FARM TALK

ON THE FARM
Innovative trials with stubble, pasture, compost.

SOIL HEALTH
Sub soils, monitoring and lime trials

AROUND THE TRAPS
Land health events and activities around the region
The Corangamite Catchment Management Authority acknowledges the traditional custodians of the land and waters where we work, and pay our respects to the Elders past and present.

Farm Talk is produced by the Corangamite CMA with funding from the Australian Government’s National Landcare Program.

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Cover Image: Lisa Miller presenting at a ‘Women on Farms’ event at Barwonleigh.
Welcome to the fourth and final edition of Farm Talk for the current Corangamite CMA Land Health Program.

The third edition of the publication, well received by over a thousand recipients, shared information including practical and profitable ways of improving soil health, understanding price volatility, and showcased some interesting trials on soil biology.

Agriculture is the dominant land use of the region, with approximately 3,500 diverse farming businesses operating across three quarters of a million hectares. Farm Talk aims to showcase the fantastic and innovative work being undertaken by land managers in the region to enhance our soils, water and vegetation.

This edition of Farm Talk takes a slightly retrospective look on the knowledge and management practice change in soil health we have gained in the Corangamite NRM region over the past few years and highlights soil monitoring, trials and new information.

The Land Health Program

Through Australian Government National Landcare Program funding the Corangamite CMA was supported to create a Land Health Program based on regional agricultural priorities.

A panel made up of regional farmers, industry experts, advisory and services sectors, government agencies and educational institutions created a steering committee for the program to provide strategic guidance.

On-farm trialling and demonstration sites were set up, run and monitored by farmer groups or state department research and extension officers in partnership with local Landcare networks or groups, who organised and promoted field days and events. At these events extension officers provided technical knowledge and information on progress to interested landholders.

Over five years, the Land Health Program has delivered more than 179 events with over 5,000 participants, and the partnerships have supported hundreds of farmers to adopt management practice change on over 100,000 Ha of agricultural land.

Learnings from the program have led to the possibility of extending it to other regions.

Farm Talk continues to share various case studies of farmers that are successfully improving traditional methods and those that are trying new and innovative ideas and also features some handy information on what is happening in agriculture “around the traps” through the Regional Landcare Facilitator program.

Thank you to the National Landcare Program and our Corangamite Land Health Program for enthusiastically supporting Farm Talk. I trust you find it valuable reading.

On a special note we would like to thank our outgoing chief editor Mandy Baker.

Mandy’s tireless work has led the production of Farm Talk since its inception, developing a local Landcare publication from the Upper Barwon Landcare Network into a regional periodical with an audience of over a thousand. A sincere thank-you and best wishes in your new role.

Alice Knight

Alice Knight, OAM, Chairman, Corangamite Catchment Management Authority
The Corangamite Catchment spans from Ballarat in the north to Cape Otway in the south, Geelong and the Bellarine in the east to Port Campbell and Camperdown in the west.

It incorporates a range of agricultural enterprises, land uses, communities, vegetation and river systems. There are eleven Landcare networks in the region, each reflecting the agricultural, environmental and social aspirations of their local communities.

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Brian Wilson, Mingay, regularly produces high yielding crops. He uses biological stubble digestors to help manage heavy stubble loads.
In this edition of Farm talk we look at the results and progress of a number of Farm Trials which have been conducted in the Corangamite area over the last five years in the ‘Land Health Program’

The Land Heath Program was designed to undertake trials, investigations and education focused on

- Soils (soil acidity, soil biology and understanding soil function)
- Maintaining groundcover (pasture cropping, crop and fodder options to maintain year round production)
- Grazing management

These activities were delivered through a partnership between Landcare, farming groups and agricultural industries. Southern Farming Systems, Victorian No Till Farming Association and the Department of Agriculture provided technical expertise and support.

**CASE STUDY - Brian Wilson & Craig Beazley**

**Mingay/Mt. Bute - Cropping & Sheep grazing**

**BRIAN** Wilson produces cereal, oilseeds and legumes at Mingay. Since 2003, in conjunction with Lawrie Co, Brian has developed a system of stubble management utilising stubble digesting microbes applied soon after harvest (subject to adequate moisture) to rapidly breakdown and incorporate stubble. This, combined with brown coal derived humates applied with lime, has appeared to improve his soil structure, biological activity, and increased nutrient cycling to the point where he is now often using a half rate of conventional fertiliser, and regularly achieving some of the highest yields in the district.

As Brian has now introduced this management regime over all his own farm, Brian’s neighbour, Craig Beazley, a farmer using a conventional “district practice” method of crop production, has allowed us to implement Brian’s “system”, on half of a paddock (10Ha), continuing “district practice” on the other half.

In January 2015, Brian implemented his system on wheat stubble, by spreading AmSul (21%Nitrogen, 24%Sulphur) to provide adequate nutrients for the soil microbes to break down the stubble prior to spraying with “Stubble- Tech” and “Digest Kicker” stubble digesting microbes. A lucky summer storm was perfectly timed to allow these to occur. Five days later, the stubble was incorporated using a speed disc, before raised beds were re-formed. The control paddock had the stubble header rows baled and removed prior to speed disc incorporation.

Soil testing was conducted by SCIPN (SFS) during May 2015 prior to a “biological blend” (brown coal humates) lime and gypsum being applied to the trial plot.

The plots were sown to Faba beans late May 2015 followed by wheat in 2016, with both being treated similarly. In July 2016, plant establishment, weed counts and measurements of rooting depth were taken in the growing crop, along with samples taken of the remaining stubble to be dried and weighed to assess any differences in stubble breakdown. No significant differences were observed between treatments.

Soil structure was compared by taking 5cm deep core samples from a number of sites from the middle of the beds of each treatment. The soil from the biologically treated plots was noticeably more friable - which may be explained by it having been speed disced to incorporate stubble in autumn 2015 - with the district practise not being cultivated for a number of years.
No significant yield difference was observed between treatments at harvest in January 2017. Another treatment of stubble digesting microbes was applied to the trial area following harvest in January 2017. Craig noticed that, when given the choice, sheep prefer to graze the treated stubble.

Following a wetter than average autumn 2017, barley was sown. A wet winter followed causing water logging to impact many of Craig’s crops on the flatter country, even those grown on raised beds.

Crop yields on the treatment were poor due to water logging and the impact of competition from ryegrass.

Craig observed that throughout the wet winter of 2017 drainage and weed control had a more noticeable impact on yields than any biological treatments applied.

During the autumn of 2017, the Lismore Land Protection Group established similar stubble management trials on four farms across the catchment. Craig volunteered to also host this trial, in a different paddock on his farm, which would give him further evidence of the pro’s and con’s of different methods of stubble management.

This trial, established by Rod Eldridge, Landcare Facilitator, involved the use of the biological fertiliser blend and stubble digesting microbes, but also included a treatment of stubble digestors only, and another treatment utilising the addition of extra nutrient (N,P,K&S) in the form of a liquid fertiliser. (see Farmtalk Volume 3 for a report on this trial).

Soil tests will be taken and a Visual Soil Assessment (VSA) will be conducted to determine if any long term changes in soil fertility and physical characteristics can be detected as a result of the stubble treatments (Results were not yet available at the time of publication).
CRAIG'S LEARNINGS

Craig Beazley is a mixed crop and sheep farmer at Mt. Bute. Craig grows wheat, barley, canola and faba beans, and produces prime lambs. Craig’s sheep graze his stubbles through the summer and autumn, with stubble being a valuable source of feed at this time of the year. Generally Craig shears all the lambs and grazes them on the beans stubbles to produce a heavy trade lamb by late summer or early autumn, with the ewes rotated around the other stubbles. One of the major benefits, of the use of the stubble digesting microbe treatment, is how much more palatable this seems to make the stubble, and how much more stubble the sheep eat where it has been treated. Craig has observed that given the choice, the sheep will preferentially graze the treated stubble. This has multiple benefits- it reduces stubble loads making them easier to sow through at seeding (often avoiding the need to burn), reduces the slug burden in the following crops, and provides a valuable feed source reducing the need for hand feeding. What the sheep don’t eat, they trample into the ground, speeding up the microbial breakdown of stubble. “It is better to go through a sheep than up in smoke”, says Craig.

Craig believes the benefits increasing stubble utilisation by sheep alone justifies the use of a stubble digestor, and would use this again, as long as the cost and effort of brewing the microbial mix was reasonable. In these trials, Brian Wilson generously supplied the microbial mixture, which needs to be brewed freshly before use, and requires some specialised equipment and time to do. Craig doesn’t think he would use enough of the product to justify the investment in the equipment himself, and would love to see a product which could be purchased off the shelf ready to go. Craig is interested in comparing the microbial treatment to alternative ways of increasing stubble digestability, such as spraying with molasses.

“You are never going to come up with the answer by trying just one thing” says Craig,” but we will never give up trying something new”.

