



**NORTH CENTRAL**  
Catchment Management Authority  
*Connecting Rivers, Landscapes, People*



**Australian Government**



**RMCG**

Environment | Water | Agriculture  
Policy | Economics | Communities



September 2014

## **Charlton Farming for Sustainable Soils group**

*Review report*

North Central Catchment Management Authority

PO Box 18

Huntly Vic 3551

T: 03 5440 1800

F: 03 5448 7148

E: [info@nccma.vic.gov.au](mailto:info@nccma.vic.gov.au)

[www.nccma.vic.gov.au](http://www.nccma.vic.gov.au)

T: 03 5440 1800

F: 03 5448 7148

E: [info@nccma.vic.gov.au](mailto:info@nccma.vic.gov.au)

[www.nccma.vic.gov.au](http://www.nccma.vic.gov.au)

© North Central Catchment Management Authority, 2014

This report has been prepared for the Charlton Farming Sustainable Soils group by:

**RMCG**

E: [rm@rmcg.com.au](mailto:rm@rmcg.com.au)

W: [www.rmcg.com.au](http://www.rmcg.com.au)

ABN: 35 154 629 943

### **Key Project Contact**

Melanie Watts

Co-ordinator – Charlton Farming Sustainable Soils group

M: 0448 368 956

E: [aaronmelanie@harboursat.com.au](mailto:aaronmelanie@harboursat.com.au)

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Purpose of the review .....	1
1.2	Approach .....	1
1.3	Farmer engagement and practice change model .....	2
<b>2</b>	<b>Local soil issues and group activities</b>	<b>3</b>
2.1	Background.....	3
2.2	Local soil issues.....	3
2.3	Group approach to learning .....	3
2.4	Charlton group objectives and activities .....	4
<b>3</b>	<b>Survey results</b>	<b>5</b>
3.1	Overview .....	5
3.2	Characteristics of farmers.....	5
3.3	Farmer self assessment of sustainable soils management .....	6
3.4	Value of the program to farmers .....	7
<b>4</b>	<b>Impact of the project</b>	<b>8</b>
4.1	Knowledge and understanding .....	8
4.2	Decisions and farm practices.....	8
4.3	Future activities and the group .....	9
<b>5</b>	<b>Conclusions</b>	<b>10</b>
	<b>References</b>	<b>11</b>

# 1 Introduction

Farming for Sustainable Soils (FSS) is a community based land protection program funded by the Australian Government's Caring for our Country program. The FSS program is delivered through a partnership between the North Central Catchment Management Authority (CMA) and participating soils groups. The Charlton FSS group has participated in the program over the past three years. This review aims to document the achievements, activities and lessons learned over this period.

## 1.1 Purpose of the review

The review has incorporated consideration of the following:

- The activities of the group in the context of the soil health issues and challenges identified within the Charlton Local Area Soil Protection Plan.
- The range of soil assessment, knowledge development (training) and land management trials that have been developed and implemented by the FSS group over the past three years.
- How each of these areas of endeavor have improved group understanding of soils and soil management, and how that understanding is leading to the adoption of sustainable practices.
- The extent to which an adaptive community-based and community led land protection model and program has proven successful.
- The key learnings realised through the three-year involvement of the Charlton FSS group in the FSS.
- The legacy of the Charlton FSS project, and the willingness, capacity and opportunities for sustaining the group beyond 30 June 2014.

## 1.2 Approach

The approach taken has involved a review of relevant information on the activities conducted by the group (provided by the facilitator) and telephone interviews and survey of 12 active Charlton group members. The consultant will also attend a dinner meeting in Charlton to discuss the main findings. The information generated through interviews and data analysis (qualitative and quantitative) has been collated and analysed to distil the key themes and then reported against the anticipated outcomes of the program. Synthesis and illustration of the main findings from the review have been presented as an easily readable report.

