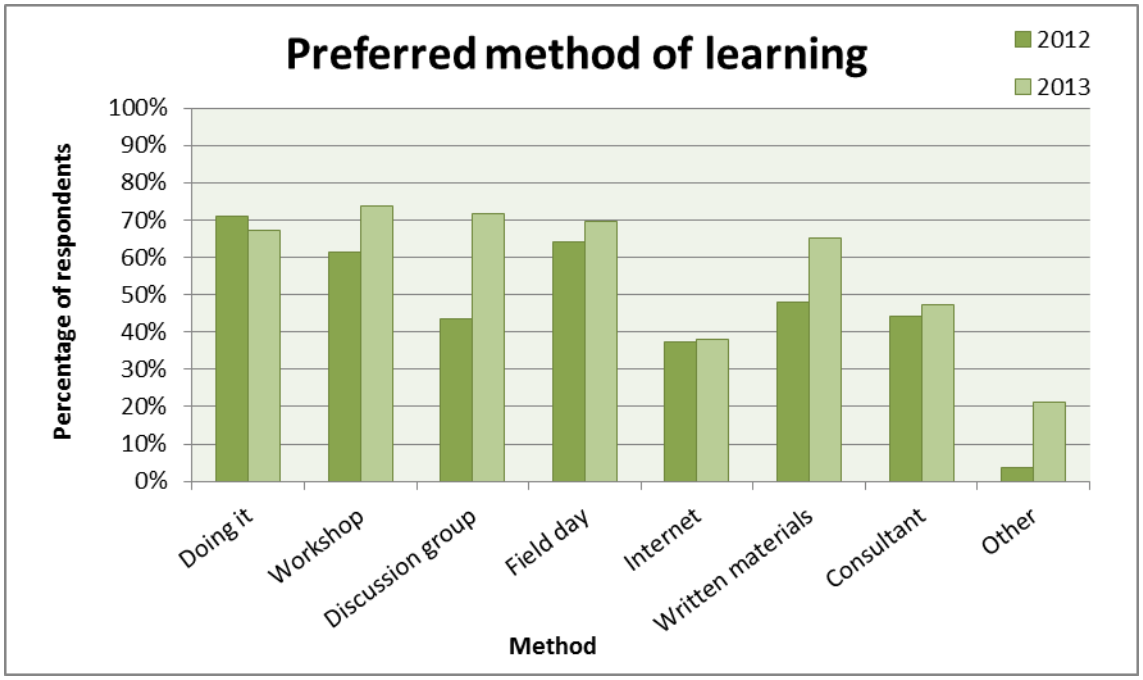
4.3.2 Sources of information

Respondents were also asked which people or groups they rely on most for information about soil health and management. All responses were higher than in the 2012 study. In particular, family, neighbours, production groups and industry agronomists were more commonly selected. Individuals also selected a greater number of sources on average in 2013 (mean = 4.47) compared to 2012 (mean = 2.38).



4.3.3 Preferred learning

Results are displayed below for the preferred methods of learning about soils and their management. There were similar responses to 2012, except for higher scores on workshops, discussion groups and written materials. Once again, respondents in 2013 selected a greater number of options (mean = 4.92) compared to 2012 (mean = 3.42).



4.3.4 Interest in learning about soils

As in 2012, respondents were asked why they were interested in learning more about the soils on their property. A prompt was also given: "For example, for productivity or sustainability." These were open ended responses that were coded against the 2012 categories for comparison.

From the table below it can be seen that "productivity and efficiency" was still the most commonly cited reason. Sustainable production was second, and "profitability and viability" third. Custodianship ranked fourth in 2013 and was much lower in 2012. Healthy plants and environmental outcomes were higher in 2012.

Interest in learning about soils

Rank 2012	Rank 2013	Responses	Reason
1	1	57	Productivity & efficiency
3	2	26	Sustainable production
6	3	17	Profitability & viability
12	4	12	Custodianship of the land-desire to improve land for the future
2	5	10	Healthy plants (trees, crops, stock feed & pasture)
4	6	9	Improve overall Farm health/essential to farming
11	7	7	Improve knowledge about soil & paddock management
9	8	5	Healthy landscape
13	9	4	Improve organic farming
6	10	3	Soil fertility & moisture holding capacity
5	10	3	Improve environmental outcomes
6	12	2	Healthy animals/stock
*****	12	2	Keep up with innovation
*****	12	2	Improve soil structure
*****	15	1	Knowledge in general
*****	15	1	Build up carbon
10	17	0	Improve knowledge about what to grow

* These 4 categories did not appear in 2012 but these responses in 2013 did not align with existing categories.

4.3.5 Change in interest

Respondents were asked directly whether their interest in learning about soil health had changed due to participation in Beyond SoilCare. As can be seen in the table below, 39% responded that it had changed whereas 61% said it had not.

Change in interest regarding learning about soils

	Change	No Change	Total Responses
Number	37	57	94
Percentage	39.36%	60.64%	100.00%

For those who reported a change in interest, they were also asked *how* this had changed. Many responses were to do with how their knowledge had changed. For those that indicated a change in their *interest in learning* about soils, the most common responses were that they were now aware of more options or aspects of soil health or that they were generally more interested.

Change in interest

Reason	Responses
Aware of other options	9
More interested	6
Always interested	2
More sustainable approach	2
Interest in soil biology	2
Fertiliser uptake	2
Doing it progressively	1
Interest in pH levels	1
Trace elements	1
Plant leaf analysis	1
Whole farm planning	1

There was also one respondent who did not reply that their interest had changed but indicated that their knowledge had:

"*I have always had an interest in that direction. It has been my level of knowledge that has improved*."

4.4 "On the Farm – The Good Dirt" articles

Apart from the activities listed earlier, communication was also delivered via a publication called "On the Farm – The Good Dirt". This was a one page case study included each month in local newspapers, on the CMA website, and sent out via email lists. In summary, less than a quarter of the respondents were aware of the articles. For those that were aware, they had read roughly half of them on average. The majority of these people did not actively go looking for the articles. Overall, these respondents thought that the articles were interesting and relatively useful. Further detail on these questions is given below.

Respondents were first asked, "Are you aware of the articles under the heading of 'On the Farm – The Good Dirt'?" Of the 94 people who responded to this question, 23 were aware of the articles.

Awareness of articles

	Aware	Not aware	Total Responses
Number	23	71	94
Percentage	25.26%	74.74%	100.00%

The following questions were asked of those who were aware of the articles. When asked where they had seen the articles, the most common response was via email. The other responses referred mainly to options given above such as email and other newspapers such as the Country News. Two people were case studies for the articles and two received them via Landcare.

'On the Farm – The Good Dirt' article sources

Source	Responses
Local newspaper	11
North by NorthEast Magazine	10
Via email	14
CMA website	0
Other	12

Those who were aware of the articles had actually read between 0 and 12 editions (there were 12 in total). The average number read was 5.92. When asked if they had actively looked for these articles, 14 said they had not, whereas 10 said they had.

When asked to rate the information in the articles, respondents gave a relatively high score for "interesting" and a moderate score for "useful". The frequencies and means are shown in the table below.

Rating of information in the articles (where 1 is not at all and 5 is very)

	1	2	3	4	5	Total Responses	Mean score
Interesting	0	0	3	12	5	20	4.10
Useful	0	1	6	11	2	20	3.70

4.5 Soil management knowledge and current practices

Respondents were given a list of eight major soil issues (see Section 4.5.1) and asked which were relevant to them and how much they knew about each. They were also presented with eight soil management practices and asked whether they were currently undertaking the practice and their confidence in undertaking it. Compared to the baseline, there were more people reporting each soil issue as relevant to them as well as undertaking soil management practices. They also reported greater confidence in undertaking the practices. There were, however, a number of issues or practices where results were lower than the baseline.

