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Lockington Farming for Sustainable Soils group

Review report

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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 the FSS groups. The Lockington 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 Lockington 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 endeavour 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 Lockington FSS group in the FSS.
- The legacy of the Lockington 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 (provided by the facilitator) on the activities conducted by the group and telephone interviews with 12 active Lockington group members and survey of around 25 members. The consultant also attended a dinner meeting in Lockington at the beginning of the review. 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 brief 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 Lockington FSS group (Figure 1.1). Participation in the group has exemplified all three decision stages in relation to farmers moving to more sustainable practices.

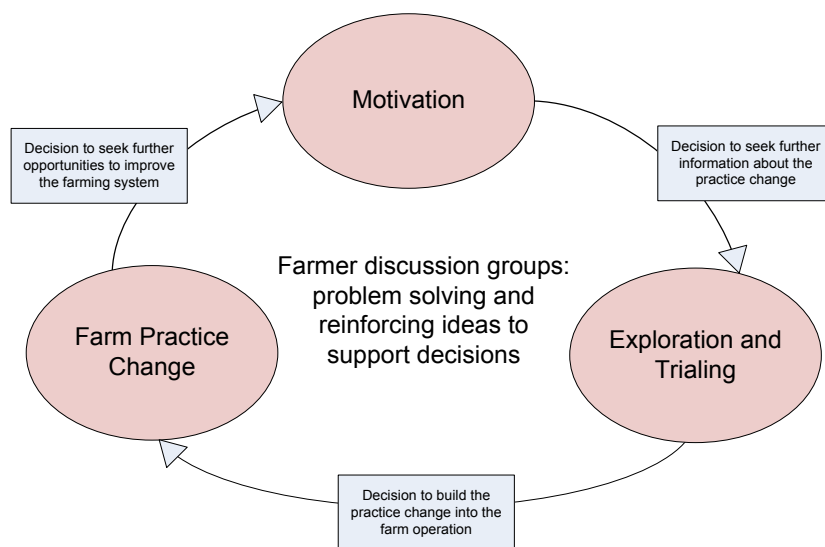


Figure 1:1 Sustainable soils group practice change model (adapted Nicholson et al 2003)

The model has three decision stages based around:

- **Motivation** (awareness) stage
 - followed by a decision to seek further information
- **Exploration and trialling** (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 Lockington FSS group was formed in 2011 following the National Soils Forum in Bendigo. The group established itself as a sub group of the local Landcare group. It comprises a diverse assembly of farmers with a good mix of ages, farm size and enterprises.

The lower reaches of the Campaspe catchment forms the main part of the group area approximating a 20 km radius of Lockington, extending south toward Hunter, east to Rochester, west to Mitiamo and north west to the Patho Plains. The Campaspe River flows through the eastern part of the group area.

The area covers plains country supporting both dryland and irrigation farming. The main dryland land use is mixed farming comprising predominantly cereal cropping, and grazing sheep for wool production and prime lambs, with some beef cattle. The predominant land use in irrigated areas is dairying, lucerne for grazing and hay production and cropping for grain and fodder.

During the 1980s and 90s the vast majority of the Rochester Irrigation district had groundwater levels less than 2 metres below the surface. There was a dramatic shrinking in the area of high water tables during the extended drought period (1997 to 2009). Reductions in irrigation water allocations in the Goulburn delivered system during the drought meant large areas of land were dewatered and perennial based irrigated pastures largely disappeared. Dramatically reduced winter/spring rainfall meant successive failed or poor seasons in the dryland areas and there was a high risk of wind erosion and soil damage over this period. The seasons changed at the end of 2009 where good rains occurred across the group area and especially high rainfall over the 2010-11 summer period caused extensive flooding.

2.2 Local soil issues

The area supports soils with a range of agricultural capabilities and susceptibilities to degradation. Farmers are looking to better manage soil compaction and surface sealing, particularly on the duplex soils. Renovating and ameliorating formerly irrigated and compacted soils is a high priority for some members of the group. Wind erosion is also a problem on the dryland cropping soils when sandy loam topsoils are left without groundcover.