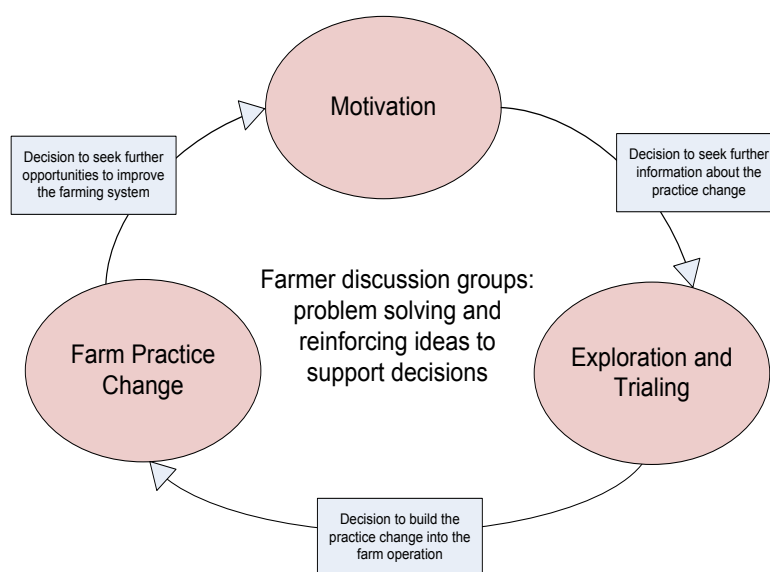
The achievements reporting has focused on the relevant 5 year outcomes of the Sustainable Agriculture stream of the Australian Government's Caring for our Country program. These outcomes relate to increasing:

- The number and area of farming entities that have trialled innovative practices for improved natural resources management.
- The percentage of farming entities and land managers improving their knowledge and skills in managing our natural resources to deliver ecosystem services.
- The capacity and confidence of regional community leaders involved in agricultural production and the protection of natural resources.
- Engagement and participation by regional communities, groups or individuals in natural resource management activities.

- Community awareness and understanding of the status of Australia’s natural resources.
- The types of measures that the achievements and outcomes reporting has focused on include:
  - *Attitude, behaviour and practice change*
  - *Increased knowledge, skills and experience in natural resource management.*

### 1.3 Farmer engagement and practice change model

An adapted practice change model of farmer decision making has been used to help guide the review of the accomplishments of the Charlton FSS group (Figure 1.1). Participation in the group has exemplified all three decision stages in relation to farmers moving to more sustainable practices.



**Figure 1:1 Sustainable soils group practice change model** (adapted Nicholson et al 2003)

The model has three decision stages based around:

- **Motivation** (awareness) stage
  - followed by a decision to seek further information
- **Exploration and trialing** (or participation) stage
  - followed by decision to build practice change into the farm operation
- **Farm practice change** (adoption) stage
  - followed by a decision to seek further opportunities to improve farm system

The review has documented evidence where participating farmers have been motivated to explore and trial new ideas leading to practice changes that will improve the condition of their soils over time.

## 2 Local soil issues and group activities

### 2.1 Background

The Charlton soils group formed in 2011 in a region that had been severely affected by drought between 1997 and 2009 with poor crop yields and reduced stubble cover over summer months, and grazing putting pressure on already limited groundcover. Particularly damaging high summer rainfall led to extended periods of flooding in the Avoca system between September 2010 and March 2011. The mid reaches of the Avoca catchment forms part of the group area and it extends from Narrewilllock to the north of Charlton, to Teddywaddy to the west, and as far south as Coonooer Bridge on the Avoca River. The Avoca River flows in close proximity to the western boundary.

### 2.2 Local soil issues

The Charlton area comprises 'mixed country' with variable soil types with a range of capabilities and susceptibilities to erosion.

A range of soil condition issues has been identified in the group's Local Soil Protection Plan. The Charlton area is comprised of five broad landform and geology types that support soils with a range of capabilities and susceptibilities to damage. The geological units comprise alluvial plains (some Aeolian plains to the west), steep and gentle granite hills, gently undulating deeply weathered meta-sediments, steep metamorphosed sedimentary hills, and associated tertiary sediments.

The extensive Riverine plain or alluvial soils extend from south of Charlton (upland alluvium) through to Coonooer Bridge and to north of the group area. These are mostly calcareous (sodic) duplex soils that tend to be well drained with moderate topsoil structure. However, once top soils are damaged or lost, these soils can be susceptible to wind erosion and compaction when groundcover is reduced. There is waterlogging in isolated depressions and periodic flooding along water courses, including the Avoca River. Forms of soil deterioration on the plains soils include surface sealing and compaction with some inundation in wetter seasons on the poorer drained areas, stream bank erosion and flooding.