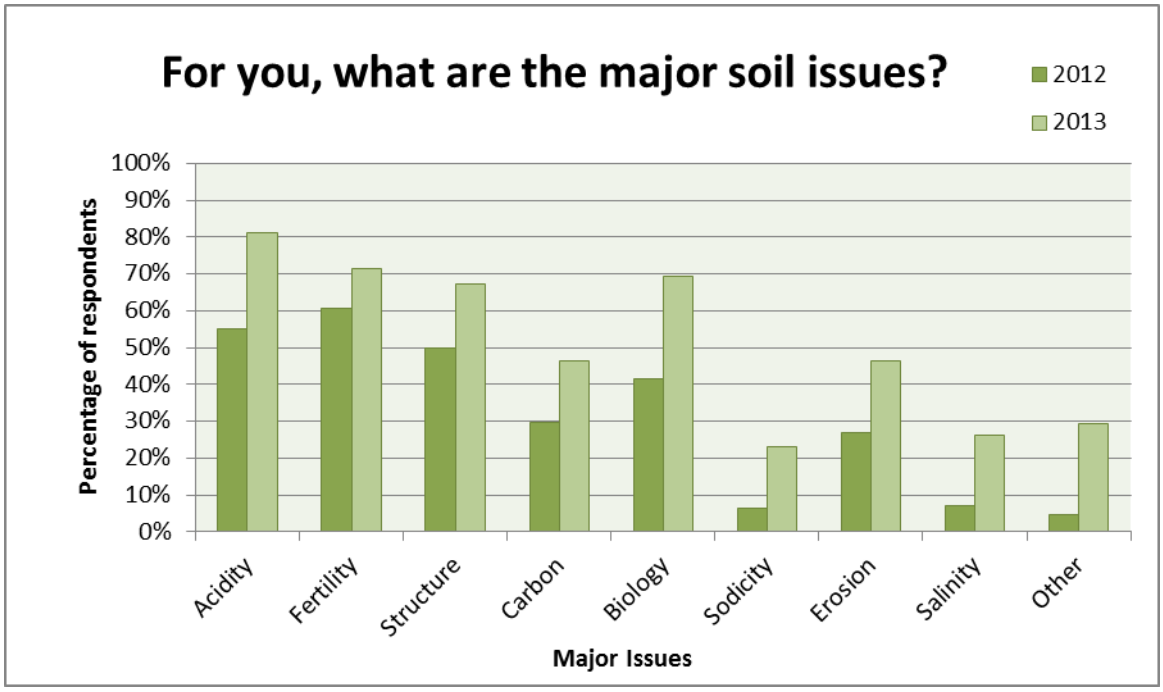
All soil issues were reported as an issue by more people in 2013, especially acidity and biology. The level of knowledge of soil management issues was mostly rated as the same or slightly higher. However, the reported knowledge for carbon and biology was lower than in the 2012 baseline study. With regard to the necessity of soil testing, respondents gave a high response on average (mean = 4.44 out of 5) and this was higher than the baseline response (4.19).

In comparison to the baseline, there were higher levels of soil testing, applying soil conditioners and gypsum, and more changes to pasture and fertiliser regimes. Lower levels of practices undertaken were reported for deep ripping, stubble retention, and controlled traffic. On the other hand, confidence in applying soil management practices was higher for all practices except controlled traffic where it was essentially the same. Respondents reported the highest level of confidence in soil testing and applying soil conditioners.

4.5.1 Soil issues

As in 2012, respondents were given a list of soil issues and asked to select which ones were major issues for them. In 2013, more respondents reported having each of the soil issues listed. The pattern of results was similar across the two years, except for acidity, which was the major issue listed in 2013 (as compared to fertility as the major issue in 2012). There was also a large increase in the number of people who reported biology as a major issue for them.

It is possible that those surveyed in 2013 were involved in the program because they had soil health issues that they needed to address and therefore reported more issues. Involvement in the program may have also made this group of people more aware of issues, perhaps as a result of their soil testing and particularly because soil acidity was a target issue for the program.



Participants were given the option of nominating other major soil issues not in the list. 20 participants named at least one additional issue.

The following issues were all named by three to four participants:

- Waterlogging/drainage/moisture
- Ground cover
- Aluminium
- Nutrient levels

In addition, the following issues were all named by one participant:

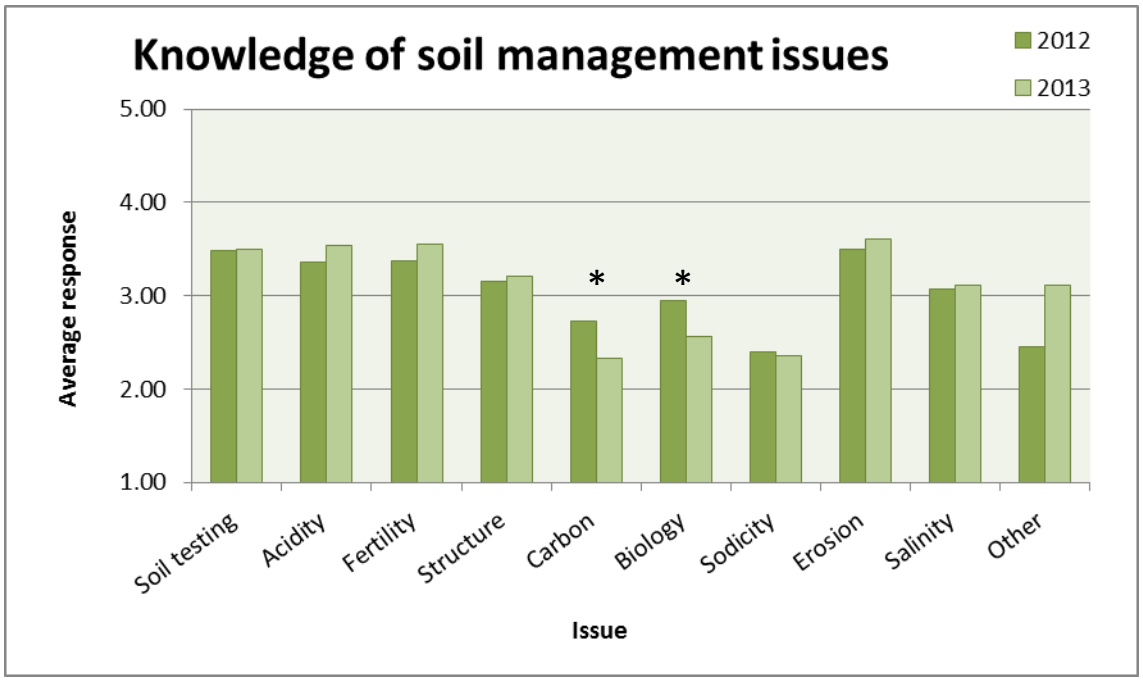
- Building up top soil
- Compaction
- Dryness
- pH at depth
- Sub-soil constraints

4.5.2 Knowledge

Respondents were also asked how much they knew about each of the soil management issues on a scale of 1 (nothing at all) to 5 (a lot). Across both years, the topic that people knew the most about was erosion. Knowledge of most issues was slightly higher or the same between years, with the exception of carbon and biology where the reported knowledge was lower than in the 2012 baseline study. Note that only the differences for carbon and biology were statistically significant.[1] Looking at the graph above on the major issues, carbon and biology were more common issues in 2013 than in 2012, suggesting that there is now greater awareness of these topics. It is possible that

[1] t tests were conducted where there were appropriate data, i.e. either scaled questions or questions that required a yes/no answer.

respondents now know more about the complexity of the issues and therefore feel that they have a low level of knowledge.[2]



** Adjacent bars with an * above indicate a significant difference between 2012 and 2013 (p<.05).*

As part of this question, participants were given the chance to mention soil issues they knew about that were not part of the above list. Thirteen participants mentioned an issue they knew about.

The following issues were mentioned three times each:

- Waterlogging/drainage
- Ground cover (*note that groundcover also had the most responses (2) in 2012 out of a total of six responses to this further question*)

The following issues were each mentioned once:

- Aluminium
- Bacteria and fungi
- Compaction
- Dryness
- Lack of soil
- Nutrients
- pH at depth

4.5.3 Soil testing necessity

Following from the baseline study, respondents were again asked: "On a scale of 1 to 5, where 1 is not at all necessary and 5 is completely necessary, how necessary do you think that soil testing is for your property?"

[2] Note that these are also identified as major areas of interest for further training in the workshop feedback.