Thanks to Craig Beazley for his generosity in hosting this trial and Brian Wilson for his tireless efforts and technical advice.
Bruce Bilney, Irrewarra Dairy calf rearing/beef producer

MURRAY JOHNS – SURF COAST AND INLAND PLAINS NETWORK

BACKGROUND

During May/June 2015, six plots were deep ripped and cultivated and had 2.5 t/Ha of lime and 2.5 t/Ha of gypsum applied to correct low calcium levels, with one left untreated as a control. Two plots were deep manured with 10-12Tonne/Ha of compost/chicken manure mix, two plots had the same rate of compost/manure mix surface applied, whilst two plots were kept as control (no compost/manure). The plots were then levelled and sown to one of two deep rooted perennial pasture mixes, recommended by Neil James (DEDJTR), one a phalaris/clover mix, the other tall fescue/clover. Pasture establishment was poor, with very low plant numbers of the perennial pasture species emerging, and annual ryegrass overtook the plots. A very dry spring followed, with the six treated plots cut for silage, whilst the control plot had too little pasture to be worth mowing.

In May 2016 a workshop was held with the Irrewarra Farmcare group to discuss the poor pasture establishment in an attempt to determine if this was a common problem on these soil types. Feedback from experienced local producers indicated that establishing perennial pastures on these soil types was a challenge with some producers no longer even attempting it, accepting to live with annual ryegrass as a pasture base, but agreeing that once established phalaris was very persistent and productive. The consensus was that pastures had to be sown early in autumn or not at all, and potentially the deep ripping of this soil had brought up the highly sodic subsoil to the surface preventing pasture germination.

The winter and spring months of 2016 were particularly wet, making the paddocks unsuitable for grazing but providing enormous pasture growth throughout late spring, particularly annual clover. The treatments were again cut for silage again with noticeable yield differences between treatments.

BRUCE Bilney is a dairy calf rearing specialist located at Irrewarra. Whilst located in a higher rainfall region, Bruce faces soil issues with a heavy grey/black sodosol, highly sodic (19% in the topsoil, up to 30% subsoil). Bruce has large quantities of by product farm waste available, predominantly woodchips and manure from his calf rearing sheds.

Recently Bruce has begun composting these products, producing 300-400 tonne per year, but is unsure of the best way to use this compost to get best results. Upper Barwon Landcare Network and the (then) Department of Environment and Primary Industries, began a project to place compost and chicken manure at depth (sub soil manuring) to encourage root development and improve soil structure. In 2014, the paddock became waterlogged and inaccessible prior to being treated with the DEPI sub soil manure machine. The site consists of 7, 1Ha plots, each fenced to allow for suitable grazing.

PICTURED PAGE 10: Local producers inspect a soil pit at Bruce Bilney’s property Irrewarra, May 2016
Table 1: Silage yield and feed test results of silage cut November 2016.

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>PASTURE SPECIES</th>
<th>YIELD (t/Ha DM)</th>
<th>CRUDE PROTEIN (%of DM)</th>
<th>ME (MJ/kg DM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost surface (+lime &amp; gypsum)</td>
<td>Tall fescue</td>
<td>8.68</td>
<td>3.7</td>
<td>8.1</td>
</tr>
<tr>
<td>Control</td>
<td>Unimproved</td>
<td>4.85</td>
<td>5.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Compost subsoil (+lime &amp; gypsum)</td>
<td>Tall fescue</td>
<td>7.57</td>
<td>2.3</td>
<td>8.6</td>
</tr>
<tr>
<td>No compost (lime &amp; gypsum only)</td>
<td>Phalaris</td>
<td>5.26</td>
<td>3.5</td>
<td>8.3</td>
</tr>
<tr>
<td>Compost surface (+lime &amp; gypsum)</td>
<td>Phalaris</td>
<td>6.20*</td>
<td>Not tested</td>
<td>Not tested</td>
</tr>
<tr>
<td>Compost subsoil (+lime &amp; gypsum)</td>
<td>Phalaris</td>
<td>6.88*</td>
<td>Not tested</td>
<td>Not tested</td>
</tr>
<tr>
<td>No compost (lime &amp; gypsum only)</td>
<td>Tall fescue</td>
<td>4.82*</td>
<td>Not tested</td>
<td>Not tested</td>
</tr>
</tbody>
</table>

*= estimate using no of bales/Ha@280 kg avg. 80% DM

It was noted that the crude protein levels of the silage tested were lower than would be expected of a pasture with high levels of clover such as these, and the control paddock had the highest crude protein content of all samples tested. It is thought that due to the high spring rainfall in 2016 and rapid pasture growth, the plants grew bulk but could not absorb enough nutrient from the soil to keep up with the growth rate, in effect a form of dilution occurred. This was experienced across south west Victoria during 2016.
Sodicity can be seen in the cloudy nature of water laying on the soil. The poor structure of the soil does not allow water infiltration, leading to pugging in the winter, then setting hard on the surface.

February 2017 - When dry, large cracks appear in the soil. Paddocks treated with manure and compost had noticeably less cracking.

Gypsum
Soils are defined as sodic when the exchangeable sodium percentage (ESP), exceeds 6%. Treatment of sodic soil involves the application of gypsum. Prior to application of compost on the trial site, all plots (except the control), had the traditional or district practise rate of 2.5 tonnes/ha of gypsum applied. The soils on this part of Bruce’s farm tested 19% ESP in the topsoil (up to 30% at 20-30 cm) - an extremely high level. When attempting to identify reasons for the poor pasture establishment experienced, the trial researchers raised the question of what would be the impact of higher rates of gypsum - double or triple this rate. Raw gypsum is only available from northern Victoria (although some is available from locally recycled plasterboard) making gypsum an expensive ameliorant. In discussion with Bruce the researchers decided to establish a further trial plot of higher rates of gypsum only. In 2017 another 1Ha plot was treated with 5t/ha (double district practise) and 10t/ha (4x district practise) to determine if high rates will assist the establishment of pasture such as phalaris or tall fescue.

Results
Whilst the initial aim was to establish deep rooted perennial pasture species that could access the compost/ manure placed at depth, pasture establishment has been poor. At the time of printing, soil test results are not yet available to determine if the chemical soil changes due to the treatments applied although improvements to the physical characteristics of the soil have been observed by Bruce and the researchers.

In each year of the trial 2015/16 and 17, plots treated with compost/ manure have produced significantly more grass, and had better pasture composition, than those treated with lime and gypsum only. The control plot grew the least in every year. The paddocks treated with compost experienced less pugging in winter (better water infiltration) and visibly less cracking in the summer. The surface applied compost had a better result than where it was placed into the subsoil. On the recently established gypsum trial, visual differences in pasture quality were observed following the autumn break in 2018 in line with the higher rates of gypsum.
LEARNINGS

Although many challenges were experienced throughout this trial, and the poor establishment of the phalaris and tall fescue did not allow researchers to determine any benefit from subsoil application of compost/manure, both Bruce and the researchers have learned a lot about the management of this type of soil. Bruce described the trial as “certainly a beneficial exercise”.

Some of the key learnings include:

- There is a very small window of time available to establish pasture- this soil type changes from too dry to too wet very quickly. Bruce’s advice following this trial is ‘you cannot hesitate, you must seize the moment. Take the punt and sow dry, you cannot wait for a weed germination- this requires good weed control in the spring prior.’
- Applying compost and manure along with lime and gypsum has a positive effect on pasture production- ‘you can certainly grow more grass using the combination’.
- There has been no significant benefit from subsoil application of compost/ manure over the time frame of this trial- in fact the surface application gave the best results (this may be due to the subsoil manuring machine bringing highly sodic subsoil to the surface). If the deep rooted pasture species had established, or over a longer time frame, we may have seen benefits from subsoil application.
- ‘Subsoil manuring hasn’t proven itself yet, the cost and complexities outweigh the benefits. Shallow discing (40-50 mm), after surface application of compost to incorporate, would be the easiest and most cost effective (at this stage)’.

‘Making significant improvements to this soil is a slow process’

Rennick Peries (DEDJTR) describing the soil profile and demonstrating the organic matter applied at depth in the deep manuring treatment, May 2016

ACKNOWLEDGEMENTS

This project was delivered as part of the Corangamite Catchment Management Authority Land Health Program funded by the Australian Government National Landcare Program

Thanks must be given to the host of this trial- Bruce Bilney, for the time, energy and enthusiasm given over the years- sometimes under trying conditions.

Agriculture Victoria staff- Nerissa Lovric, Neil James and Rennick Peries

Upper Barwon Landcare Network

Irrewarra Farmers Group
TROY Missen is a crop and livestock producer based at Werneth, who also leases and sharecrops a number of properties from Wingeel to Rokewood. Crop production is Troy’s main enterprise. Troy will have a go at growing almost anything, but the main crops in his rotation include wheat, canola, barley, faba beans, oats, and lupins. Soil health has always been a priority for Troy; he sees it as his most important asset. Troy has always been quick to adopt the latest practices, and refine them to best suit his farming systems.

During the 1990’s and early 2000’s, many cropping producers began to remove livestock from their systems and continuously crop their land. It seemed a sensible decision at the time - wool and sheep-meat prices were low (compared to the income from crops) - and research was showing the impact of compaction on soil health. At around the same time, the value of stubble for soil health was beginning to be recognized, with many croppers moving away from burning stubble to retaining it in the paddock. Technological advances such as controlled traffic farming and GPS guidance combined with wider row spacings allowed seeders to be driven so accurately that a crop could be planted between the rows of standing stubble from the previous crop. Adopting these techniques to work in the high stubble loads experienced by farmers in Victoria’s south west came with its own set of challenges.