The main soil associations in the Lockington area have differing permeability and drainage characteristics and therefore different suitability for irrigation, and these include: Timmering loam (most suited to irrigation), Koga clay loam (reasonably good irrigation soils), Rochester clay (less suited) and the Carag clay (unsuited to irrigation). The soils associated with prior stream channels are wide ranging; from well drained brown soils (with light and medium textured profiles) to poorly drained grey clays (Skene and Harford 1964).

The Timmering loamy soils have the lowest subsoil salinity levels and therefore have the widest land use possibilities. Areas with slower surface drainage, for example, can have high salinity levels in the deep subsoils.

All soils within the group area (with the exception of the Rochester clay) are non-calcareous close to the surface and are slightly acidic in the top horizons. All surface soils generally have low percentages of sodium, however, sodium increases with depth in the profile which can lead to low subsoil permeability and drainage difficulties (Skene and Harford 1964).

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:

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

One of the prime achievements of the FSS project in Lockington has been increasing the access for farmers to learning opportunities in sustainable soils. This has been an essential step in making progress towards achieving more stable and healthier soils. Activities have included visits to other regions, field days, workshops and on-farm demonstrations and field trials.

The main areas of achievement are described in more detail below, with examples drawn from group activities reviewed as part of this project.

2.4 Lockington group objectives and activities

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

- Conduct baseline soil condition monitoring and follow-up monitoring of changes in organic carbon, nutrients and cation exchange balance (sampling at trial sites and testing on farms) – Year 1, 2 and 3.
- Improve knowledge and skills in sustainable farming practices through training (professional training provided by guest speakers) - Year 1, 2 and 3.
- Research and trial best practice farming methods (cropping and pasture management) that will maintain groundcover, improve soil structure, build soil carbon and lead to healthier soil (extensive alternative fertiliser trials, soil structure improvement trials investigating ameliorants and soil fracturing methods, intensive remediation of irrigated compacted soils and trialling of different cover crops and soil conditioners – under different irrigation regimes) – Year 1, 2 and 3
- Undertake plant tissue testing (in conjunction with soil tests) to increase members' knowledge of crop agronomy, nutrient uptake and soil constraints to identify a broader range of plant growth and soil management issues – Years 2 and 3.
- Install rainfall and soil moisture measurement instruments for farmers to use as tools to make better pre and in-crop decisions to improve production of plant biomass/root mass and better manage groundcover to improve soil management – Year 2 and 3.

The Lockington 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 | Monitoring soil condition, results interpretation, taking samples |
| 2. Professional training, knowledge and advice | Examples: soil pit investigations, improving soil structure, managing nutrient deficiencies and chemical imbalance, climate drivers, soil microbial health, seasonal forecasting and climate models |
| 3. Cropland management and agronomy: crop walks, field days | No-till seeding, equipment set up, stubble management and erosion protection, weed management and herbicide resistance, seed varieties, plant tissue testing, crop production and management |
| 4. Soil moisture and rainfall measurement | Installation of moisture probes at 7 sites, rain gauges, Yield Prophet |
| 5. Soil compaction amelioration and fertiliser trials: gypsum, lime, alternative fertilisers, sub-surface ripping | Trialing techniques to improve soil structure, fertiliser applications and additives to ameliorate |
| 6. Irrigated and non irrigated cropping trial on newly lasered ground (coming up in 2014 summer period) | Trialing different fodder varieties, cover crops, nitrogen fixers and soil conditioners under different water regimes |