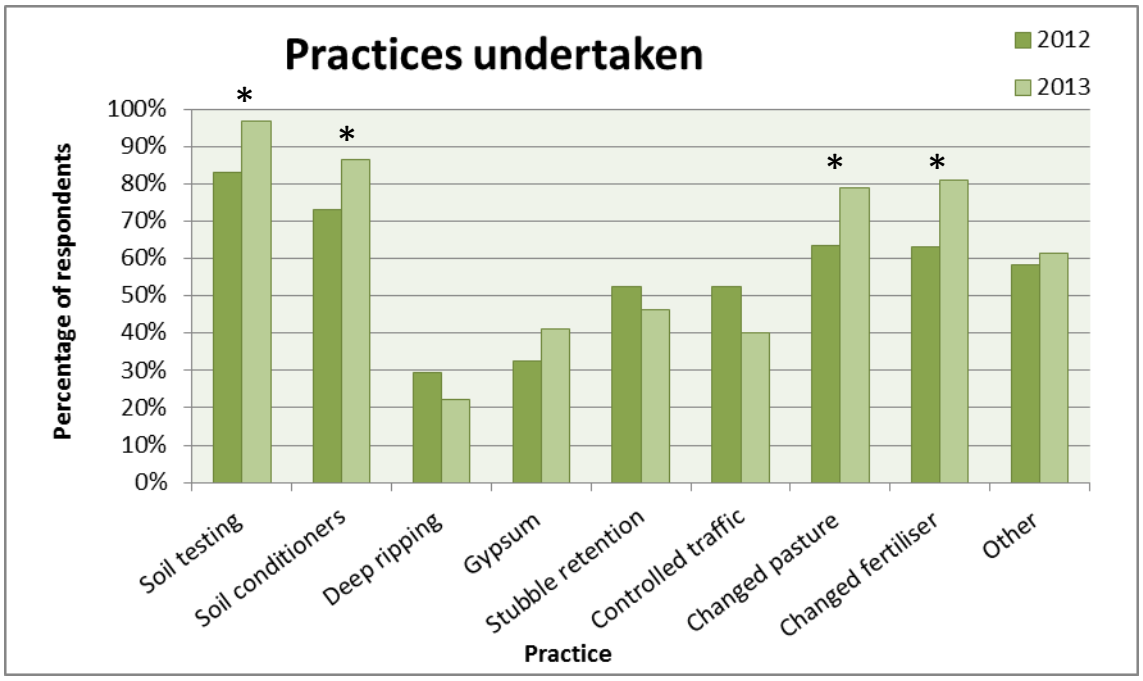
As can be seen in the table below, the overall response was high, indicating the importance attached to soil testing by these respondents. Moreover, this was higher than the 2012 baseline level (note this difference is significant at $p < .05$).

Necessity of soil testing (1 is not at all and 5 is very necessary)

	Mean score
2012	4.19
2013	4.44

4.5.4 Current practices

One of the key variables for comparison across the 2012 and 2013 surveys was what soil management practices were being undertaken. Respondents were asked to indicate whether they were currently undertaking each practice. Soil testing was again the most common of these practices and was more commonly used in 2013 than in the 2012 baseline study, as were applying soil conditioners and gypsum, and changed pasture and fertiliser regimes. In contrast, fewer people used deep ripping, stubble retention, and controlled traffic in 2013; however these differences were not significant.



** Adjacent bars with an * above indicate a significant difference between 2012 and 2013 (p<.05).*

Respondents were given the opportunity to name practices that were not on the above list. 18 participants named additional practices.

Of these, by far the most popular practice, with ten responses, was:

- Grazing management

(In several cases this included reference to rotational grazing)

Three participants made reference to:

- Reducing or minimising tillage

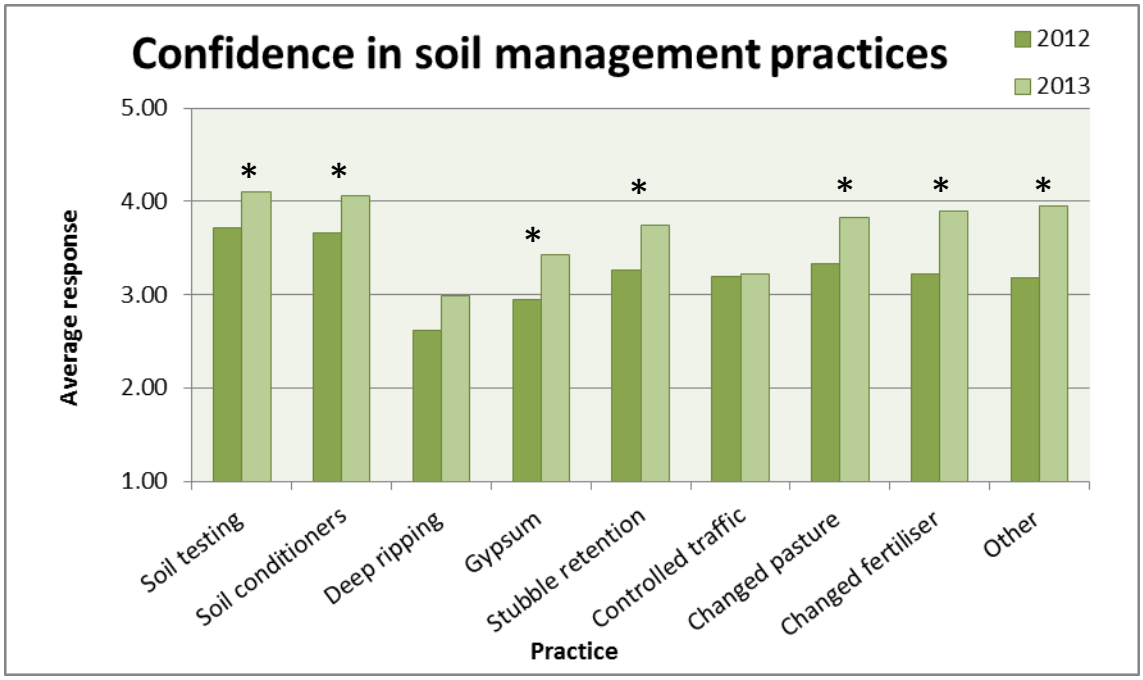
Two respondents mentioned worms or worm “juice”.

The following responses were all mentioned once:

- Use of agriplow
- Direct drilling
- Harrowing
- Managing ground cover
- Nutrient balancing
- Pasture cropping
- Stopped irrigating
- Topping and mulching
- Weed removal

4.5.5 Confidence

Respondents were also asked to rate their level of confidence in using each of the practices on a scale of 1 (not at all) to 5 (very) confident. Compared to the baseline, respondents were more confident in all practices, except for controlled traffic, where there was no difference. Respondents again reported the highest level of confidence in soil testing and applying soil conditioners.



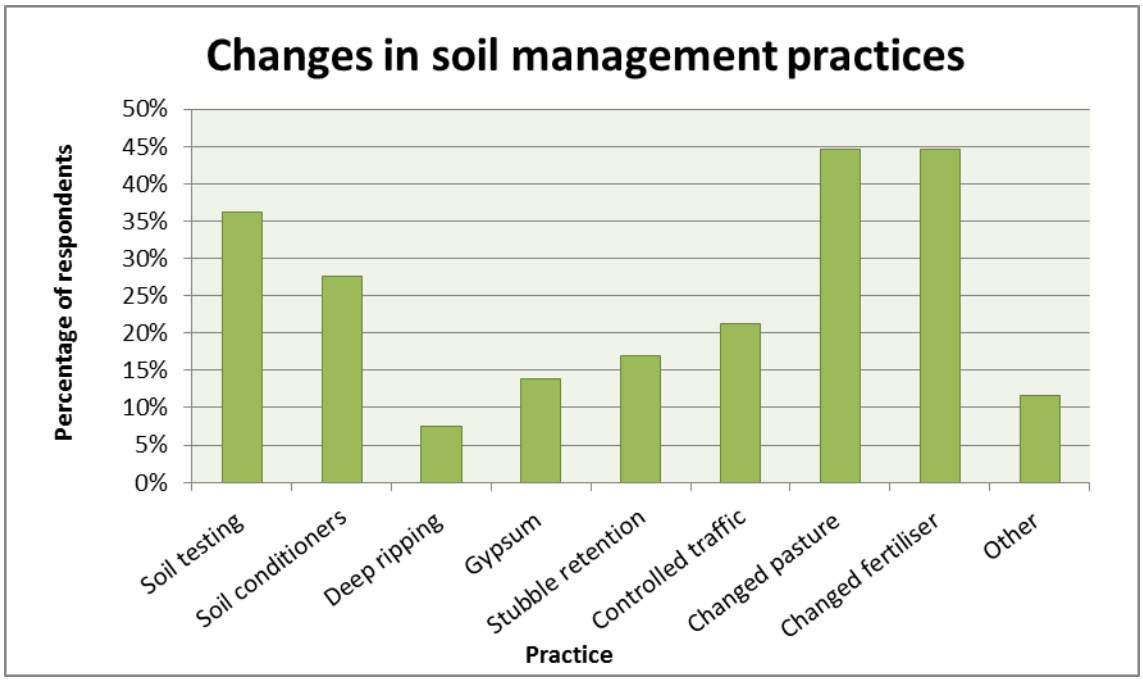
** Adjacent bars with an * above indicate a significant difference between 2012 and 2013 (p<.05).*

4.6 Change in soil management practices over the past year

Respondents were asked whether they had made changes to their soil management practices over the past year across a number of categories:

- Soil testing
- Applying soil conditioners (including lime)
- Deep ripping
- Gypsum
- Stubble retention
- Controlled traffic
- Changed pasture
- Changed fertiliser regimes
- Other

Overall, 84% of respondents had made a change in at least one of the practices and 57% had made changes in two or more. Across the nine categories, changed fertiliser regimes (46.15 per cent) and changed pasture (45.65 per cent) were the categories with the highest number of respondents staying that they had made a change. Deep ripping (7.61 per cent) and gypsum (14.29 per cent) had the lowest amount of change reported by respondents. These are shown in the graph below and in more detail in the table following.