The slopes of the granite rises, when cropped, and susceptible to sheet and gully erosion. These red calcareous granite loams are weakly structured and inherently sensitive to deterioration. Metamorphosed sedimentary hills support stony loam soils that are excessively drained and are generally used for grazing. These soils are prone to sheet and gully erosion and contribute to dryland salinity due to excessive groundwater recharge.

The group's trial work has focused on the plains soils where the majority of cereals are grown. These soils can be degraded by compaction and surface sealing, particularly on the duplex soils, where frequently cultivated. The most prominent problems with the red cropping soils are their hard setting surfaces and all these soils tend to have high sodicity in the subsoil. Improving the structure of the red sodic cropping soils is a high priority for members of the group. Farmers have been working towards better understanding their soils and identifying problem areas and common issues and finding new ways to improve soil health and structure and build soil carbon.

### 2.3 Group approach to learning

New knowledge and skills have generally been acquired through participation in three main areas of activity:

- Baseline soils knowledge and testing



- Training and knowledge sharing in a range of areas to do with soil protection including: soil health and sustainable cropland management
- Farm scale trials and gaining experience with new practices.

Learning has occurred through participation in activities that better manage soil resources and this has been mostly achieved by:

1. Bringing people together to share knowledge, skills and experiences.
2. Providing access to technical specialists.
3. Building partnerships and networks.

## 2.4 Charlton group objectives and activities

To address these soil issues, group members set the following growing season objectives:

- Research and trial best practice farming (cropping and pasture) methods that will maintain groundcover, improve soil structure, build soil carbon and lead to healthier soil (Precision agriculture/disc seeding trial, soil structure improvement trial investigating ameliorates and fracturing methods, green manuring techniques trial) – Year 1, 2 and 3
- Implement an Integrated Pest Management Program (training in IPM monitoring and understanding) – Year 2
- Conduct baseline soil condition monitoring and continued monitoring of changes in organic carbon, nutrients and cation exchange balance (sampling at trial sites and testing on farms) – Year 1, 2, 3
- Improve knowledge and skills in sustainable farming practices through training (professional training) - Year 1, 2 and 3

The Charlton group’s activities have been summarised in Table 2:1.

**Table 2:1 Activities undertaken over the past three years**

Activities	Group focus
1. Baseline soils knowledge and testing	Results interpretation, taking samples
2. Professional training, knowledge and advice	Soil pit investigation, managing nutrient deficiencies and chemical imbalance, climate drivers, soil microbial health, balanced soil biology, (fungi, composting and manuring)
3. Cropland management and agronomy: crop walks, field days	Soil protection from wind erosion. weed management, herbicide resistance, seed varieties
4. Precision farming trials: GPS based technologies, tillage and seeding techniques	Trialing seeding techniques, stubble management
5. Soil compaction amelioration trials: gypsum, lime, fertilisers, sub-surface ripping	Trialing techniques to improve soil structure and additives to ameliorate
6. Integrated Pest Management	Reduced chemical usage & machinery traffic, practical skills in assessing spray requirements through pest monitoring
7. Green manuring trial (coming up)	