3 Survey results

3.1 Overview

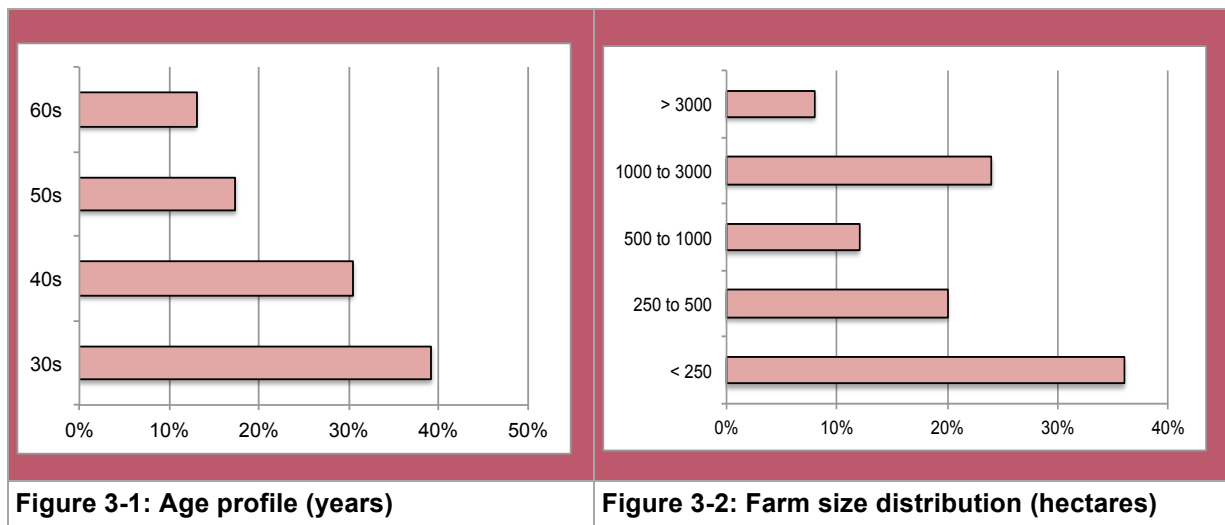
Members of the Lockington FSS group were interviewed by telephone in March 2013 and again in July 2014. Up to 12 farmers were interviewed each time. An evaluation survey was devised later in 2013 as a means of measuring the level of value that farmers and investors are getting from the program. The main findings of the farmer interviews and of a wider evaluation survey completed by 25 members are presented in the following sections.

3.2 Characteristics of farmers

Those surveyed represent a mix of farmers comprising a range of ages, farm business types and farm size.

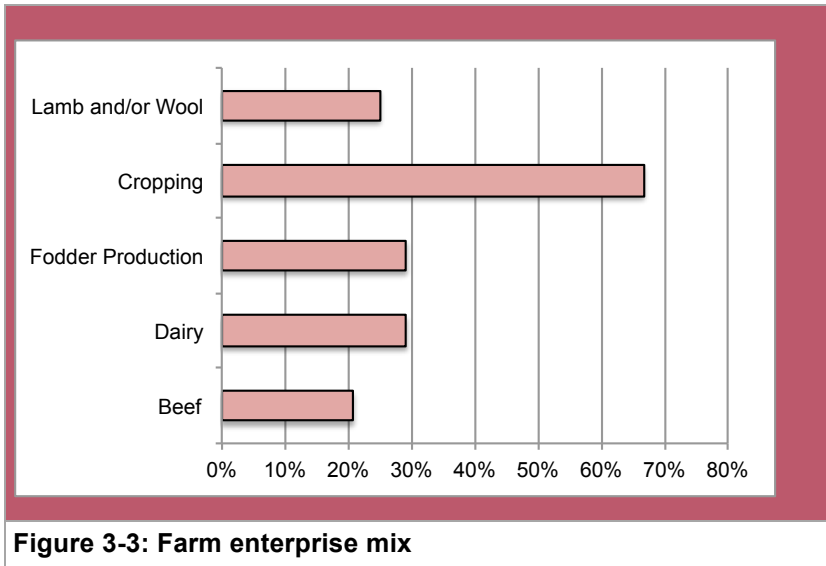
The following charts illustrate several key demographic characteristics of group members.

Farmers ranged between 30 and over 60 years of age, however the majority were relatively young farmers. They were predominantly aged in their 30s (39%) and 40s (30%), with the remaining 30% over 50 years (Figure 3-1).



A good spread of farm sizes were represented, with around one third managing under 250 hectares ha, and a further one third farming between 250 and 1000 ha, around one quarter farming over 1000 and up to 3000 ha, and just less than 10% farming more than 3000 ha (Figure 3-2). Almost three quarters of farmers expressed that they intend to increase their farm size over the next three to five years while the remaining quarter were aiming to maintain their farm size.