Have you done anything differently with the following soil management practices over the past year?

Practices	Yes	No	Total Responses
Changes to 1 or more practices	**80 (84.21%)**	**15 (15.79%)**	**95**
Soil testing	**33** (34.74%)	**62** (65.26%)	95
Applying soil conditioners (including lime)	**26** (27.66%)	**68** (72.34%)	94
Deep ripping	**7** (7.61%)	**85** (92.39%)	92
Gypsum	**13** (14.29%)	**78** (85.71%)	91
Stubble retention	**16** (17.58%)	**75** (82.42%)	91
Controlled traffic	**20** (21.74%)	**72** (78.26%)	92
Changed pasture	**42** (45.65%)	**50** (54.35%)	92
Changed fertiliser regimes	**42** (46.15%)	**49** (53.85%)	91
Other	**11** (25.58%)	**32** (74.42%)	43

Note: percentages are calculated based the number of yes or no responses to the question, as a fraction of the total number of responses to that particular question.

4.6.1 Soil testing

Of the 95 responses to this question, 34.74per cent of respondents indicated they had done something different in regards to their soil testing in the past year.

Soil Testing

	Change	No Change	Total Responses
Number	33	62	95
Percentage	34.74%	65.26%	100.00%

Of the 33 respondents who indicated they had done something differently, the changes they reported can be categorised into the following themes:

- Did more soil tests than previously (15 comments)
- Started doing soil tests (10 comments)
- Did soil tests in different locations on the property (5 comments)
- Did more targeted soil testing to address specific issues (6 comments)
- Did soil tests to greater depths (1 comment)

- Independent interpretation of results (1 comment)
- Different way to take the test (1 comment)

"Had a fella come in to do the soil test and he came back with a map with different soils and we went and tested each section - this showed how should vary the rate of lime, gypsum etc. across the different soils. Also using yield maps to indicate where to change fertiliser applied." (Surveyed landholder)

4.6.2 Applying soil conditioners (including lime)

Of the 94 responses to this question, 27.66 per cent of respondents indicated they had done something different in regards to their soil conditioner application in the past year.

Applying Soil Conditioners (including lime)

	Change	No Change	Total Responses
Number	26	68	94
Percentage	27.66%	72.34%	100.00%

Of the 26 respondents who indicated they had done something differently, the changes they reported can be categorised into the following themes:

- Used more lime (15 comments)
- Used more soil conditioners, type unspecified (3 comments)
- Used liquid fertilisers (3 comments)
- Used self-made conditioners (2 comments)
- Used chicken manure (1 comment)
- Stopped using fertiliser company fertilisers (1 comment)
- Used magnesium (1 comment)
- Used phosphorus (1 comment)
- Used worm juice (1 comment)
- Used dolomite (1 comment)
- Targeting different areas (1 comment)

"What the soil tests told us to do we did. Where before we would do whatever we wanted now we do the test and do what's needed. I put on 1 to 2 tonnes of lime. I have small paddocks, so I can experiment without spending too much." (Surveyed landholder)

4.6.3 Deep ripping

Of the 92 responses to this question, 7.61 per cent of respondents indicated they had done something different in regards to their deep ripping practices in the past year.

Deep Ripping

	Change	No Change	Total Responses
Number	7	85	92
Percentage	7.61%	92.39%	100.00%

Of the 7 respondents who indicated they had done something differently, the changes they reported can be categorised into the following themes:

- Undertook a deep ripping trial on a portion of their property (4 comments)
- Increased amount of deep ripping (3 comments)
- Stopped deep ripping (1 comment)

"Trialled deep ripping, then lots of research on different websites on different approaches to take, now going to apply new deep ripper on one principle found." (Surveyed landholder)

4.6.4 Gypsum

Of the 91 responses to this question, 14.29 per cent of respondents indicated they had done something different with regard to their gypsum practices in the past year.

Gypsum

	Change	No Change	Total Responses
Number	13	78	91
Percentage	14.29%	85.71%	100.00%

Of the 13 respondents who indicated they had done something differently, the changes they reported can be categorised into the following themes:

- Used more gypsum (10 comments)
- More considered, condition-responsive approach to gypsum use (1 comment)

"We are fine-tuning our approach (to gypsum use) *as we have been reading about cations. So we have been looking at our magnesium levels and looking at those to fine tune the application."* (Surveyed landholder)

4.6.5 Stubble retention

Of the 91 responses to this question, 17.58 per cent of respondents indicated they had done something different with regard to their stubble retention in the past year.

Stubble Retention

	Change	No Change	Total Responses
Number	16	75	91
Percentage	17.58%	82.42%	100.00%

Of the 16 respondents who indicated they had done something differently, the changes they reported can be categorised into the following themes:

- Increased stubble retention (11 comments):
    - In order to ensure ground cover (3 comments)

    - Bought new equipment to assist with retention (2 comments)
- Decreased stubble retention (4 comments), because:
    - The stock can digest it better and it rots more quickly (1 comment)
    - Previous failed attempt at stubble retention (1 comment)
    - Easier to sow (1 comment)
    - Due to moving from burning to biological stubble digesters (1 comment)
- Increased awareness of stubble retention (2 comments)

"I'm getting better. I top it and at the moment this year I've been experimenting with topping it longer and shorter and both. And we've got a marvellous retention of stubble at the moment. We'll see how the autumn comes through. That's what I'm trialling at the moment." (Surveyed landholder)

4.6.6 Controlled traffic

Of the 92 responses to this question, 21.74 per cent of respondents indicated they had done something different in regards to their controlled traffic management in the past year.

Controlled Traffic

	Change	No Change	Total Responses
Number	20	72	92
Percentage	21.74%	78.26%	100.00%

Of the 20 respondents who indicated they had done something differently, the changes they reported can be categorised into the following themes:

- Restriction of machinery/vehicles to set paths (6 comments)
- Creation or improvement of lane ways for restricted stock movement (4 comments)
- Variation of machinery/vehicle routes to avoid erosion (3 comments)
- Rotational grazing (2 comments)
- Improved traffic control, method unspecified (2 comments)
- Removed stock from certain areas to allow for recovery (2 comments)

"It depends on your definition of controlled traffic. We control stock traffic as opposed to machine traffic. Stock have a trampling effect as opposed to tyres and machinery. We've completed a laneway system for stock." (Surveyed landholder)

4.6.7 Changed pasture

Of the 92 responses to this question, 45.65 per cent of respondents indicated they had done something different in regards to their pasture management in the past year.

Changed Pasture

	Change	No Change	Total Responses
Number	42	50	92
Percentage	45.65%	54.35%	100.00%

Of the 42 respondents who indicated they had done something differently, the changes they reported can be categorised into the following themes:

- Experimenting with different pastures (8 comments)
- Undertaking a pasture renovation program (7 comments)
- Sowed different seed, type unspecified (5 comments)
- Increased the amount of cropping, decreased stock (4 comments)
- Introduced more perennials (3 comments)
- Introduced more annuals (3 comments)
- Rotational grazing (2 comments)
- Spraying to contain certain grasses (2 comments)
- Great emphasis on native species (2 comments)
- Introduced Lucerne (2 comments)
- Introduced millet (2 comment)
- Introduced plantain (2 comments)
- Introduced chicory (2 comments)
- Introduced rye (2 comments)
- Introduced oats (2 comments)
- Introduced clover (1 comment)
- Introduced legumes (1 comment)
- Introduced cocksfoot (1 comment)
- Introduced no till machinery (1 comment)
- Direct seeding (1 comment)
- Spread seeding (1 comment)
- Undersowing (1 comment)

"Trialling different ways of sowing that are low cost. Gather seed myself, scratch it, and sow it. Have experimented with different pasture, like rye grass and clover." (Surveyed landholder)

4.6.8 Changed fertiliser regimes

Of the 91 responses to this question, 46.15 per cent of respondents indicated they had done something different with regard to their fertiliser regimes in the past year.

Changed Fertiliser Regimes

	Change	No Change	Total Responses
Number	42	49	91
Percentage	46.15%	53.85%	100.00%

Of the 42 respondents who indicated they had done something differently, the changes they reported can be categorised into the following themes:

- Application of lime (8 comments)
- Location specific use of different fertilisers based on soil tests (6 comments)
- Application of super phosphate (5 comments)
- Increase in amount of fertiliser used (4 comments)
- Application of manure (4 comments)
- Experimenting with different fertiliser options (3 comments)
- Application of organic fertilisers (3 comments)
- Application of phosphorous (2 comments)
- Application of urea (2 comments)
- Reduction of phosphorus (2 comments)
- Application of molybdenum (2 comments)
- Reduction of nitrogen (1 comment)
- Application of compost (1 comment)
- Application of nitrogen (1 comment)
- Application of worm juice (1 comment)
- Application of sea-sol (1 comment)
- Application of potash (1 comment)

"Increased phosphate and trace elements. We are matching our fertilizer to our soil tests." (Surveyed landholder)

4.6.9 Other

Of the 43 responses to this question, 25.58 per cent of respondents indicated they had done something different in soil management that wasn't covered by the previous eight categories in the past year.