In 2004, the Woady Yaloak Catchment Group, with funding from Grain and Graze, established a trial on Troy’s farm to compare different methods of stubble management. The three treatments were;

- full stubble retention without any grazing (the system Troy was implementing across his farms)
- stubble retention plus some grazing
- stubbles being grazed and burnt

**SUMMARY OF RESULTS**

**2005 to 2014**

Additional direct costs and income from crop grown on the trial site only - additional income and costs associated with running sheep on the trial was not calculated.

The key points to note are:

- Stubble wasn’t burnt or grazed every summer. The stubble was only grazed when adequate feed was available. Winter grazing was of cereals only in years when growth allowed.
- The expectation was for the full stubble retention treatment – without grazing or burning (titled “No Till”) to increase soil organic Carbon (SOC%), but when left standing (i.e. no contact with soil), SOC actually fell over the life of this trial. In line with this, conventional cropping is known to reduce SOC%. In contrast SOC% increased in the treatment that had stubble retained but grazed with sheep. It is thought that sheep trampling stubble to provide soil contact improved the breakdown of stubble in addition to what was eaten and returned to the soil through manure. Grazing actually had a positive impact on SOC%.
- Additional treatment costs include slug baiting and summer weed control. In this trial slugs had a more significant impact where no grazing was conducted.

The table below summarises the key measures monitored in the trial from 2005 to 2014.

<table>
<thead>
<tr>
<th>Key measures</th>
<th>No till</th>
<th>Graze &amp; burn</th>
<th>Graze only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times stubble burnt</td>
<td>0/10</td>
<td>6/10</td>
<td>0/10</td>
</tr>
<tr>
<td>Times stubble baled</td>
<td>0/10</td>
<td>1/10</td>
<td>1/10</td>
</tr>
<tr>
<td>Times stubble grazed</td>
<td>0/10</td>
<td>9/10</td>
<td>9/10</td>
</tr>
<tr>
<td>Ave stubble grazing days/yr</td>
<td>0</td>
<td>493</td>
<td>627</td>
</tr>
<tr>
<td>Times winter cropped grazed</td>
<td>0/10</td>
<td>3/10</td>
<td>3/10</td>
</tr>
<tr>
<td>Ave winter grazing days/yr</td>
<td>0</td>
<td>202</td>
<td>202</td>
</tr>
<tr>
<td>Total income from grain, straw ($/ha)</td>
<td>$896</td>
<td>$1016</td>
<td>$1120</td>
</tr>
<tr>
<td>Summer weed herbicide control</td>
<td>3/10</td>
<td>0/10</td>
<td>0/10</td>
</tr>
<tr>
<td>Additional treatment costs to grow crops ($/ha)</td>
<td>$44</td>
<td>$16</td>
<td>$15</td>
</tr>
<tr>
<td>Soil carbon (% OC) 2005</td>
<td>2.61</td>
<td>2.34</td>
<td>2.23</td>
</tr>
<tr>
<td>Soil carbon (% OC) 2014</td>
<td>2.37</td>
<td>2.25</td>
<td>2.62</td>
</tr>
</tbody>
</table>
This chart demonstrates the yield (tonnes/ Ha) of crop produced each year in the trial. In most years yields were not significantly different between treatments (other than 2010). In 2010 significant slug impact was experienced in the canola crop, particularly in the “no till” treatment. The ‘grazed and burned’ treatment required one baiting for slugs, whilst the ‘graze and no burn’ did not require baiting and went on to produce a 2.0t/Ha crop. Despite multiple baiting and resowing the canola in the ‘no till’ treatment was wiped out. The cost of this complete crop failure, multiple baitions, and resowing outweighs any positive cumulative yield benefit.

At the completion of the Grain and Graze funding, the Corangamite Catchment Management Authority provided resources and funding via their Land Health Program to continue the trial.

In 2008 Troy made the decision to sell all his sheep (other than some to graze the trial paddocks). This was partly to concentrate on the cropping side of his enterprise but, more importantly, he felt that the sheep weren’t helping his goal of implementing a system of full stubble retention to improve his soil health. The sheep trampled stubble, causing seeding difficulties rather than leaving it standing in rows which could be sown between, spread and buried weed seeds making them harder to treat, and caused surface compaction (a “sheeps-foot roller” is often used in road making). Troy admits that selling all the sheep went against the advice of his local Landcare Coordinator, trial facilitator and agricultural consultant Cam Nicholson, but Troy was adamant that his farming system was going to be better off without sheep.

Ten years on from the decision to sell all the sheep, Troy’s farm is quite different. Large numbers of livestock (both sheep and cattle) are traded annually and Troy is finding that when managed carefully the livestock are actually having a positive impact on the profitability of the cropping program and improving soil health, not to mention the profits that can be made. “Land around here is worth too much not to squeeze the most out of it”. A recent run of wet years limiting yield and low grain prices has meant that the cropping enterprise is not as profitable as it was. The extra income from livestock trading is a good form of risk management.

The main livestock enterprise is trading lambs. Troy aims to purchase large runs of store lambs, direct from breeders if possible, in late spring. These may
need to be held and fed in containment areas until the first crops (usually beans) are harvested. Whilst fattening lambs and cattle on stubbles for 3-4 months over summer was the initial aim, Troy is now holding them longer or trading into the more lucrative winter months by grazing winter cereals and even sowing some of his worst performing paddocks to annual pasture mixes. He is even considering breeding from some of the composite ewe lambs.

Troy has found a number of benefits from bringing livestock back into his farming system with some of his fears of negative impacts on soil health proving unfounded. Spraying of summer weeds has been reduced, although Troy is keen to stress that weed management is the most important factor and you can’t rely on sheep alone to do this. Leaving summer weeds untreated for sheep feed is something you will regret in time. Troy has found that the increasing problem of mice in crops appears worst in paddocks that haven’t been grazed - particularly evident in 2011. Sheep clean up fallen grain which removes a food source for mice, thereby discouraging them from breeding. Grain growers are often stuck with difficult to sell damaged or downgraded grain. Feeding this to livestock can turn a potential loss into a profit. For example, when water got into bunkers of stored grain, Troy wrote this off as ruined and put it down to a learning experience. But when looking for something to feed sheep between stubble feed running out and winter grazing crops becoming available, Troy found the sheep would eat a surprising amount of the damaged grain.

Slugs are a growing problem throughout the high rainfall cropping areas, but Troy has found them to be less of a problem in paddocks grazed by sheep over summer. He is unsure why but believes the (light) compaction caused by the sheep helps prevent slugs from breeding over summer. A Grain and Graze trial demonstrated this, where slugs caused the complete failure of a canola crop in a non grazed paddock. Bulk density testing of soil showed no significant compaction caused by grazing sheep. Troy said; “When you think about it, a 60 or 70 kg sheep is nothing compared to some of the machinery we use nowadays”. Sometimes what may appear a failure provides an unexpected opportunity. Last year an oat crop being grown for seed became infested with ryegrass late in the season and was going to be unsuitable for certified seed. To prevent the ryegrass setting seed, the entire crop was sprayed out last spring and was left standing until this autumn. Cattle grazed the oats into the ground this autumn, wasting very little, and put on weight at a time when there was little other paddock feed. Fattening cattle for the winter markets worked so well that Troy is considering planting a paddock of oats this year solely for this purpose. Spraying the crop in late spring effectively provided a “hay freeze”- maintaining palatability and nutrients in the straw.

Although Troy has completely changed his views on grazing crops and stubbles with livestock, he does so with caution. With a tall standing wheat stubble (to be sown into canola for example) he will only graze lightly to prevent sheep from knocking down too much straw, although with the wide row spacings (375 mm) Troy finds that the sheep tend to walk down the gaps between rows and really don’t trample much at all. Troy’s seeding plant - a 9m disc seeder with residue managers - on a 3m controlled traffic system allows (usually) successful seeding through heavy stubble loads. Troy believes the minimal soil disturbance created by the seeding discs keeps weed seeds on the surface, either reducing their ability to germinate, or having them germinate early to allow successful knockdown. Troy found the results of the CCMA/ Grain and Graze trial gave him the confidence to believe that, rather than having a negative impact on his soil health, reintroducing sheep into his farming system could be both sustainable and profitable. One of the key learnings Troy took out of the trial was to assess and monitor how much feed really was available in stubbles. Weekly weighing of sheep grazing the trial paddocks showed that although they gained weight quickly at first, once the spilled grain and maybe a few weeds have all be eaten, they can lose weight just as fast. “There is no point keeping sheep on stubble once the grain is gone, just for it being somewhere to keep them”.

1717
Knewleave Partnership
St Leonards

Aerial shot showing the extensive shelter belts on the farm
Knewleave, run by Fiona Conroy and Cam Nicholson on the Bellarine Peninsula, is an exemplar farm run along conventional farming lines. Originally 150ha purchased in the early 1980’s, the farm now has a total area of 365 ha (910 acres) + (agistment area ~ 60 ha used each summer/autumn) with effective grazing of 335 ha and with 9.0 % made up of trees and fenced off watercourses.

GOALS OF THE FARM BUSINESS INCLUDE

• To create a low labour input business that has capital growth and is sustainable and complements other off-farm activities (taxation).
• To obtain the optimum return for the resources invested, by reaching the potential of the pastures, livestock and marketing options. This has meant considerable capital investment.
• To enjoy the time spent farming.