### 3 Survey results

#### 3.1 Overview

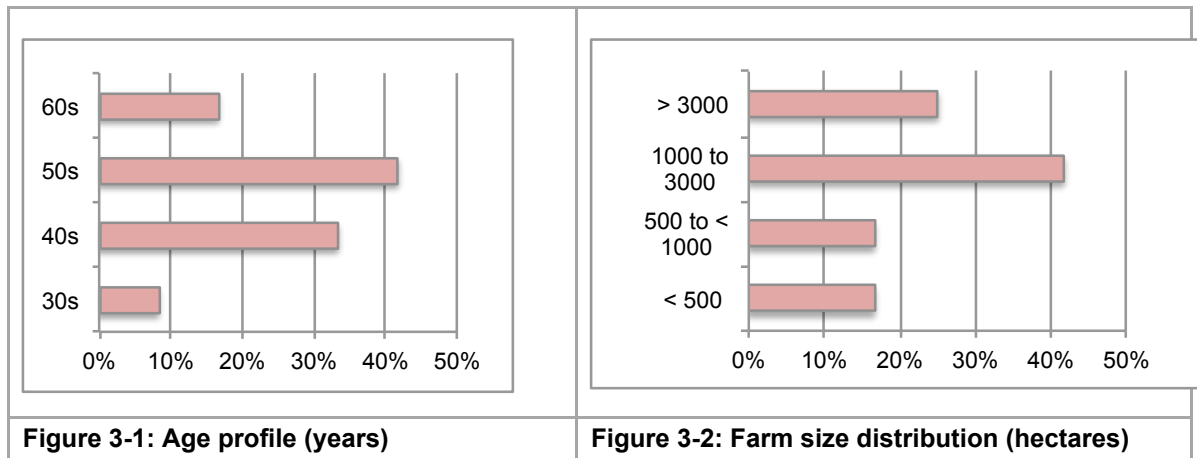
Members of the Charlton FSS group were interviewed in March 2013 and again in July 2014. Up to 12 farmers were interviewed for each survey. An evaluation survey was devised later in 2013 that will be a means of measuring the level of value that farmers and investors are getting from the program. This will be especially valuable for new groups formed in 2013, where farmers have been surveyed at the beginning of their involvement and will be resurveyed at the conclusion of the three-year program. The main findings of the farmer interviews are presented in the following sections noting that the results between the two surveys are not always directly comparable.

#### 3.2 Characteristics of farmers

The farmers surveyed are representative of the geographical area and mix of farmers of a range of ages and farm size. The majority of farmers (around 75%) had been involved in farming for over 20 years with around one third farming for more than 30 years. Two thirds of farmers expressed that they intend to keep their farm size the same for the next 3 to 5 years while the remaining third were aiming to increase their farm size.

The following charts illustrate several key demographic characteristics of group members.

Farmers ranged between 30 and over 60 years of age. They were predominantly aged in their 40s and 50s (83%) (Figure 3-1).



A good range of farm sizes were represented, with just over one third managing under 1000 ha, and the majority farming between 1000 and 3000 ha, and the remaining 25% farming over 3000 ha (Figure 3-2).

The average enterprise mix amongst Charlton farmers is 60:40 cropping/livestock in terms of farm production. All members are cropping and around 80% have some sheep (either wool and/or lamb production) and just less than 10% have beef cattle. Cereals account for around three quarters of cropping production and the remainder is oil seeds and legumes. The majority of farmers (66%) do however grow some non cereals.