Other

	Change	No Change	Total Responses
Number	11	32	43
Percentage	25.58%	74.42%	100.00%

Of the 11 respondents who indicated they had done something differently that didn't fit into the previous eight categories, the changes they reported can be grouped into the following themes:

- Rotational grazing of stock (3 comments)
- Not over-stocking the pasture (2 comments)
- Needs responsive farming based on the context (i.e. weather) (2 comments)
- Feeding stock in different areas to spread effluent load (1 comment)
- Nutrient mapping (1 comment)
- Installation of new fencing (1 comment)

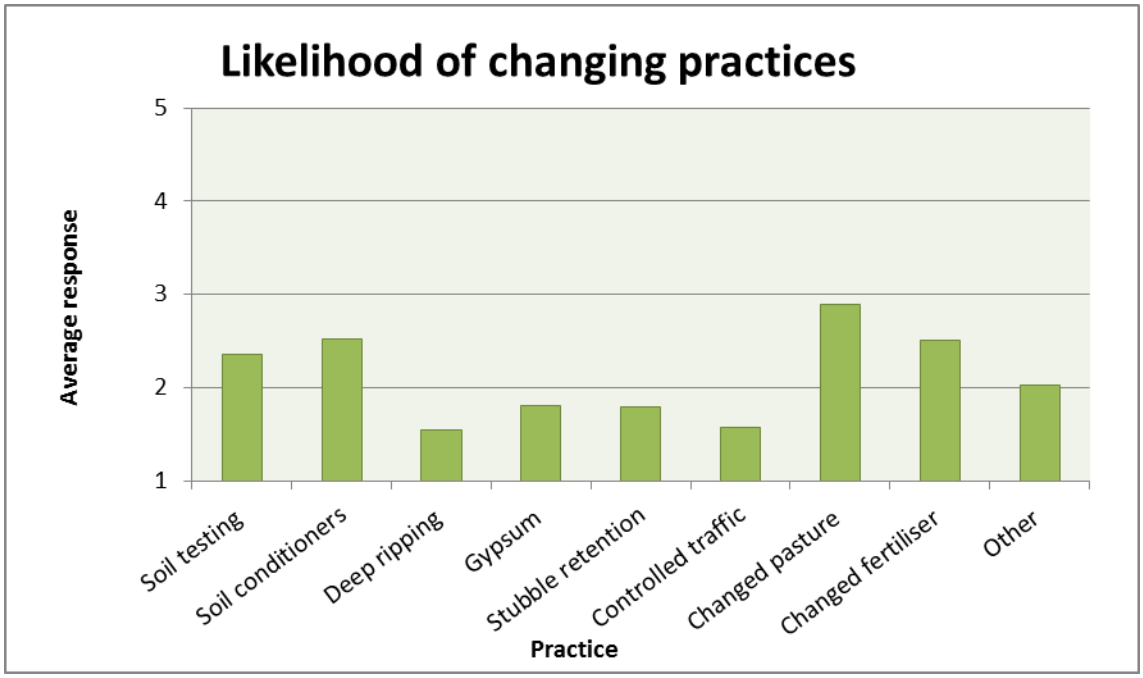
- Grazing to maintain ground cover (1 comment)
- Compacting the soil sheep tracks (1 comment)
- Higher stocking rate over a shorter amount of time (1 comment)
- Grazing to manage weeds (1 comment)
- Encouraging native grass growth rather than using fertiliser (1 comment)
- Tree planting (1 comment)
- Application of self-made biodynamic preparations (1 comment)

"We don't use fertilisers as we are encouraging native grasses. The horses we have are 'Morgans' and they thrive on native grasses. They can eat the hard grasses. We had cattle before and that was different. Now we don't need the sweeter grasses. We have wallaby and kangaroo grasses now too." (Surveyed landholder)

4.7 Likelihood of making changes to soil management practices in the next 12 months

Respondents were asked whether they were likely to make changes to their soil management practices in the next 12 months, again across the nine categories, on a scale of one to five, where one was not at all likely, and five was very likely. The average responses are given in the graph below with more detail in the table following it.

In the next 12 months respondents were most likely to change pasture management, with a mean likelihood of 2.89. Deep ripping was the least likely to change, with a mean likelihood of 1.54.



How likely are you to make changes to the following soil management practices in the next 12 months, on a scale of 1 to 5, where 1 is not at all likely and 5 is very likely?

Practices	Mean likelihood	Mode likelihood	Total Responses
Soil testing	**2.36**	1 (52.13%)	94
Applying soil conditioners (including lime)	**2.52**	1 (45.74%)	94
Deep ripping	**1.54**	1 (78.26%)	92
Gypsum	**1.80**	1 (70.65%)	92
Stubble retention	**1.79**	1 (71.43%)	91
Controlled traffic	**1.57**	1 (79.35%)	92
Changed pasture	**2.89**	1 (35.11%)	94
Changed fertiliser regimes	**2.51**	1 (45.16%)	93
Other	**2.02**	1 (65.85%)	41

Comparisons to 2012 are difficult given that only open responses were gathered for the baseline. Nonetheless, the most commonly cited areas of change are similar, although soil testing went from the most common in 2012 to the fourth in 2013.

To account for those already undertaking the practice who may not need to alter their practices, an analysis was conducted with those currently undertaking each practice removed. However, for the most part this did not affect the reported likelihood of making changes.[3]

Another analysis was conducted based on whether soil structure was identified as a major issue (in line with the baseline study and section 4.5.5). For those who did identify structure as a major issue for themselves, their reported likelihood of undertaking relevant practices was not changed to a great extent. Deep ripping was slightly lower at 1.50 and gypsum use was higher at 1.94, but still one of the lower scores overall.

4.7.1 Soil testing

Of the 94 responses to this question, 52.1 per cent of respondents indicated that they were not at all likely to make any change to their soil testing in the next 12 months. The average likelihood specified was 2.36.

[3] For those not currently undertaking the practice, there were two instances where the likelihood of making a change was higher than the overall level reported. This was a slight increase for soil testing (mean = 2.36 vs 2.50) and a moderate increase in the likelihood of applying soil conditioners (mean = 2.52 vs 3.08).

Soil testing (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	49	5	10	17	13	94	2.36
Percentage	52.13%	5.32%	10.64%	18.09%	13.83%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

- Increase the frequency of soil testing (24 comments)
- Test in more locations across the property (9 comments)
- Decrease the frequency of soil testing (2 comments)
- Not do any soil testing in the next 12 months (2 comments)
- Undertake more detailed testing (1 comment)
- Standardise the sampling technique (1 comment)

"I don't want it to slip back. And soil testing is the only way I can refer to. Because I've got soil tests from previous years, so if I can get more organic matter into the soil, my learning is that everything else improves. Soil tests are the only way I can prove that because you can't see it. So by maintaining the stubble and rotational grazing I am going to have to keep soil tests to see if I'm maintaining or getting better." (Landholder survey)

4.7.2 Applying soil conditioners (including lime)

Of the 94 responses to this question, 45.74 per cent of respondents indicated that they were not at all likely to make any change to their soil conditioner application in the next 12 months. The average likelihood specified was 2.52.

Applying Soil Conditioners (including lime) (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	43	7	11	17	15	94	2.52
Percentage	45.74%	7.45%	11.70%	18.09%	15.96%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

- Apply more lime (16 comments)
- Modify soil conditioner application based on results of soil tests (13 comments)
- Apply more soil conditioner, type unspecified (6 comments)
- More location-targeted approach to soil conditioner application (1 comment)
- Apply super phosphate (1 comment)
- Apply manure (1 comment)
- Apply compost (1 comment)
- Apply less lime (1 comment)

- Apply seasol (1 comment)
- Apply dolomite (1 comment)
- Apply conditioner to develop the root system further (1 comment)
- Improve the soil biology (1 comment)
- Move away from commercial products (1 comment)
- Use more natural products, and no chemical products (1 comment)
- Apply less soil conditioner (1 comment)

"As a result of the workshops we decided to put on 150 tonne of lime." (Landholder survey)

4.7.3 Deep ripping

Of the 92 responses to this question, 78.26 per cent of respondents indicated that they were not at all likely to make any change to their deep ripping practices in the next 12 months. The average likelihood specified was 1.54.