FARM ENTERPRISES

Beef cattle breeding (Angus, JBAS 8). Self replacing, turning off steers at 15months (440 kg approx) as backgrounding for the feedlot market. Progeny test herd for Te Mania Angus. Lease Bulls and use AI.

Wool sheep (18 micron) ewes joined to Kurra Wirra rams as a self replacing flock, plus older ewes sometimes joined to white Suffolk rams.

BACKGROUND FACTORS

The property has an average rainfall of 550 mm/yr, which varies between 25 and 65mm/mth (Portarlington 607m/yr). There are virtually no frosts, with the occasional summer thunderstorm.

Calving / lambing runs for 5 -6 weeks and commences at the start of August.

Pastures are perennial based with species dominant paddocks – phalaris (Sirosa, Holdfast), perennial ryegrass (Victorian, Banquet II), tall fescue (Resolute) and lucerne (Stamina GT). Sub clover (Trikkala, Gosse, Riverina). Paddock weeds include Cape weed, barley grass and erodium, which are managed by grazing & herbicides.

Fertiliser- the average Olsen P range is 15 to 18 PPM, average Colwell K range 150 to 200 PPM (with rapid loss of potassium through leaching). Lime is applied every 8 to 10 years and Poultry manure has been used at a rate of 7.5 m3/h

Grazing average is 18.7 DSE/ha. All paddocks are grazed and spelled (~ 4 paddocks per mob). Spelling time is more important than grazing time. Sacrifice paddocks are often used (and animal conditions score) to allow other pastures to get away.

Hay/silage is cut partly as a pasture management tool, but is often required because of high stocking rates.

Accreditation schemes

• SustainaWOOL (integrity scheme for animal welfare, environment, social responsibility)
• Livestock Production Assurance Scheme (Biosecurity plan, animal welfare plan)
• Traceability schemes (EU, JBAS 8)

Landcare activities on the property include

• Land class fencing, creating 23 paddocks and laneway system, 35 km of fencing.
• Full reticulated water supply to all paddocks
• Planting of 33 ha of trees (~36,000 trees) over 20 years (tubes tock and direct seeding)
• Annual pest control program (rabbits, foxes) – baiting, shooting, fumigate, K5
• Removal of all gorse from property
• Significant active erosion gullies (stock exclusion, structures) addressed
• All waterways and drainage lines fenced off
• Ongoing vigilance with Chilean needle grass, serrated tussock, olives
**ISSUES**

The biggest issues for the farm are population increase and the ability to farm. This is impacted by Council rates and rules, stock movement across Murradoc Road, and environmental weeds. Because the property is located in the Swan Bay Catchment (which is a RAMSAR listed lake providing protection for migratory birds) it is often used by outsiders as a reason to object to practices on private land.

There is a need to operate with minimal labour input – therefore the property has all weather laneways, single person operation yards, minimal supplementary feeding if possible, no water supply problems and minimal machinery.

The farm can get very wet, so effective drainage is imperative. It is also challenging to make decisions with highly variable Autumn break and Spring.

Sheep issues include challenges to growing weaner sheep over summer, the presence of metabolic disorders with rapidly growing, highly productive pastures and tender wool (25 – 30 N/k tex caused by the break).

*Before and after shots of revegetation around a dam*

*Before and after shots of shelter belt planting*
One of the key things that I have learned is that you can run a conventional style farm business using modern technology, such as improved pasture species and adapting technologies, and still do good environmental management. We are certainly into trying to use Best Practice such as looking at pasture monitoring from space and regular soil monitoring.

There’s a bit of a re-defining momentum in agriculture at present which I find disturbing and sad, that says that if you practice conventional farming you can’t be looking after the environment. This can be distressing in that it infers that if you do a good job, you’re a rarity. There are a lot of farmers out there that are combining good conventional farm management with fantastic environmental works on farms. For example, soil monitoring of fertilizer and acidity, the targeting of lime applications and the combining of that with the right pasture species. We’ve seen a lot of improvements in terms of soils. We have deep-rooted pastures, lots of worm activity, and nutrient cycling going on that’s been achieved by using “best practice conventional farming methods”.

It’s doing stuff with attention to detail and looking at what’s happening rather than say, just put on the fertilizer every 3 years or whatever. You must constantly monitor. Both technology and attitude has helped us. I think that down the track, monitoring soil moisture for example will give us a greater insight into the soil and therefore pasture growth potential.

We are noticing that we are receiving less rainfall. I do think that the seasons are changing. If we look back at the 1970’s which were wet, there seemed to be more consistent high rainfall. Looking at the historical meteorological data, we always seemed to have Autumn’s that were unreliable, but Springs were always the same. Lately Springs are unreliable as well. That then affects the whole business. If you run high stocking rates, you must monitor things a lot more closely and anticipate where things are going, and we are currently running higher stocking rates and soil fertility levels. It’s a bit like running a sports car! It’s a bit more responsive and you need to be alert at all times. When things start to take off they can do so quickly. So as an example, you may notice pasture growth not where it was intended, so we do monitor pasture growth and plant cover regularly.

I love livestock, so I get enormous pleasure out of working with cattle and sheep, seeing them perform well and I also get enormous pleasure out of the farm environment that we have created. I’m a bit of a bird fanatic – a “bird nerd”. We were drenching cattle last weekend when some yellow tailed black-cockatoos were about, and I just had to stop work and enjoy that moment. One of the risks with farming is that you tend to do things in a hurry. You need to slow down and enjoy it. It’s when you start noticing things, possibly things relevant to the farm. It can be a bit of a feedback loop on what to do next or what not to do. For example, it can remind you that when in drought its amazing how important the farm water supply is, not just to your stock but also the fauna of the farm.
Sarah Brien, Upper Barwon Landcare Network taking soil cores for analysis.
“We didn’t realise we were not putting on enough lime and creating a subsurface soil acidity issue.”

This was a major finding in the Corangamite CMA Land Health Program as discussed by research and extension officer for Southern Farming Systems (SFS) Lisa Miller.

SFS worked with landcare networks and groups across the catchment to identify and sample 100 paddocks and establish 20 lime response trials in both crops and pastures.

Lisa said the soil monitoring in 2014 indicated a big issue with soil acidity in the top 10 cm but we were more surprised to find a similar level of acidity at 10-20 cm. Occasionally we found issues with subsoil acidity but generally soils became less acid at the depth where clay content increased.

Investigations began to understand the subsurface acidity issue which was apparent even when liming occurred.

Lisa said tucked away in old research papers, was evidence showing movement of alkalinity down the profile is controlled by soil pH. When soil is saturated with alkalinity and the pH (CaCl2) is greater than 5.5 then the alkalinity moves to the next layer.

“Where farmers had moved away from incorporating lime, any topdressed lime was working to remove acidity in the top 5 to 8 cm of soil but then it was essentially running out before it could address deeper acidity,” said Lisa.

Farmers often let their soil pH drop down too much (pH 4.5) before reapplying lime and inadvertently helped create an acid layer that plant roots and microbes don’t perform well in.

“A take home message from the project is that if you applying lime with little disturbance then to remove acidity you need to maintain surface pH above 5.5 and that means putting on more lime or more frequent applications,” said Lisa.

Farmers need to know the acidity status within the soil profile because a 0-10 cm soil test doesn’t give you the whole picture. Think of soil in layers and pH varies amongst the different layers. Differences in the layers are exacerbated when you top dress with lime because alkalinity leaching is very slow. Most of the pH change will occur within the top part of the soil as shown with 5 cm increment testing (see table 1).

In cracking clays some physical movement of undissolved lime can fall down cracks but generally after 4 years there is limited lime movement beyond 10 cm and that’s due to time, heavy textured soils and not saturating pH in the top 10 cm (see table 2).

As expected the more lime applied, the more pH change created (see table 2 next page).

### Table 1. Soil pH measured in 2018 (exception Modewarre) in nil lime plots versus topdressed lime 2.5t/ha applied in 2014 at district trial sites

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Modewarre crop (measured 2017)</th>
<th>Murroon pasture</th>
<th>Freshwater Creek pasture</th>
<th>Deans Marsh pasture</th>
<th>Rokewood pasture</th>
<th>Ballan pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nil Lime 2.5 t/ha</td>
<td>Nil Lime 2.5 t/ha</td>
<td>Nil Lime 2.5 t/ha</td>
<td>Nil Lime 2.5 t/ha</td>
<td>Nil Lime 2.5 t/ha</td>
<td>Nil Lime 2.5 t/ha</td>
</tr>
<tr>
<td>0-5</td>
<td>4.8 5.2</td>
<td>4.8 5.4</td>
<td>5.0 5.6</td>
<td>4.4 6.1</td>
<td>4.6 5.5</td>
<td>4.6 5.2</td>
</tr>
<tr>
<td>5-10</td>
<td>4.5 4.4</td>
<td>4.7 5.1</td>
<td>4.8 5.3</td>
<td>4.3 5.1</td>
<td>4.6 4.7</td>
<td>4.7 4.8</td>
</tr>
<tr>
<td>10-15</td>
<td>4.6 4.5</td>
<td>4.7 4.7</td>
<td>4.8 4.9</td>
<td>4.3 4.7</td>
<td>4.6 5.3</td>
<td>4.9 4.8</td>
</tr>
<tr>
<td>15-20</td>
<td>4.7 4.7</td>
<td>4.6 4.6</td>
<td>4.8 4.8</td>
<td>4.4 4.7</td>
<td>4.7 5.9</td>
<td>4.9 4.7</td>
</tr>
</tbody>
</table>
Table 2. Soil pH(CaCl2) change at different depths under different topdressed lime rates applied in 2014 at district trial sites.