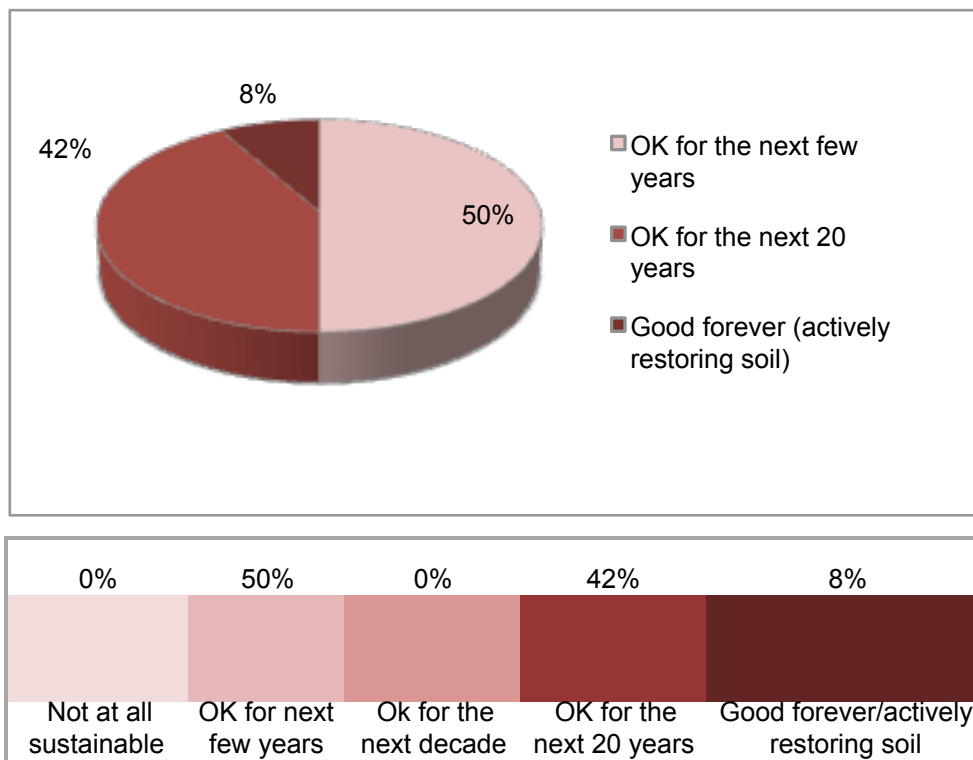


### 3.3 Farmer self assessment of sustainable soils management

The 2014 survey asked farmers to self assess their level of knowledge of how to achieve sustainable soils and to consider the level of sustainability of their current soil management practices. Farmers were then asked to assess how far they had progressed with achieving their desired level of sustainable soils management on their farm.

Two thirds of farmers felt that they had moderate knowledge on how to achieve sustainable soil management at the moment and the remaining one third felt that they had considerable or high levels of knowledge. No farmers reported poor or very poor levels of knowledge. Around 40% of Charlton farmers reported that their soils knowledge had increased a “fair bit” after only 12 months of being in the program (according to the earlier 2013 survey findings). A further 20% reported that their knowledge had increased “a lot” and the remaining one third reporting a small increase in soils knowledge.

Half of farmers felt that their practices are likely to be sustainable for the next few years while just over 40% felt that they will be sustainable for the next 20 years with the remaining 8% reporting that their practices will be sustainable well into the long term and that they are restoring their soils (Figure 3-3).



**Figure 3-3: Q. How sustainable do you feel that your current soil management practices are generally?**

Farmers were asked how far they had progressed in achieving sustainable soils management on their farm. Similarly, half of farmers felt that they were managing their soils fairly well but have more to do in this area, while around one third felt comfortable with where they are at, acknowledging that there is still more to do, and the remaining 8% felt that they have achieved sustainable soils management already (i.e. one farmer out of 12) (Figure 3-4).

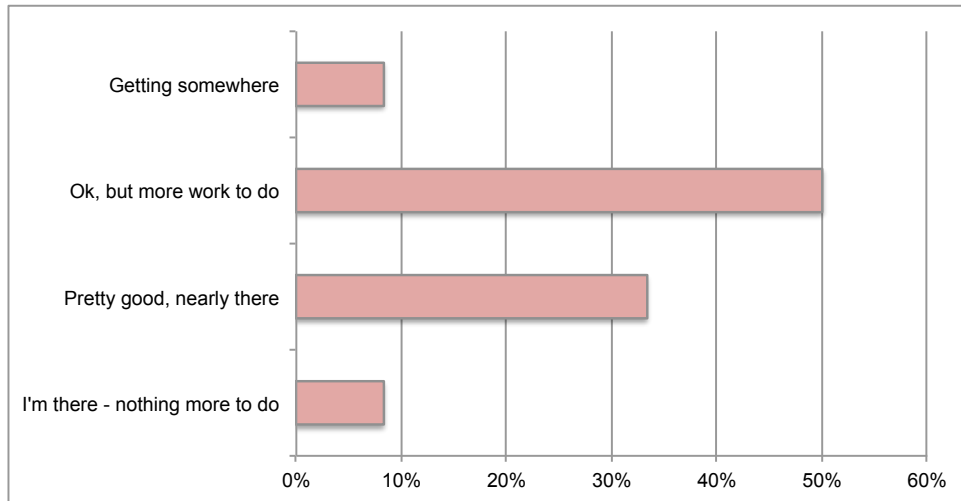


Figure 3-4: Q. How far are you along the road to achieving sustainable soils on your farm?