Deep Ripping (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	72	3	8	5	4	92	1.54
Percentage	78.26%	3.26%	8.70%	5.43%	4.35%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

- Start deep ripping trial (7 comments)
- Increase the amount of deep ripping (4 comments)

"Going to trial deep ripping. Want to see what it does. Going to trial it in a 20 hectare block to see if it works or not." (Landholder survey)

4.7.4 Gypsum

Of the 92 responses to this question, 70.65 per cent of respondents indicated that they were not at all likely to make any change to their gypsum application in the next 12 months. The average likelihood specified was 1.80.

Gypsum (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	65	2	10	8	7	92	1.80
Percentage	70.65%	2.17%	10.87%	8.70%	7.61%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

- Increase the amount of gypsum (13 comments)

- Start a gypsum trial on an area of the property (2 comments)
- Decrease the amount of gypsum (1 comment)

"Might do a trial on some of the higher country. It is to do with sulphur content of the area not the structure." (Landholder survey)

4.7.5 Stubble retention

Of the 91 responses to this question, 71.43 per cent of respondents indicated that they were not at all likely to make any change to their stubble retention practices in the next 12 months. The average likelihood specified was 1.79.

Stubble Retention (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	65	5	6	5	10	91	1.79
Percentage	71.43%	5.49%	6.59%	5.49%	10.99%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

- Increase the degree of stubble retention (12 comments), through:
    - Use of new machinery (2 comments)
    - Stock rotation (1 comment)
    - Grazing (1 comment)

"Just try different methods of breaking it down without burning it. There's always different stuff coming up." (Landholder survey)

4.7.6 Controlled traffic

Of the 92 responses to this question, 79.35 per cent of respondents indicated that they were not at all likely to make any change to their controlled traffic practices in the next 12 months. The average likelihood specified was 1.57.

Controlled Traffic (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	73	1	7	7	4	92	1.57
Percentage	79.35%	1.09%	7.61%	7.61%	4.35%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

- Increase the amount of stock control (7 comments)
- Make greater effort to confine vehicles/machinery to set routes (3 comments)

- Make greater effort to vary vehicle/machinery travel across different routes (1 comment)

"We are making sure not to track over ground when too wet or bring animals into certain areas. Started thinking about what's going on underneath." (Landholder survey)

4.7.7 Changed pasture

Of the 94 responses to this question, 35.11 per cent of respondents indicated that they were not at all likely to make any change to their pasture management in the next 12 months. The average likelihood specified was 2.89.

Changed Pasture (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	33	2	18	24	17	94	2.89
Percentage	35.11%	2.13%	19.15%	25.53%	18.09%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

- Change pasture, seed type unspecified (29 comments)
- Experiment with different pasture varieties (7 comment)
- More perennials (5 comment)
- More Lucerne (3 comment)
- More native varieties (3 comments)
- More clover (2 comments)
- More legumes (2 comments)
- More annuals (1 comment)
- More canola (1 comment)
- More Wimmera rye (1 comment)
- More wheat (1 comment)
- More peas (1 comment)
- More oats (1 comment)
- More phalaris (1 comment)
- More millet (1 comment)
- More soybean (1 comment)
- Use bio-dynamic preparations (1 comment)
- Swap the location of cropping and pasture (1 comment)
- Increase pasture management, commencing from prior to rotation grazing (1 comment)
- Direct drilling and over sowing (1 comment)
- Undertake direct seeding (1 comment)

"Improve some pastures with plants like native grasses. Also going to sow in some clover to fatten up the cattle." (Landholder survey)

4.7.8 Changed fertiliser regimes

Of the 93 responses to this question, 45.16 per cent of respondents indicated that they were not at all likely to make any change to their fertiliser practices in the next 12 months. The average likelihood specified was 2.51.

Changed Fertiliser Regimes (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	42	7	14	14	15	93	2.51
Percentage	45.16%	7.53%	15.05%	15.05%	16.13%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

- Change fertiliser regime, types unspecified (19 comments)
- More super phosphate (3 comments)
- More lime (3 comments)
- More targeted fertiliser use to address particular issues (2 comments)
- More liquid fertilisers (2 comments)
- More compost (2 comments)
- More manure (2 comments)
- Less superphosphate (2 comments)
- Less fertiliser use (2 comments)
- More phosphorus (1 comment)
- More MAP or DAP (1 comments)
- More gypsum (1 comment)
- More seasol (1 comment)
- More magnesium (1 comment)
- More ammonia and reactive rocks (1 comment)
- More organic fertilisers (1 comment)
- Less phosphorous (1 comment)
- Change rate of application (1 comment)

"Mainly the quantity [of fertiliser]*. It depends on how much money I've got to spend on it and the price of fertilizer and how my produce sells. And sometimes I spread lime instead of superphosphate. If the superphosphate gets too dear I'll spend the fertilizer dollar on lime. I've nearly got to the whole place with lime once now. By the time I finish once it's time to start again with the paddocks I first put it on."* (Landholder survey)

4.7.9 Other

Of the 41 responses to this question, 65.85 per cent of respondents indicated that they were not at all likely to make any change to any other soil management practices in the next 12 months. The average likelihood specified was 2.02.

Other (where 1 is not at all and 5 is very likely)

	1	2	3	4	5	Total Responses	Mean likelihood
Number	27	1	4	3	6	41	2.02
Percentage	65.85%	2.44%	9.76%	7.32%	14.63%	100.00%	-

The changes respondents reported they were interested in making can be categorised into the following themes:

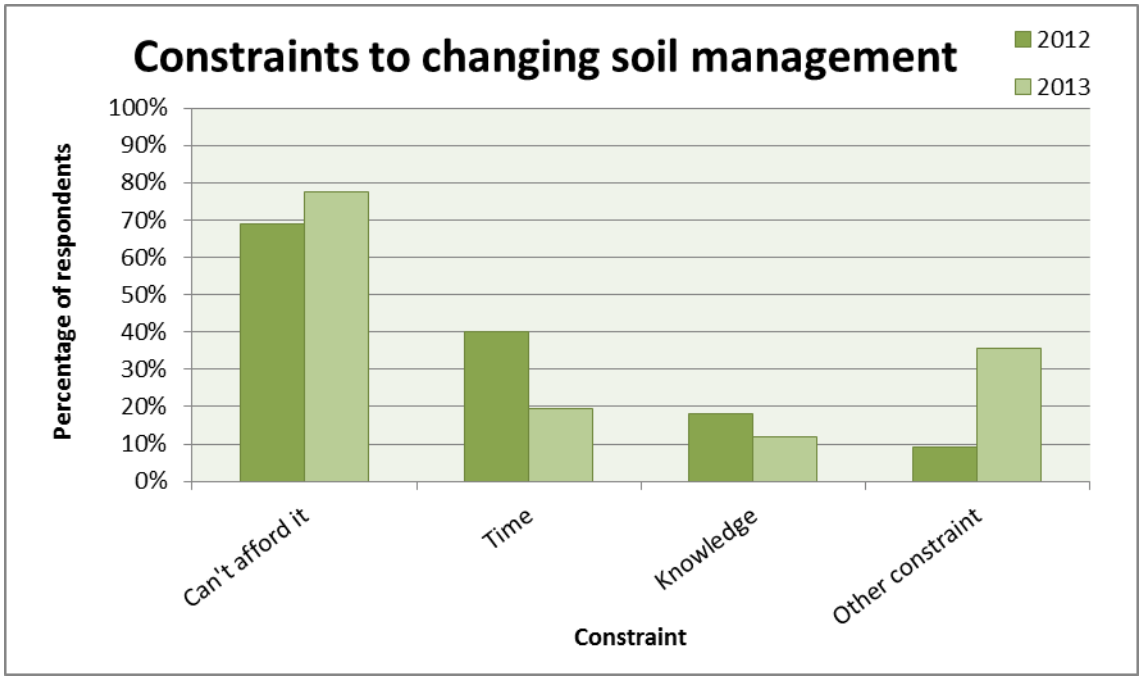
- Subdivision of land to allow for rotational grazing (6 comments)
- Start minimum tillage seeding (1 comment)
- Learn more about soil biology to be able to manage weeds more naturally (1 comment)
- Cut some hay (1 comment)
- Better deal with organic matter (1 comment)
- Tree planting (1 comment)
- Application of worm juice (1 comment)
- Decrease amount of sheep, increase amount of cattle (1 comment)

"The biology of the soil is something that I would really like to know more about. I know it is linked to the organic content in soil. I am becoming interested in looking at way we can address weeds by natural ways. The single biggest change in our practices has been the reduced use of weed killer, through pasture management. We have been moving away from fertilizers, we don't want to go to biodynamic farming, or anything like that but just to know more about alternatives." (Landholder survey)

4.7.10 Constraints

As in the baseline study, respondents were asked, "What are the major constraints to changing or improving soil management for you?"