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>2014</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Soil pH (CaCl2)</td>
<td>Control</td>
</tr>
<tr>
<td>Modewarre crop basalt</td>
<td>0-10</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>10-20</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>20-30</td>
<td>5</td>
</tr>
<tr>
<td>Murroon</td>
<td>0-10</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>10-20</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>20-30</td>
<td>4.7</td>
</tr>
<tr>
<td>Freshwater Creek</td>
<td>0-10</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>10-20</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>20-30</td>
<td>5</td>
</tr>
<tr>
<td>Deans Marsh Sedimentary pasture</td>
<td>0-10</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>10-20</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>20-30</td>
<td>4.6</td>
</tr>
<tr>
<td>Rokewood pasture</td>
<td>0-10</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>10-20</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>20-30</td>
<td>5.9</td>
</tr>
<tr>
<td>Ballan</td>
<td>0-10</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>10-20</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td>20-30</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Lisa recommends to also sample the 10-20 cm depth or sample in 5 cm increments, if you are growing acid sensitive plants like lucerne or faba bean.

“This will help to identify where your acidity issues are or to see what depth your lime has worked at,”

A formula and example for calculating lime rates is shown in the box to help farmers work out how much lime they need to treat soil acidity at 0-10cm, 10-20cm and 20-30cm if necessary.

**STEPS TO CALCULATING LIME RATES**

a. Soil test and subtract your soil pH results from your target pH. Let’s assume a target pH(CaCl2) of 5.5 and a soil test result of 4.5 e.g. 5.5 - 4.5 = 1.0

b. Divide this number by a conversion factor for different soil types: 0.26 for clay, 0.37 for clay loam, 0.47 for sandy clay loam and 0.57 for sandy loam. Let’s assume the soil type is a clay loam, therefore 1 ÷ 0.37 = 2.7 t/ha of pure lime.

c. If your soil test shows your OM% is above 2% then add an extra 0.4 t/ha. This is likely in most pastures or crop pasture rotations. The lime rate is 2.7 + 0.4 = 3.1 t/ha

Note this is for only 0-10 cm, repeat to calculate the requirement for 10-20 cm. Generally a target pH for this depth is 4.8.

Topdressing without incorporation may cause micronutrient deficiencies if pure lime(Neutralising value 100%) rates are in excess of 2 t/ha for a sand, 3 t/ha for a sandy loam or 4 t/ha for a loam to clay loam soil are used and micro nutrients are already marginal e.g. Boron, Zinc and Manganese.

If rates higher than this are required, consider split applications over a period of years or mixing the lime with a tine or disc implement.
Soil pit at Werneth with pH indicator showing a strongly acidic soil at 10 to 20 cm depth indicated by the indicator solution turning yellow and an alkaline soil at depth (purple).

Lisa Miller discusses the results of the lime response trial at Simpson with Heytesbury District Landcare Network members.
How long before we need to re-lime is a common question by farmers. One that the Corangamite CMA Land Health Program was keen to answer through soil monitoring and lime response trial work.

In 2014 and 2018, the same transects were sampled across 100 paddocks of different enterprises.

The equivalent lime application required to annually counteract the acidification from production has been calculated from falls in pH over a four year period and is expressed as kg lime/ha/year.

Unfortunately our testing revealed that the majority are not at a stage where maintenance liming is an option. They are in a recovery phase which is discussed in lessons learned from soil acidity.

Preliminary analysis of trial and paddock monitoring shows the rates of acidification in table 1 which varies according to the farming system.

Table 1. Average annual acidification rate measured across Corangamite farming systems 0-10 cm based on pH change over 4 years.

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>AVERAGE ANNUAL ACIDIFICATION RATE (Application of kg pure lime/ha/year to counteract acidity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazing</td>
<td>109 (Range 68-271)</td>
</tr>
<tr>
<td>Cropping</td>
<td>142 (Range 68-338)</td>
</tr>
<tr>
<td>Lucerne hay cutting &amp; grazing*</td>
<td>372 (Range 320-426)</td>
</tr>
</tbody>
</table>

*2 paddocks only

Locally there has been little information on acidification rates. Generally soils within the catchment are naturally acidic, however more intensive product removal and higher uses of nitrogen fertilisers accelerate acidification (see table 2).

Fortunately our soils are reasonably high in organic matter (greater than 2%) and many are high in clay content and this helps to prevent pH change (pH buffering effect). In lighter textured soils, this buffering of pH is reduced and so higher falls in pH were measured and in systems were nitrogen leaching was more likely, such as annual pastures, stock containment paddocks and annual pastures.

Legume crops or pastures can contribute to acidification if the nitrogen produced is not used up by the crop and nitrate leaching occurs which leaves behind acid hydrogen ions. For example for every 1 kg N fixed/ha that is leached, 3.6 kg of lime/ha are required to neutralise it. This is likely why lucerne crops in loamy soil measured pH falls of 0.15 to 0.2 pH unit fall per year in comparison to grain crops with pH falls of 0.05 pH unit/year.

The risk of Nitrogen leaching in soils is dependent on soil type with the highest rates likely on sands and minimal leaching on clays. Nitrate leaching will vary significantly from year to year depending on the frequency, intensity and timing of rainfall.

Ammonium based fertilisers are major contributors to soil acidification. They have an acid reaction and their use acidifies the soil even when nitrogen is fully utilised by plants (see table 3). For example a typical application of 80 kg/ha of MAP requires the equivalent of 37 kg lime/ha.

Crop and pasture plants take up alkaline cations as they grow, expelling acidic hydrogen ions to balance the soil charge. The alkaline cations are often permanently removed from the system as grain, hay or livestock. If plant material was returned to the soil, then it is slightly alkaline and counteracts any acidity.

A 3 t/ha hay crop may require at least 75 kg lime/ha to counteract product removal which is why repeated hay cutting can quickly acidify soil.
Knowing what causes acidification can help you plan to minimise it. Some ways are listed below:

- Having efficient water use by healthy well managed crops and pastures that dry out the soil profile over summer, thereby reducing potential nitrogen leaching.
- Using deep rooted perennial plants that will catch any nitrate before it leaches.
- Sowing on the break or before it, gives plants a chance to use nitrogen before it’s potentially leached which can occur with delayed sowing.
- Avoiding the use of highly acidifying fertilisers such as sulfate of ammonium and mono-ammonium phosphate (MAP).
- Post-emergent nitrogen applications are more likely to be utilised by the crop and will cause less acidification.
- The acidification caused by removing hay or silage is neutralised if it is fed to livestock in the paddock where it was made and the waste products are distributed evenly over the paddock.

Lime or Dolomite remains the best treatment of acidification. Organic amendments like composts or poultry litter are alkaline and can raise pH only slightly.

Table 2. The amount of lime needed to neutralise the acidification caused by removal of produce. Information sourced from Slattery et al, 1991 and Santonoceto et al, 2002.

<table>
<thead>
<tr>
<th>PRODUCE</th>
<th>LIME REQUIREMENT (kg/tonne of produce)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>9</td>
</tr>
<tr>
<td>Canola</td>
<td>25</td>
</tr>
<tr>
<td>Soybeans and Lupins</td>
<td>20</td>
</tr>
<tr>
<td>Grass hay</td>
<td>25</td>
</tr>
<tr>
<td>Clover hay</td>
<td>40</td>
</tr>
<tr>
<td>Maize silage</td>
<td>40</td>
</tr>
<tr>
<td>Lucerne hay</td>
<td>70</td>
</tr>
<tr>
<td>Meat (assume stocking rate of 10 DSE/ha largely set stocked)</td>
<td>30*</td>
</tr>
<tr>
<td>Wool (10 DSE/ha at 6 kg/ wool/sheep)</td>
<td>25*</td>
</tr>
</tbody>
</table>

*The meat and wool lime requirement is mainly due to net transfer of urine and dung to stock camp areas. For every DSE/ha over 10 DSE/ha add a further requirement of 3 kg lime/ha/DSE. Source DPI 2005.

Table 3. Acidifying effect of nitrogenous fertilisers and legume-fixed nitrogen.

<table>
<thead>
<tr>
<th>FERTILISER</th>
<th>N% from product analysis</th>
<th>0% nitrate leached</th>
<th>50% nitrate leached</th>
<th>100% nitrate leached</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High acidification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfate of ammonium</td>
<td>21%</td>
<td>3.7</td>
<td>5.4</td>
<td>7.1</td>
</tr>
<tr>
<td>Mono-ammonium phosphate (MAP)</td>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medium acidification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di-ammonium phosphate (DAP)</td>
<td>18%</td>
<td>1.8</td>
<td>3.6</td>
<td>5.3</td>
</tr>
<tr>
<td><strong>Low acidification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td>46%</td>
<td>0</td>
<td>1.8</td>
<td>3.6</td>
</tr>
<tr>
<td>Ammonium nitrate</td>
<td>34%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pasture legume fixed N (30 kg/ t DM)</td>
<td>30%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grain legume fixed N (60 kg/t grain)</td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>No acidification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single super Super potash</td>
<td>0%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Source Fenton & Heylar, 2002

REFERENCES

27
Maintain good soil pH to prevent production losses before a penalty occurs. This is a key message from the Corangamite CMA Land Health Program who have measured how much soil acidity affects yield.