### 3.4 Value of the program to farmers

The 2014 survey asked farmers a range of questions about how much they had learnt and how much they got out of their involvement in the project over the past three years. The results are illustrated in Figure 3-5. All farmers are either moderately (over 80%) or highly satisfied with their participation in the project. This accords with the results of the earlier 2013 survey, conducted after 12 months participation in the project. One quarter of farmers have been highly motivated to undertake more trials and/or implement new approaches by the project, with a further 40% moderately motivated. More than 80% felt that their participation has helped them in achieving their sustainable soils management goals. More than 80% of farmers felt that there was still either moderate (55%) or significantly (25%) more information that they needed to know about sustainable soils.

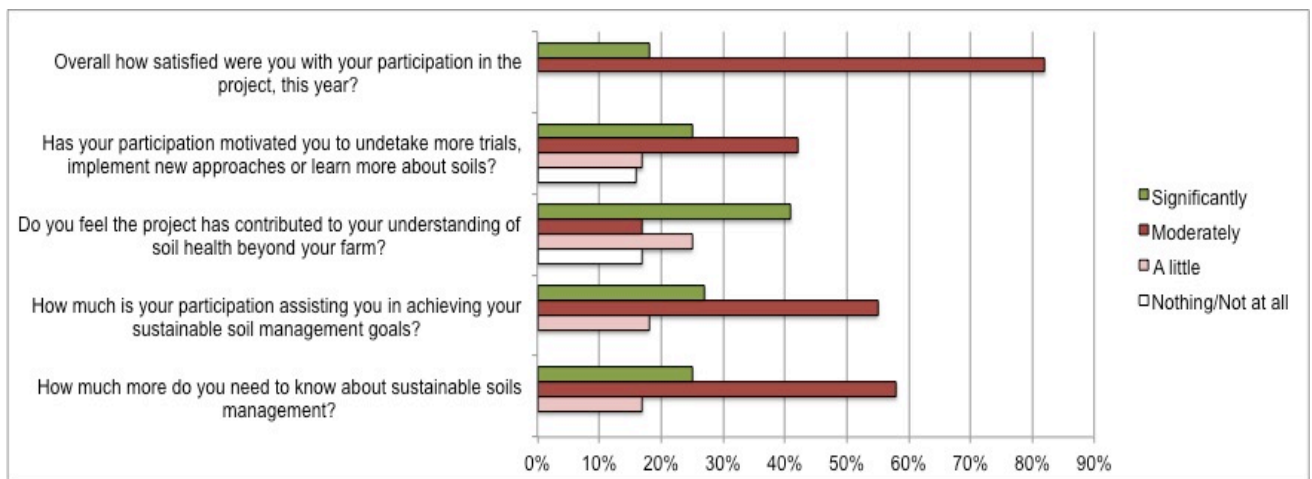


Figure 3-5: Value of the FSS project to farmers

The earlier survey, conducted after the first 12 months of the project, found high levels of participation in project sponsored training activities. More than 80% of farmers reported that they had learnt new information about their own soils and all farmers felt that they had learnt new information from talking to other farmers in their group.

## 4 Impact of the project

One of the prime achievements of the FSS project in Charlton has been providing an avenue to bring local farmers together to learn about their soils and trial more sustainable practices. This has been an essential in assisting farmers in making progress towards achieving more stable and healthier soils.

Some of the main areas of achievement are described in the following sections with examples drawn from group activities and interviews with group members.

### 4.1 Knowledge and understanding

The group has hosted farm walks at trial sites, attended field days, soil forums, training sessions, and conducted soil sampling on their own properties. Various influential agronomy and soils specialists have been engaged to help with interpretation and understanding of the limitations of their soils and how to improve soil condition.

The suitability and performance of a zero-till disc seeder was assessed by group members through trialing in common soil types of the local area. The group has learnt how to better manage damaged soil structure including compaction through conducting soil ameliorant (gypsum) and soil fracturing (sub-surface ploughing) trials. The use of soil pits has greatly helped with understanding the presence of compaction, organic matter and nutrient limitations, in the red sodic cropping soils in particular.

*Indecision is your enemy and being in the group has certainly got me thinking about how to do things better with the red hard setting soils I'm farming with.*

The group has enabled farmers to talk over their soil issues amongst themselves and with various soils and agronomy specialists. This is helping them with setting direction for operating their farming systems in a more sustainable way.