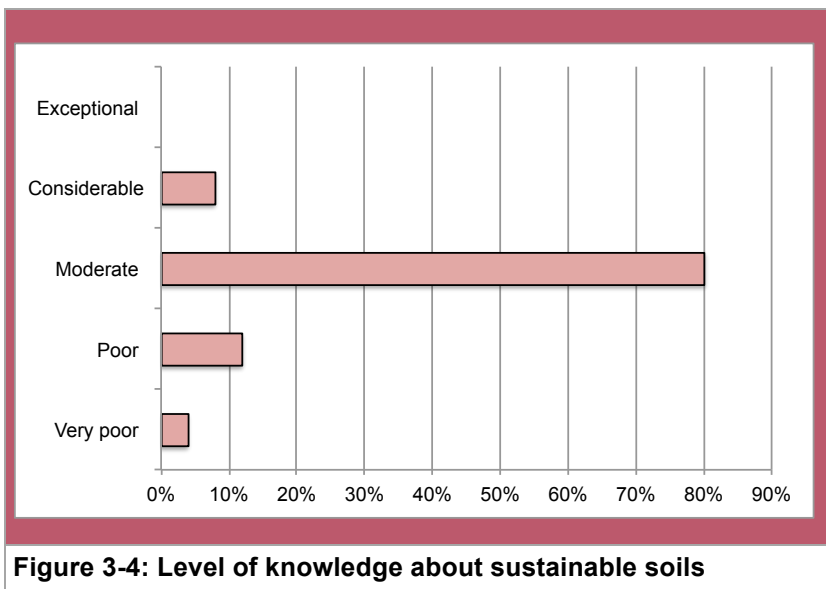
The mix of farming enterprises is shown in Figure 3-3. Almost 30% of Lockington farmers are dairying, a similar percentage are producing fodder, 67% are cropping (dryland and/or irrigated), one quarter are producing sheep (either lamb and/or wool) and 21% are involved in beef production on their farms. Cereals account for 70% of cropping production and the remainder is other crops including oil seeds and legumes. The vast majority of farmers (80%) do however grow some non cereals.



3.3 Farmer self assessment of sustainable soils management

The 2014 evaluation 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.

The vast majority of farmers felt that they had moderate knowledge on how to achieve sustainable soil management at the moment and a further 8% felt that they had considerable or high levels of knowledge. No one felt that they had exceptional knowledge and round 15% of farmers felt that they had poor or very poor levels of knowledge (Figure 3-4).



According to the earlier 2013 survey findings, around 40% of Lockington farmers reported that their soils knowledge had increased a “fair bit” after only 12 months of being in the program. A further 20% reported that their knowledge had increased “a lot” and the remaining 40% reported a small increase in soils knowledge.

Almost half of all surveyed farmers felt that their practices are likely to be sustainable for the next few years and a further 28% felt that their soils were ok for the next decade. Less than 10% felt that their practices would be sustainable for the next 20 years however the remaining 20% reported that their practices would be sustainable well into the long term and that they are restoring their soils (Figure 3-5).