Responses to lime were measured from 2012 to 2017 on 30 different crop and pasture trials and used to create likely response curves to soil acidity. A local lime was topdressed with minimal disturbance in 2014. The difference in yield between no lime versus lime at 2.5 or 3 t/ha which is assumed to remove most nutrient constraints provides us with a measure of production loss expected from soil acidity.

Lime is slow to move and responses are a reflection of lime ameliorating soil acidity mainly at depths to only 5 to 8 cm after 4 years.

Not all responses shown are statistically significant which is also the case for most common nutrient production response curves, but confidence is increased where the number of trial data is high.

Response curves have been generated using regression analysis.

The graphs show the cost of acidity. For example, at the Drysdale trial with a pH of 4.2, losses in yield have been recorded to reduce yield by 33% (1 t/ha) in barley, 24% in Canola (0.4 t/ha) and 16% in wheat (1.2 t/ha), equivalent to $734/ha in lost production over 3 years.

The yield penalties of acidity can occur each year and its costs can mount up especially with current prices of grain and livestock products. Lime which ameliorates acidity, costs approximately $50/t/ha spread ($150 for 3 t/ha) and lasts approximately 7 to 14 years depending on the acidification rate and can quickly pay back.

Some farmers let their soil pH levels drop to 4.5 before liming when they feel it is more likely to pay for itself, but it’s likely they will have been losing production for some time and also driving acidity further down the profile.

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**Figure 1. Wheat responses 2012-2017 results (n=16)**
The response line steepens with crops as it approaches pH 4.0. Similarly as pH increases above 4.8 there are fewer acidity impacts and the curve should start to flatten out where maximum production is achieved. Although many legumes (excluding lupins) have rhizobia highly sensitive to acidity and require pH levels throughout the soil profile of 5.2.

This is a first attempt at developing response curves which will be improved with further research. It’s likely another response curve is needed for incorporation of lime where subsurface acidity exists.

Responses to lime are difficult to measure in trials as they are impacted by season, sub surface acidity, lime movement and nutrient status.
Figure 4. Faba bean and Field pea responses (n = 5)

Figure 5. Pasture responses (n = 26)

Note: The point at 4.2 has been taken from Acidity costs calculator, which is based on SARDI SA trials.

In pastures, most lime responses have occurred in the autumn and winter period and because lime is slow to move through soil, responses are generally not seen in the first year of application.

At some sites, the pasture responses to lime were not as large as expected and this appears to be due to deficiencies in nutrients suppressing plant production, acid tolerance in perennial ryegrass or subsurface acidity.
Measuring dry matter response at the Bamganie lime trial.

Control versus Lime 2.5 t/ha at Bamganie trial. There was more clover consistently across treatments with lime which indicates a likely increase in available molybdenum.
INTRODUCTION
The injection of organic amendments into the subsoil has been promoted as a way of overcoming what is seen as one of the major impediments to improving crop yields in the HRZ of Victoria - hostile subsoils. For a number of years now, work trialling chicken manure as an amendment has been successfully undertaken however there are limitations to how widespread this tactic will be adopted. The challenges centre on supply, price and logistics/handling forcing producers to look for alternative sources of organic amendment. Eg Eco Shelter Waste, Compost, Biosolids etc. The challenge has also led to the growing of amendment, in situ, it’s harvesting and depositing underground as an alternative.

THE SYSTEM
The concept stemmed from discussion around what are the possible uses for crops grown as part of an integrated weed management system being researched in a project called Pastures in Crop Sequencing. Research in this project was revealing that there were benefits to breaking away from the traditional Canola, Wheat, Barley rotations by introducing pasture species with the goal of reducing weed seed set, fixing nitrogen and pushing out the rotation length to help combat chemical resistance. One of the sticking points, however, was what to do with the alternative crop produced in the expanded rotation. Grain is easy to deal with but silage, hay and brown/green manuring are a more difficult proposition especially in our cool climate not overly suited to haymaking whilst the value of green/brown manuring hasn’t been widely demonstrated or accepted in large scale operations.

This led us to think that there may be an opportunity to develop a system using “home grown fodders” as an amendment building on the benefits associated the sub soiling procedure using other products.

The new system would provide a product that could be readily grown on farm, assist combat other problems faced by our farmers (weeds, disease and nutrient deficiencies) and is cost effective. For the system to work we think the minimum input parameters required include:
• 8t/DM crop at around flowering
• A product that has a Carbon : Nitrogen ratio of 30:1
• A mix of cereal/legume that achieves the above levels
• A ripping depth of that penetrates the B horizon and deposits the amendment at the interface between the horizons.

From ourPCS trialling we found it was possible to grow 6-8t/ha of DM without pushing production levels (keeping costs down) with both legumes and cereals producing similar tonnages with the legumes producing higher quality and the cereals consistently more quantity. Targeting a combination of the two will achieve the desired yield and C:N ratio of 30:1.

Figure 1. Pasture species available for In situ sub soiling.
SOIL ISSUES

Hostile sodic sub-soils have been recognised as a major limiting factor to increased crop production in western Victoria’s HRZ. It has been shown that sub soiling can help alleviate the problem as can developing root channels with deep rooted perennial such as Lucerne. See Figure 2.

In a twist, as a result of examining numerous soil cross sections over the last few years, it seems that sodic sub soils can’t be completely held responsible for theoretical crop yields not being reached. Many of our soils actually have good subsoil structure and moisture levels which would enhance crop yield if accessed. The problem is many roots don’t reach the B horizon or are stunted when they get there. Many of our soils have a bleached layer at the bottom of the A horizon which exhibits poor structure and seems to inhibit root development. See Figure 3.

It is often associated with a “buckshot” layer (which sets like concrete), a lack of organic matter and water holding capacity. In dry years it stops the natural capillary action of the soil from drawing moisture from deeper down the profile further reducing crop yields whilst the clays remain damp. See Figure 4.

Figure 2. Hostile Sub soil showing remedial work. Canola Roots following old lucerne root voids through the sub soil.

Figure 3. Shows bleached layer.

Figure 4. Shows the break in moisture between horizons.
FIELD OBSERVATIONS 2014 AND 2015

Spring 2013 saw our theories put into practise with a small trial established at Inverleigh on a soil type that exhibited a hostile bleached interface between the A and B horizons.

A pea/oat mix (See Figure 5) crop was grown in situ, harvested and then positioned at the interface between the clay and topsoil layers in the spring of 2013 before a wheat crop was grown in 2014 and a barley crop was grown in 2015.

By placing the amendment in the interface between the two horizons it is hoped that a bridge can be formed between the parts of the profile that are supporting the crop, the topsoil and the clay layers below.

If a better connection can be made it is hoped that we will increase the “bucket size” by increasing the number of roots that can be seen working at depth. We have seen this occur with plants using decaying Lucerne roots to good effect. This process is geared towards replicating this occurrence. See figure 6 for example of Barley roots using decaying Lucerne roots to bridge “the gap”.

OBSERVATIONS

2014 saw a visual crop response in a very dry spring at grain fill which was very encouraging.

(See Figure 7)

Figure 5. above Standing Pea/Oat mix
Below Product ready for injection.

Figure 6. Decaying Lucerne root being used by barley roots to access deep clay layers.
2015 saw a similar visual response at two newly established sites in an even drier finish (no rain in October). The barley at the initial site showed greater vigour and crop biomass up until October then it basically “stopped’ leaving the Nil treatments to run up to head and the treated plots to simply die.

When we looked underground we found considerable differences in root development. A lack of root growth and bleached layer penetration was clearly visible away from the amendment chamber. (See Figure 8)

Interestingly root development above the chamber in the bleached layer and interface between the horizons was enhanced with roots clearly tracking towards the amendment. Also the amendment that had been down for two years was still quite visible physically holding open the interface and bleached layer. Roots from the crop above seemed to be encouraged to migrate towards it.

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FarmPlan21

Expression of interest
“A sound investment of time”

Update your whole farm plan or create a new one

Identify options to improve farm productivity, sustainability and resilience to climatic variation. Free mapping software is provided to develop a digital map of your farm.

The course covers:
✓ Vision and goal setting
✓ Soil productivity and soil health
✓ Land capability
✓ Farm water supply
✓ Grazing and pasture management
✓ Risk management
  (e.g. climate and fire)

Courses can be tailored to suit your needs.

Cost: $150 per property/business
Lunch provided

Course length
Four or six sessions run one day a week (9.30am – 3.00pm) for 4-6 weeks. Some session involve visits to local farms, others involve guest speakers and presentations.

Expression of Interest
Nerissa Lovric
Nerissa.lovric@ecodev.vic.gov.au
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In the beginning, we came out to our property in Wurdibuloc from town with no experience and no appreciation of the complexities or challenges that are faced when coming on to the land. The advantage of the FarmPlan21 course was that it helped me identify and think about all those things, things that in fact I didn’t even know about. There are challenges around water, around weed control, challenges around soils, you can name a whole bunch of things, the animals, animal husbandry.... There are all types of issues and challenges that all landowners really must face.