While the overall pattern of responses is the same with a focus on the cost, there were some changes across the two studies. Affordability was rated as a constraint by more people, whereas half as many people reported time as a constraint. Knowledge was also seen as less of a constraint in 2013, with only 12% of people reporting this as a limitation to making changes to their soil management. The "other" category received more responses than in 2012 although these are spread across a range of issues. These are outlined below.



Participants were given the option of nominating constraints to improving soil management other than affordability, lack of time and lack of money. 27 participants named at least one additional impediment.

The two most frequently mentioned barriers were:

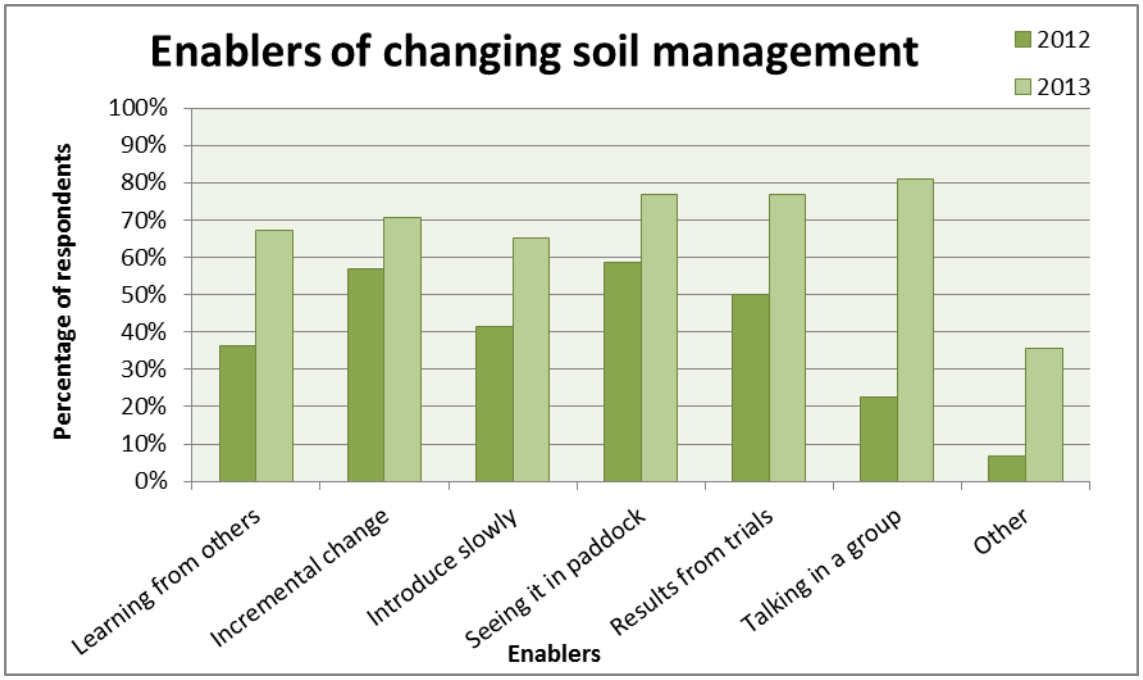
- Weather – including rainfall and climate change
- That the benefit may not justify the cost

Other barriers mentioned by at least one participant were:

- Age
- Conflicting or poorly coordinated advice and information
- Topography
- The time lapse between action and result

4.7.11 Enabling factors

Respondents were asked what would make it easier for them to trial something new to improve soil health. There was a similar pattern of responses to the 2012 study, although all options were selected by more respondents. Particularly large increases were seen for "learning from others" and "talking in a group". The latter went from the lowest of the main options to the highest in 2013. While the other options are also rated highly, this indicates the importance of peer learning and the appropriateness of the group based approach taken in the workshop delivery.



There was also an open ended question where participants were asked to suggest what would make it easier for them to trial new soil management strategies, other than the six options given above. 20 respondents provided suggestions.

The most frequent response was:

- Money (including grants and subsidies)

The following were also mentioned at least once:

- Reading material (one person specified it should be printed)
- Hard data
- Amenable climate and weather
- A regular soil testing program
- Talking with farmers who share similar goals
- Advice from consultants
- Advice from DPI staff and scientists (not consultants)
- More space

5 Workshop feedback

Overview

This section summarises the evaluation data collected from the workshops delivered as part of the project. While 22 events had been conducted up to the time of this survey, only ten had collected evaluation data.

Overall, there were positive responses about the form and content of the workshops from participants. Most attendees agreed that the workshops covered what they were hoping to learn and that they were enjoyable, valuable and thought provoking. The pacing of the workshops was mostly felt to be appropriate and participants were comfortable to contribute to the discussion. Attendees reported that the workshops had improved their understanding and ability to interpret soil tests and manage soil pH. The majority of attendees said they could apply what they had learned to their own farm, and most said they were either "likely" or "very likely" to make a change on their land. The greatest interest in topics for further training were grazing management, soil biology and soil carbon.

Four of the workshop results are from hard copy questionnaires (approx. 72 respondents) and a further six were conducted electronically using TurningPoint (approx. 79 respondents). The results for these are mostly presented separately as there are differences in the way some of the questions were phrased and the possible response options. In the paper based questionnaires, attendees were able to select more than one option for a number of the questions, whereas with TurningPoint in many cases only one response could be selected.

Content and process

What was your main reason for attending today?

For the workshops completing feedback with the TurningPoint devices only one option could be chosen. The majority of people selected "All of the above". (Note this does not include the Yea River Catchment Landcare (YRCL) workshop, reported in the following table.)

Reason for attending (TurningPoint)

Reason	Yes
Understand Soil Test	5%
Understand Soil pH and Implications	5%
Apply soil test results to achieve productivity goals	13%
Learn about fertilizer requirements	0%
All of the above	77%
	100%

The focus of the Yea River Catchment Landcare (YRCL) workshop was on fertiliser management decisions. In the feedback, attendees could choose more than one option. Learning about fertiliser requirements was the main reason for attending, followed by applying soil test results for productivity.

Reason for attending – Yea River Catchment Landcare

Reason	Yes
Apply soil test results for productivity	68%
Learn about fertiliser requirements	77%
Learn about lime requirements	9%
Other	5%

For the four workshops that completed hard copy feedback forms, attendees could also choose as many responses as applicable. Understanding soil test results and applying them were the major reasons for attending.

Reason for attending (hard copy)

Reason	Yes
Read a soil test and understand the reason behind the results.	71%
Understand soil pH, its implications for soil chemistry and how to manage it.	60%
Apply soil test results to achieve soil condition and management goals.	67%
Learning about pasture renovation.	39%
Learning about fertiliser regimes.	44%
Other	8%

Did this workshop cover what you were hoping to learn?

Overall, attendees agreed that the workshops covered what they were hoping to learn.

Met expectations (1 is not all and 5 is completely)

	Mean score
Combined score	4.13

The workshop was well paced (not too slow: not too fast)

The pacing across the workshops was mostly felt to be appropriate. Only 2% felt they were too slow and 7% felt they were too fast.

Pace of workshops (combined responses)

	% Overall
Too slow:	2%
Okay:	91%
Too fast:	7%

Ratings of workshop

TurningPoint

For those workshops where only one choice was given, the majority of attendees rated the workshop as "valuable". In the YRCL workshop, attendees could choose multiple options. Thought provoking and valuable were both commonly chosen.

"I found the workshop:" (TurningPoint)

Description	Yes	YRCL
Enjoyable	12%	36%
Valuable	63%	64%
Thought provoking	23%	68%
Had no new information	0%	9%
Was not a productive use of my time	2%	5%
	100%	
Total number of respondents:	(57)	

Hard copy

Those completing hard copies rated the descriptions on a scale of 1 to 5. A high level of agreement was expressed across the 4 categories.

"I found the workshop:" (1 is Strongly disagree and 5 is Strongly agree)

Description	Mean score
Enjoyable	4.25
Valuable	4.36
Thought provoking	4.25
Had new information for me	4.07

The presenters were knowledgeable:

Knowledgeable (1 is Strongly disagree and 5 is Strongly agree)

	Mean score
Combined score	4.52

I felt comfortable to contribute to the discussion:

Comfortable (1 is Strongly disagree and 5 is Strongly agree)

	Mean score
Combined score	4.32

Outcomes

Improved ability and understanding

In general, there was a high level of agreement that the workshops had improved understanding and ability to interpret soil tests and manage soil pH.

TurningPoint

The majority of attendees reported that their abilities had improved due to the workshop.

Improved ability

Did this workshop improve your ability to:	% Yes
interpret soil tests	96%
manage soil pH	85%[4]
understand fertilizer requirements	90%

[4] At one of the workshops there was not enough time to cover lime explicitly. With the results for this workshop removed, the figure changes to 98%.

Hard copy

In terms of their improved understanding due to the workshop, attendees reported generally high scores on a scale of 1 to 5.