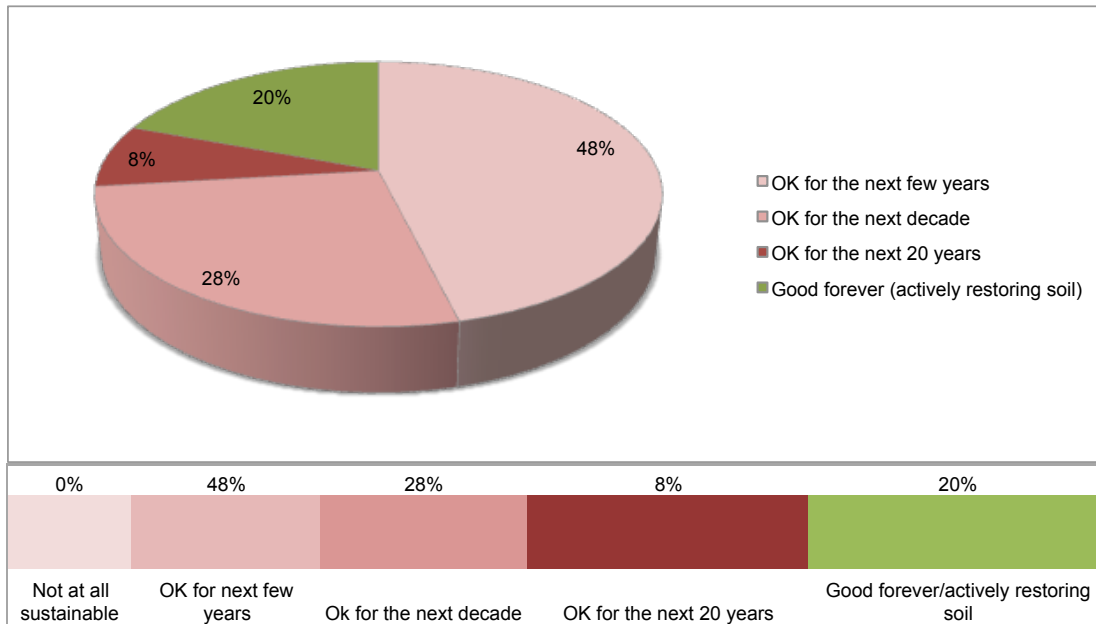


Figure 3-5: Q. How sustainable do you feel that your current soil management practices are generally?

Farmers were asked how far they had progressed in achieving sustainable soils management on their farm. Around 20% of farmers reported that they were just starting and a further 24% felt that they were getting somewhere. Around 60% of farmers felt that they were managing their soils fairly well acknowledging that they have more to do in this area, while 8% (2 out of the 25 responses) felt comfortable with where they are at. No one reported that they felt that there was nothing more to do (Figure 3-6).

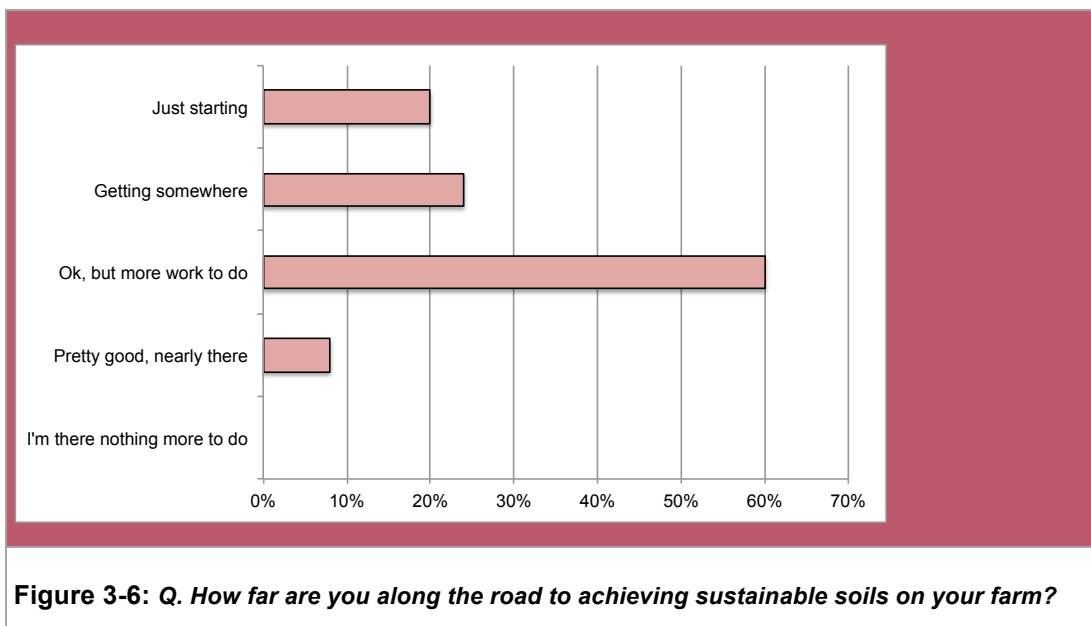


Figure 3-6: Q. How far are you along the road to achieving sustainable soils on your farm?

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 3-7. The majority of farmers were either moderately (52%) or highly (38%) satisfied with their participation in the project. This concurs with the results of the earlier 2013 survey, conducted after 12 months participation in the project with all farmers rating their level of satisfaction with the project as either high (40%) or very high (60%). Almost half of surveyed farmers have been highly motivated to undertake more trials and/or implement new approaches by the project, with a further one third moderately motivated.