We had no background to go back to, or anybody with experience to solve some of these problems. The beauty of FarmPlan21 is that it provides a structure in which to think about these things and strategies to tackle them without spending a fortune or making a great string of mistakes first. It allows you to zero in and plan strategies.

The Farm Plan 21 course helped us to make a plan for the property which, as the term suggests, gave us direction on what to do. This included making planning decisions such as water infrastructure, linking infrastructure, how many tanks were needed and where. We needed to think about fencing and where we needed them rather than just drawing straight lines across the property. We learnt about land classification and the best way to divide up the property. In our case we fenced off a few acres of trees. We put in some fences along traditional fence lines but others were planned to link vegetation to create farm corridors and even just to control water flows across the property.

We actually completed the course a second time a few years after the first. The first time, approximately two years into owning the property, was all very much about broad decisions of what we were going to do and, as we did not have farming background, basic information. The second time we discovered a whole heap of other issues had cropped up that we were looking to resolve.

We had the opportunity to go back and look at all the body of experience we have gained and relook at the basic structures that we had implemented from the first time. With more experience it starts to make a lot more sense and you sort of fill in the gaps you missed in the first place – it’s a new level of understanding. It’s not just about re-reading the course material, it’s about going back and getting a better understanding of what that information was about and saying, “I now know what this is talking about, I now know what really are the challenges and I can now apply a solution.” The first time was about the theory, and the second was the practice.

It would be useful to extend the course by providing mentoring. It would be good to have local experts from The Dept of Ag coming out with a good agronomist who could make suggestions or ask, “have you considered this, or that.” To give a little bit more on farm practical advice could be helpful.
**FARM BIO SECURITY**

Australia’s red meat industry is worth $28 Billion a year to our economy. One of Australia’s competitive advantages in the world is our reputation for clean and healthy livestock. It has been estimated that a minor Foot and Mouth disease (FMD) outbreak could cost our industry $50 Billion over 10 years. On farm biosecurity is something all livestock producers need to be aware of, to protect our own interests, and our industry as a whole.

Farm biosecurity isn’t rocket science— it is mostly just common sense. Having a farm biosecurity plan is now a requirement to be a part of the National Livestock Identification Scheme (NLIS). It doesn’t have to be complicated, the key point to remember is; “control what you can, document what you can’t”.

Some of the key arts of a farm biosecurity plan include:

- **Inputs- feed and water**: do you know what is in the feed you have purchased? Does it contain weeds or restricted material, chemical withholding periods etc.? Buy from trusted suppliers and ask for a Commodity Vendor declaration.

- **People, Vehicles and Equipment**: are they clean and free of weed seeds before entry to your property? If possible, offer to use your own vehicle. In some cases this will be impractical e.g. Powercor trucks, fertiliser spreaders, so record who and when. Implement entry and exit procedures (e.g. gate signs with your phone number).

- **Production practices**: record animal health treatments (vaccination, drenching etc.) with date, dosage, product name, batch number, expiry date, WHP/ESI etc (you can take a photo of the label with your phone). Use individual animal ID to allow recording of treatment, illness etc.

- **Security**: Have secured boundary fencing, record any stray animals on your property.

Quarantine purchased livestock (for up to 3 weeks), and check for signs of ill health.

As part of the LPA/ NLIS scheme you may be audited (and you will be eventually). This is a simple process to ensure that you have a farm biosecurity plan and to assist you to make it work.

**ELECTRONIC ID AND NLIS**

Land managers need to be aware and prepared for the introduction of sheep/goat electronic tagging.

All livestock producers (including alpacas, horses and over 100 chooks) will need to have a PIC (property Identification Code) number. Time frame for the roll out is;

- **31st March 2018** – Saleyard scanning commencing and property to property movements recorded.
- **1st January 2019** – tagging commences for stock that’s come from interstate and any animals born after 1/1/2019
- **1st January 2022** – all sheep and goats in Victoria must be tagged with EID tags.

Your legal obligations for cattle and as of 31/3/18 for sheep or goats are

‘Property to property movements of electronic NLIS tagged livestock must be recorded on the NLIS database by the person receiving the livestock, within 48 hours of the animals arrival onto the property.’

- Property to property movements must be recorded on the National Livestock Identification System (NLIS) database, this is protecting you, your property and your industry.
- If you own more than one property, including if they are in adjoining shires, the properties can be linked by their PIC – this takes away the need to record stock movements on the database. If the properties are not linked, then all stock movements must be recorded.

- A National Vendor Declaration (NVD) is a form that is generated by the owner/person responsible for the dispatch of stock to a property with a different PIC – including direct to an abattoir.

- Private sales e.g. advertised on gumtree or neighbour to neighbour still need a NVD and to be recorded – the buyer or receiver of the stock must record the transfer or engage someone else to do it e.g. their stock agent.

- Sales through livestock selling centres (saleyards) or public auctions, the seller provides the NVD and the saleyards/livestock agents complete the NLIS transfers.

- Setting up your own account on the NLIS database allows you to easily complete your own transfers and reconcile your tag numbers.

- It is the responsibility of the purchaser or receiver to record livestock movements on the NLIS database within 48 hours of arrival onto the property (or engage someone to do so e.g. stock agent). Details to include:
  - Property PIC number
  - Total number of head
  - NVD serial number
  - Apply 1 EID tag only in the right ear (Cattle), either ear for sheep and goats. The year colour is not important as long as they are tagged. Apply post breeder tags for livestock not bred by the owner.

- MyMLA, a Meat and Livestock Australia initiative gives you a single log on/sign in for key integrity and information systems
  - National Livestock Identification System NLIS
  - Livestock Production assurance LPA
  - National Vendor Declarations NVDs
  - Livestock Data Link LDL

Of course, these days there is an app for everything, the NLIS database is no different. Most commercial scanning wands have an app put out by their manufacturer that will link to the scanner, record your tag numbers and be used to complete a transfer on the database.

**To find out more**

NLIS database help desk phone 1800 654 743
email: support@nlis.com.au or
website: www.nlis.com.au

Agriculture Victoria NLIS helpline
phone 1800 678 779
www.agriculturevictoria.vic.gov.au

NVD hotline 1800 683 111 or lpa@mla.com.au

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BACKGROUND

The use of compost as a soil ameliorant for agriculture has been documented since early Roman times. More recently, home gardeners have produced compost from garden and household waste as a method of improving garden soils, particularly for vegetable production. The benefits of compost have been recognized by home and market gardeners as a method of improving soil structure, adding organic matter, improving water infiltration and water holding capacity and, to a degree, providing essential nutrients for plant growth and increasing soil microbial activity. All these soil health benefits are also of value to broad-acre livestock and crop producers in Australia, improving the productivity and resilience of soils used for agricultural production on a much larger scale. Compost is relatively low in available nutrient compared with manufactured fertilizer or straight animal manure. Large quantities of compost per hectare would be required to provide adequate nutrition for crop or pasture production or to achieve soil structural changes. Where a backyard garden might be 10 or 20M2, and even market gardens in the few hectares, broad-acre cropping and grazing properties in southwest Victoria range from the hundreds to thousands of hectares- how would it be possible to produce enough compost at a low enough cost to apply to even a portion of this land?

To produce compost, two main forms of product are required- a source of carbon, and a source of nitrogen, in the ratio of 25-30 parts carbon to 1 part of nitrogen. The actual sources of these products are not important- the composting process will break down fiborous carbon sources, but it needs to be readily available to the location where the compost is to be made as large quantities are required and
at low cost. Many industries including agriculture, timber and food processing, produce large quantities of waste suitable for compost production. Around the early 2000’s commercial companies in the south west of Victoria began to emerge to develop a method of compost production utilizing waste products from the dairy industry. In the high rainfall dairy region of southwest Victoria many dairy farmers were beginning to question the high rates of use of artificial fertilisers and were looking to try a more holistic approach to soil health on their farms. Initial results from broad-acre use of compost produced off farm were positive, and as interest grew, methods were developed to produce compost on farms. Dairy farms often have spoiled or waste hay and silage and a nitrogen source in dairy effluent - all the ingredients required to produce compost.

**GREEN WASTE COMPOST**

After around a decade of increasing compost use by south western Victorian dairy farmers, the positive results achieved for broad-acre compost use became known. Crop farmers and graziers in the greater Geelong region became interested in trialing compost but generally didn’t have the same access to raw materials as dairy farmers. Urban councils provide a green waste collection service for residents - some of which had been used as mulch for gardens but much of which was dumped into landfill. Landfill sites near urban areas are becoming more difficult to establish and existing landfills are rapidly filling, so the dumping of large volumes of organic waste was not ideal. The anaerobic breakdown of organic waste also produces large volumes of methane - a potent greenhouse gas. Due to these issues, some urban councils began to investigate the composting of organic waste. Different methods of large scale compost production were trialed with limited success. Using techniques perfected by the south west dairy farmers, some farmers and a commercial company began to trial on-farm compost production. Urban green waste was the major carbon source with waste products from food processing as a nitrogen source. Whilst the Geelong region farmers may not have had access to the raw materials on farm, they were located close to the source - a huge benefit as the products are generally bulky and transport can account for a large part of the cost.