*The group has been a great way to talk to neighbours and mates about farming practices.*

### 4.2 Decisions and farm practices

After three years participation in the project around three quarters of group members are now doing some things differently on their farms and these decisions have been influenced by their involvement in the project. Several farmers reflected that while their involvement hadn't led them into changing anything in particular, it had provided them with reassurance about what they were already doing.

*Being in the group has been informative and has reinforced that what we are doing is the way to go.*

This builds on the findings from the earlier survey (in 2013) where around 90% of farmers felt that being able to talk to people with specialist soils knowledge had influenced their decision making and two thirds of farmers had already changed some of their practices. About one third of these farmers reported that they would not have made these changes if the program hadn't been in place.

Several farmers indicated that they are doing more soil testing and now feel more comfortable with interpreting and making good decisions from the results from physical and chemical tests.

*The levels of pH in my soil surprised me and we learnt how a lower pH locks up calcium which plays an important role in the plant's access to nutrients.*

Some farmers are using more gypsum and lime in addition to fulfilling their usual fertiliser requirements. Several farmers are now more discerning about the source and quality of the gypsum and lime they are buying.

*I'm now using a better quality product that is also better value for money.*

Farmers are working on ways to apply the knowledge they have learned, for example, about soil aeration through ripping, effects of cultivation, building soil organic matter through growing root mass, to improve soil condition.

*I'm spraying and doing less working to save moisture and it's softer on the soil.*

Farmers have also gained skills in assessing spray requirements through pest monitoring. Several farmers in the Charlton area are now monitoring insect infestations (rather than wholesale spraying) after learning more about integrated pest management.

*I'm trying to take more of a scientific approach to pest control rather than just broad scale spraying a whole paddock when I suspect a problem.*

### **4.3 Future activities and the group**

The three year formal commitment of FSS funding of the Charlton group concludes in September 2014. Farmers were moderately to highly satisfied with where they got to with the project after three years, however, the majority of group members also felt that there was more they could do that would be of value to them.

There remains interest in conducting further trials (liquid fertilisers, for example) and monitoring the effects of previous trials (ripping and additions of soil ameliorants and fertilisers) over the medium term. There is also some interest in expanding activities to cover pasture quality and grazing management. A further area of interest is learning more about the financial aspects of adopting the trialled practices, and the payback periods and profitability of these types of investments at a farm scale.

All group members recognised the importance of the paid coordinator's role and were concerned about how the group would maintain its momentum without on-going and assured funding of this position. Some members felt that they could continue with a smaller amount of funding at some level (ideas and information sharing, occasional guest speakers, for example) but it would be difficult to fund the close involvement of technical specialists and keep the trial work and associated activities going, without the support of the coordinator and additional funds.

## 5 Conclusions

Charlton farmers have increased their level of understanding of soils over the past three years.

Group members have worked well together and through the role of the coordinator, been able to run a flexible program that has catered for the knowledge needs of individual farmers. From the beginning, the Charlton group was formed around local soil issues and farmers were encouraged to set their own program (within the scope of the FSS guidelines). Group members were familiar with their main soil condition issues and were able to identify these when developing a soil plan for the project period. Members have been able to access specialist knowledge that has been relevant to them and find ways to begin to improve soil condition on a range of soil types in the Charlton area. This has led to some trialling and the adoption of practices intended to improve soil condition on members' farms over time.

Charlton farmers feel that they are making progress with improving soil condition and are managing their soils reasonably well but also feel that there is more to learn and do in this area. There is strong interest in conducting further trials and monitoring the effects of previous trials over the medium term. There is also some interest in expanding activities to cover additional soil and production related issues and practices. Financial support would need to be accessed from other programs to fund some on-going co-ordination of activities to keep the group motivated and connected. The group will be looking at other funding sources during 2014-15 to ensure some continuity in group activities including ongoing monitoring of trial sites and sharing of observations and learning amongst members.

## References

Nicholson, C., Barr, N., Kentish, P.M., Dowling, L.H., McCormick, M., Palmer, I., Simpson, K., and Walsh, J. (2003). A research-extension model for encouraging the adoption of productive and sustainable practice in high rainfall grazing areas. *Journal of Experimental Agriculture* 43 (8) 685 – 694.