Half of farmers felt that their involvement in the project moderately contributed to their understanding of soil health beyond their own farm and a further 25% felt that it had significantly contributed to their broader knowledge.

70% felt that their participation has helped them in achieving their sustainable soils management goals and the vast majority of farmers felt that there was still either moderate (50%) or significantly (38%) more information that they needed to know about sustainable soils.

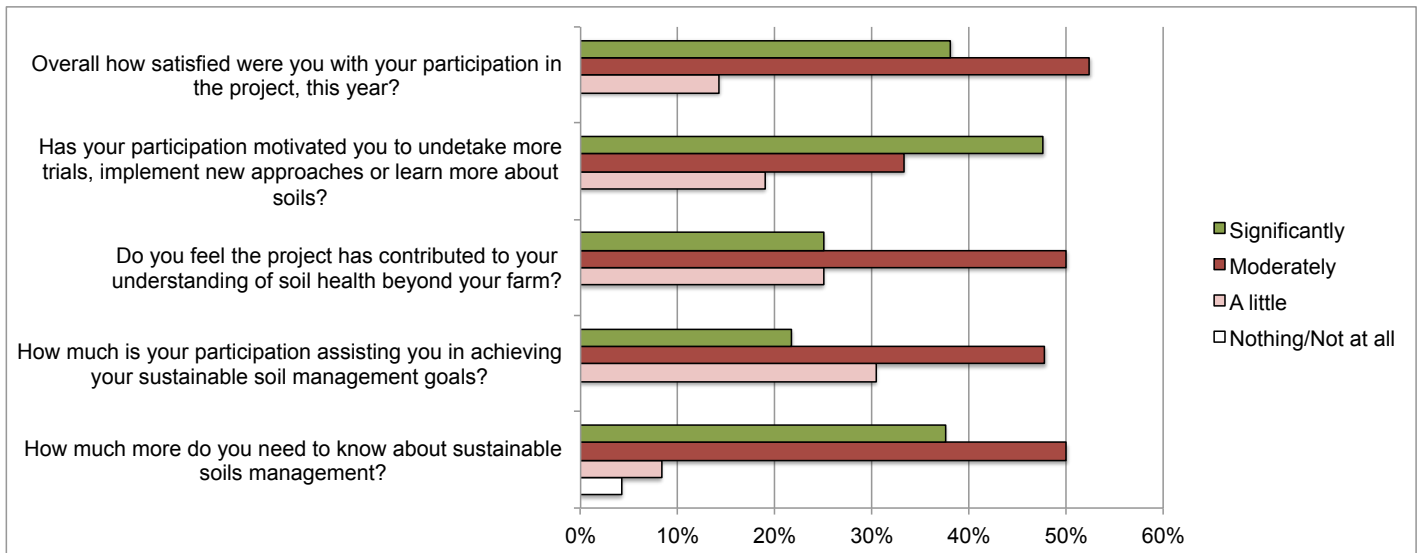


Figure 3-7: Value of the FSS project to farmers

The earlier survey, conducted after the first 12 months of the project, found moderate levels of participation in project sponsored training activities (60% had attended training activities) and this had increased to over 80% of interviewed farmers attending more than five activities by the end of the three year project. Around 80% of farmers reported that they had learnt new information about their own soils and they also 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 Lockington has been providing a means to bring local farmers together to learn about their soils and trial more sustainable practices. This has been 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. Farmers have hosted expert speakers on many aspects of soils, tillage, weed management and herbicide resistance, and improving soil structure and production on dewatered land. Farmers have also participated in the Yield Prophet program that has enabled better in-crop nitrogen and fungicide decisions, and identification of management zones within paddocks.

I have learnt so much – not only from expert talks but also from other farmers involved in the group.

A lot of the activities that are put on in the region are too generic - there's much more value in this program because we are looking at our own soil problems and its local.

Soil testing and general soil investigations through studying soil pits and discussing testing results has been valuable for farmers. Around half of farmers had not been regular soil testers and they have especially benefited and those who had done some testing previously and already use an agronomist advisor, have been reassured by the independent advice being provided through the program. The independence of the soils management advice being offered through FSS is highly valued by farmers.