Improved understanding (1 is not all and 5 is completely)	
Did this workshop improve your understanding of:	**Mean score**
Soil test interpretation	4.07
Soil pH and how to manage it	4.12
Pasture renovation	3.78
Fertiliser regimes	3.59

Can you apply what you have learned to your own farm situation?

The following table presents results for all workshops combined. Most attendees could apply what they have learned to their own farm, 22% said partly, and 4% could not apply it at all.

Applicable:	
	Overall %
Yes:	73%
Partly:	22%
No:	4%

Are you likely to do anything different on your land as a result of the information today?

TurningPoint

Most people reported intending to make a change on their land, with 88% either "likely" or "very likely" to make a change.

	%
Not Likely	12%
Likely	57%
Very Likely	31%
	100%

Hard copy

Those in the workshops completing hard copies rated their likelihood on a scale of 1 to 5. There was also a relatively high reported likelihood of making a change for these groups.

Hard copy (1 is Not likely and 5 is Very likely)	
	Mean score
Likelihood of making changes	3.93

How important do you think this learning has been for the future of your business?

Those completing hard copies also indicated how important the workshop material was for their business. 84% of respondents rated this as either "important" or "very important".

Hard copy – Importance to future of business	
	Mean score
Little Importance	0%
Some Importance	16%
Important	48%
Very Important	36%
	100%

If this event revealed the need for further training what would the topics be?

Further training topics

Reason	Yes	YRCL
Soil Pits	4%	7%
Grazing Management	25%	19%
Soil Biology	25%	30%
Liming rates	7%	16%
Soil Carbon	16%	21%
Other	13%	7%
Fertilizer Management*	18%	
Sodic Soils*	5%	

* Fertiliser management was given as an option for only two of the groups. Three of the remaining groups were given the option "Sodic Soils" instead. The percentages are in relation to the number of people in the workshops where these options were given.

What are you going to do?

Note that the YRCL workshop was specifically on fertiliser management decisions.

Actions

Reason	Yes	YRCL
Apply Lime	37%	22%
Apply fertilizer	12%	42%
Do nothing	2%	0%
Totally renovate paddock	5%	14%
Apply Gypsum	7%	0%
Need more information before I do anything	18%	22%
Other	19%	0%
	100%	

6 Presenter feedback

Overview

Four of the workshop presenters completed formal feedback questionnaires. Overall, the presenters were very positive about the workshops and their role as presenters. Workshops and discussions were seen as highly appropriate methods of delivery and all four presenters reported that the structure was effective. The opportunity for discussion and interaction was noted as a particular strength of the workshop format. Presenters also made some suggestions for improvements.

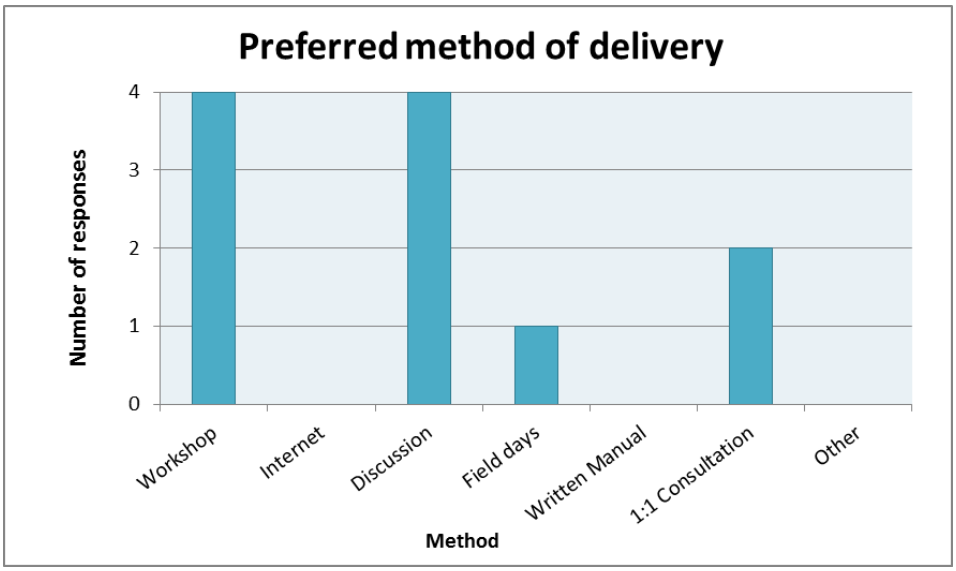
Expected Aim of Presenting

Facilitators provided the following responses as their aims for presenting:

- Improving peoples knowledge and understanding
- Provide objective practical information
- Industry Involvement
- Widen public knowledge that [laboratory], as a provider of soil analyses, has a keen interest in contributing to the general improvement of Australian soils and has a dedicated scientific interest in addition to a commercial interest in this area

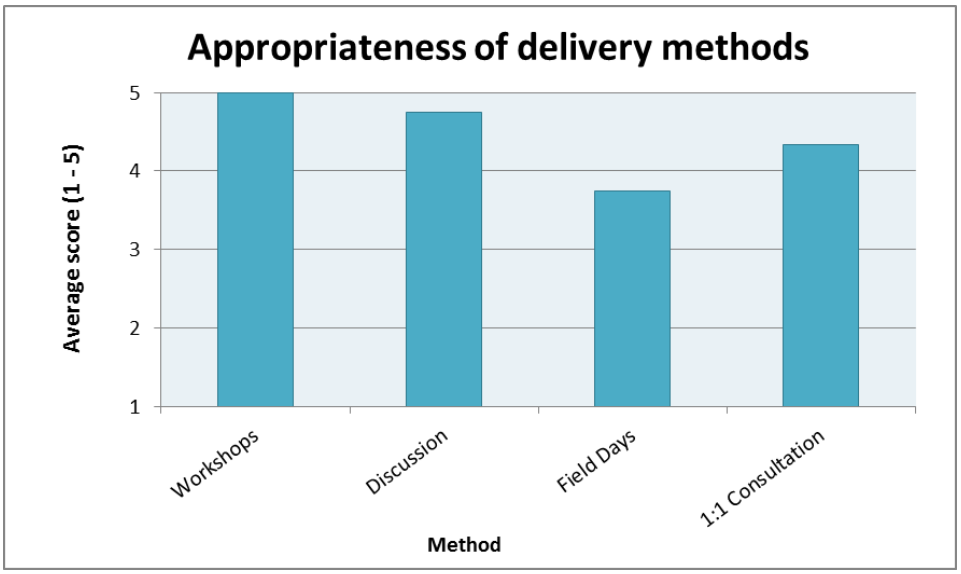
Preferred method of delivery

All four presenters preferred workshops and discussion as means of delivery.



Appropriateness of delivery methods

Workshops were given the highest possible rating for appropriateness (on a scale of 1 to 5). Field days received the lowest rating (3.75) but all options were above the midpoint of 3.



Comfort, structure and enjoyment

There were three scaled questions where all four presenters responded with the most positive option for each. These are shown in the table below:

Question	Response	Number of responses
Comfort Level (rating out of 5)	5	4
Was the structure effective	Yes	4
Level of enjoyment	Very much Enjoyed	4

Suggested Methods of Delivery

Presenters suggested the following alternative methods of delivery:

- Soil pits as visual aids
- Active involvement in On Farm Trials
- A well run course with hands-on workshopping

Why Do You Want to Deliver Learning?

Presenters provided the following responses:

- To improve landholder understanding
- Major driver of farm profitability is stocking rate - Major determinant of stocking rate (given responsive species) is soil fertility - Structure, acidity, nutrients. Productive soils are resilient soils
- Industry Involvement, Professional Development, Client Contact
- Constant addition of technical and scientific knowledge to the practical knowledge that the landholder has can obviously be important in raising the general level of soil management and awareness of issues in the community. This works two ways because those giving the information also get valuable feedback and knowledge from the farming community

Were Resources Sufficient?

The presenters reported that resources were in the most part sufficient:

- 3 of the facilitators replied that resources were sufficient
- 1 responded “Mainly/in Part” and gave the comment that the “Ability to illustrate some points with data projector would have helped.”

What worked well?

Presenters provided the following responses:

- The discussions - Good engagement of participants
- Breakfast - Opportunity to meet participants in relaxed atmosphere
- A relatively small group which was interactive with the speaker in asking questions and discussing as we progressed

What didn't work & Why?

Only two responses were provided to this question:

- Needed to have the pastures and fertiliser discussion at separate time. Both topics were of interest
- Probably tried to cover too much in a short time, but not a major problem

Modifications (made or suggested)

Presenters provided the following suggestions for modifications:

- Some discussions pre-workshop with co-presenter - Clearer idea of roles of each of the co presenters
- Tighter scheduling of presentation content to fit time available (but this is always a challenge).