We learn from our mistakes and you do wonder what everyone is doing and what mistakes they are making being part of a group helps with finding things out.

There was a lot of interest in the fertiliser trials involving sub surface ripping. Farmers learnt about the importance of being more discerning about the quality of gypsum, lime and other products. Farmers saw the value in breaking up the soil to improve aeration and plant growth, the importance of root mat in building organic matter. Several farmers acknowledged that the results of these trials are to some extent inconclusive given the need to monitor the effects of the treatments on plant growth and soil condition of over time. Similarly some farmers were also concerned about the high cost of these approaches and that the benefits would need to be monitored over time.

We had already been doing some deeper seeding to break up the soil a bit but I have been reassured that this is the right way to go so will do more of it.

Soil moisture probes and rainfall gauges have been installed for one growing season and while only one third of farmers have accessed data online and used this information to make decisions on their farm (so far), it is expected that more farmers will access this information over time. Accurate soil moisture and rain measurement will help shape local decisions that will deliver better and more diverse crops, which will also mean denser crop residues and greater soil protection throughout summer.

I will use this information to make decisions about fertiliser application and irrigation timing.

Every season is different and there's no recipe that will work all the time – you just have to take from it what fits with your farm and your soil types.

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.

Some of the practices being adopted by irrigation farmers include: laser levelling of irrigation bays, use of double cropping, opportunistic use of irrigation water when lower cost, tendency toward autumn irrigation of annual pastures rather than replacing run down irrigation perennial pastures.

Several farmers are already doing some soil amelioration work using sub surface ripping, deep banding fertilisers and other soils conditioners. Farmers expressed their concerns about the expense needing to be carefully considered when implementing these practices on a paddock or farm scale. Dairy farmers have the added difficulties associated with high stocking rates and the impact of this on their soils and their ability to manage these impacts.

Data generated from soil moisture probes has enabled several farmers to make better decisions about crop types for the coming season, capitalising on residual soil moisture by growing higher risk (and return) crops, for example.

The group will be trialing double cropping (incorporating a summer growing season crop into their rotation) of different fodder varieties, as a way of building soil organic matter and microbial activity, using the principles of not over working and keeping soils covered at all times

4.3 Future activities and the group

The three-year formal commitment to FSS for the Lockington group concludes in September 2014. Most farmers were highly satisfied with where they got to with the project after three years, at the same time all those recently interviewed felt that there was more they could do that would be of value to them.

Two thirds of farmers felt that the group would continue to function after the formal funding period concluded and that there was enough interest to seek further funding elsewhere and keep meeting at some level. There is a substantial number of younger farmers in the group, many involved in dairying, who expressed that they were very interested in learning more about soil management. Some of these farmers are not well connected into other producer group networks and have found their involvement in the FSS program extremely valuable.

5 Conclusions

Lockington farmers have increased their level of understanding of soils over the past three years. This is a relatively young group of farmers where the majority are hoping to increase their farm size and farming enterprise over the next three to five years. There is a lot of enthusiasm to learn more about soils and how to expand their businesses in a sustainable way.

Group members conduct a wide range of farming enterprises with around one third involved in dairying, two thirds are cropping and around half are carrying livestock for combinations of wool, lamb and beef production. Cropping is both irrigated and dryland and while crop production is mostly from cereals the majority of cropping farmers are growing other crops (fodder, oil seeds, legumes) in addition to cereals.

Farmers were satisfied with where they got to with the project after three years, reporting that their participation had helped them at least partly realise their sustainable soil management goals. Most farmers have been motivated to undertake trialing and implement new approaches on their own farms and all members have been reassured by having access to specialist advice through the program and that their management can improve soil condition.

Group members highly value the role of the coordinator and report that a flexible program has been delivered that has catered for the knowledge needs of a diverse group of farmers. They have gained considerable knowledge from their involvement in the group however members expressed that they want to learn more about soils and felt that they would benefit from continued connection with the group. Most felt that and that they need to keep learning new information and trial practices that will ensure sustainability of their soils long term.

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