In 2014, the Corangamite Catchment Management Authority, as part of the National Landcare Program, engaged the Surf Coast Inland Plains Network to investigate the growing use of organic waste compost by landholders near Geelong.

**WHY USE COMPOST?**

There are a number of reasons farmers in the greater Geelong region give for using compost. These fall into 4 main categories:

- **Reducing reliance on chemical fertilizers** - Many felt that they seemed to be using more and more chemical fertilisers to achieve the same level of production and this was unsustainable in terms of soil health, environmental impact, and the depletion of finite resources such as phosphorous and potash

- **Improving soil structure** - increasing carbon, water and nutrient holding capacity

- **Improving soil microbial activity and nutrient cycling** - potentially unlocking nutrient tied up in soil

- **Organic farming**

*Compost can provide many benefits to your soil*
How is compost made?

Compost requires carbon, nitrogen, water and oxygen. When combined in the correct ratios, naturally occurring microorganisms will break the carbon source down into hummus, exuding heat in the process - temperatures of up to 70°C are common. Regular monitoring is required to ensure adequate moisture is available and turning the compost regularly is required to incorporate adequate oxygen. If either moisture or oxygen levels fall too low the composting process will stop before it is complete.

Compost requires 25-30 units of a carbon source for each unit of nitrogen, this is the bulk of the raw ingredients required. In the Geelong region, urban organic waste is readily available, but other sources that have been used are woodchips, sawdust, stable straw and reeds removed from waterways. These products need to be available at low or no cost to make the compost affordable. Nitrogen can be sourced from animal manures, or if close to a processing plant, food processing by product. Moisture levels of the inputs often are adequate, but during the summer months or if the source product is dry, may require water to be added.

Make or buy compost?

Farmers thinking of using compost need to consider if they will purchase the completed product, make the compost themselves on farm, or pay a contractor to make it on their farm. Having ready made compost delivered is the simplest option but as most producers in the Geelong region are using rates of 5-10 m³ / Ha or more consideration needs to be given to the transport costs involved. If a producer wants a few truckloads as a trial this is the simplest option. There are a number of companies in the Geelong region that have compost available for purchase but it is best to

Ingredients such as sawdust, manure and food processing waste before mixing and rowing up.

FARM TALK
order some months in advance to ensure it is available when you require it. Most complete composts contain around 30% moisture so if you are purchasing compost by weight be aware that you may be paying for water.

When large quantities of compost are required it is best to make it on farm near to where it is to be spread. Farmers can make compost themselves if they have a suitable site and access to a front end loader and can source suitable inputs. Using a front end loader to turn rows is adequate but labour intensive. Making the compost in rows 2-3m wide and up to 2 m high mean it can be turned using a specialised compost turner making the process quicker and easier. There are a number of agricultural contractors in the Geelong region with compost turners available for hire.

Commercial companies will make compost on your farm for a fee. These companies will source and deliver the product, row it up, monitor temperature and moisture levels, turn it regularly, and finally screen the finished compost ready for spreading. These companies often have contracts with municipal councils and food processors to take all of their waste products suitable for compost production meaning it can be difficult for a farmer to source these products independently. Using one of these companies to make compost on farm is the most common way Geelong district producers source large quantities of compost.

ISSUES TO CONSIDER — PROS AND CONS

• What is the nutrient content of compost? Can it supply adequate nutrient for my pasture?
  Unlike conventional fertilisers, compost varies in its nutrient analysis and can vary from batch to batch. Before using compost ask for the test results. Remember that compost when ready to be applied is usually around 70% dry matter by weight i.e. 30% water, so calculate the rate required accordingly.

• Composts contain a much lower concentration of essential nutrient than conventional fertilisers.
  A number of samples of Green waste compost used by farmers in the Geelong and Surf Coast region over the past four years were tested for their chemical composition at a reputable soil testing lab as part of this project. Analysis of this green waste based compost found the major nutrients to present to range between
  0.9 -1.9% Nitrogen
  0.3-1.5% Phosphorous
  0.6-1.8% Potassium

• Ensure the compost you use is “mature”-i.e. it has completed the composting process and is no longer heating when turned or stockpiled. Immature compost can actually draw nitrogen out of the soil when applied, resulting in short term nitrogen deficiencies.

• Compost takes much longer to release nutrients to plants than conventional fertilisers. Only a small portion of the total available nutrient is readily available to plants. Typically only 5% of nitrogen, 50% of phosphorous, and 70% of potassium is available to plants in the first year after application. Many producers mix compost with chicken or pig manure to increase the rate of readily available nutrients.

• When the DM% and nutrient availability are taken into account you may find that high rates of compost are required to supply adequate nutrient for efficient plant growth. The cost of transport and spreading of high rates can be significant. If large quantities are to be used try to make it as close as possible to where it will be applied to reduce transport costs.

• If making compost on-farm, choose the site carefully. Large volumes of raw product need to be delivered by large trucks requiring appropriate access, and tractors and loaders will need to regularly turn the compost. Ensure the location has all weather access and is located so that any runoff from the site does not impact waterways or sensitive areas. At the beginning of the composting process there may be unpleasant odors produced. The EPA has regulations and guidelines for on farm compost production www.epa.vic.gov.au/our-work/publications/publication/2017/june/1588-1
• Compost made using municipal green waste can contain many types of plant and weed seeds. If correctly made the compost should heat to a temperature adequate to pasteurize these seeds but regular observation should be made around the composting site, or following application, to ensure weeds are not introduced onto your property. There is an Australian Standard for compost (AS4454) which includes protocols such as evidence that the compost has reached appropriate temperatures to ensure seed pasteurization. If purchasing compost request evidence that it meets these standards. Most herbicides and pesticides that may be present on organic matter will be broken down during the composting process but some persistent herbicides such as Picloram may survive the process and remain active in the completed compost.

• People put all sorts of things in municipal green waste bins other than organic matter. Plastic bags, string ties on bundles of waste, rocks and glass are all common contaminants of municipal green waste. Most producers finely screen compost prior to delivery or spreading which removes most of the larger contaminants, but if making compost on farm plastics may blow out of compost rows creating littering issues.

• Waste products other than green waste may contain soluble salts or heavy metals which do not break down during the composting process. Regular and high rates of application may cause an increase of these compounds in soil. If possible, request evidence from your supplier of the levels of these compounds in the products used.

Further reading:
Applying second dairy pond effluent after your silage cut will replace valuable nutrients and boost pasture regrowth.

Local Agriculture Victoria trial work found when second pond effluent was applied after a silage cut, pasture growth was increased by between 0.9 tonnes DM/ha and 2.7 tonnes DM/ha.

Second pond effluent is a valuable source of nutrients, especially nitrogen and potassium. Most farms have a large amount of these nutrients sitting in their second effluent pond, ready to be spread and benefit silage regrowth. As we know harvesting pasture removes a large amount of potassium, so why not apply effluent to your silage paddocks to increase regrowth and replace nutrients? The nitrogen in the effluent will also give the pasture a good kick along. Applying effluent to actively growing plants will ensure the greatest benefit, so silage regrowth is ideal.

It is best to test the effluent prior to application to assess the nutrient levels and to help calculate application rates. The Dairy Australia Nutrients and Sludge Calculator can help determine appropriate application rates. It can be found on the Dairying For Tomorrow website www.dairyingfortomorrow.com.au Remember second pond effluent is often high in salt, so this needs to be taken into account and paddocks monitored with regular soil tests.

Along with the potentially high salt levels, the high levels of nitrogen mean that plants should never be germinated with effluent.

Following any effluent application it is important not to graze for at least three weeks. This allows the plant time to take up the nutrients, reduces the risk of pathogens and nitrate and also allows enough time to reduce palatability issues associated with the application. It is advised not to graze late pregnancy cows or freshly calved cows on effluent application paddocks. It is also recommended that young stock not be grazed on effluent application paddocks to avoid animal health issues.

If it isn’t practical or you don’t want to use the effluent on silage regrowth paddocks, then starting thinking of a plan as to how you are going to utilise the resource you have. Another way to make efficient use of second pond effluent is applying to summer fodder crops (single or multiple graze crops). If applying to multiple graze crops the application of effluent can be split, the first in the rapid growth phase of the crop and the second after grazing. If used on a single graze crop then the whole application should be applied in the crop’s rapid growth phase. Similar principles apply for application and withhold periods.

For more information please contact Rachael Campbell, Agriculture Victoria, Ballarat on 03 5336 6868 or rachael.campbell@ecodev.vic.gov.au

Travelling irrigator spreading effluent in the field
‘Real Eggs’ free range farm visited on a tour by Lismore Land Protection Group

Slow feeding station; part of a ‘Paddock Paradise’ system visited as part of the Horse Property Design Field Day
SHARI MCCONACHY – Lismore Land Protection Group

The Lismore Land Protection Group took farmers on a bus trip at the end of June 2018 to the North Central CMA region to Daylesford and Hepburn Springs area. Each year Lismore Landcare organises a bus trip to give people the opportunity to see first-hand the innovative and sustainable ways people manage both our agricultural and natural resources. As well as fitting in a lot of informative visits on these trips we always leave room for the fun things. The trips are important for our region not only to encourage the transfer of knowledge but for the health and wellbeing of our farmers. The trip ran over 3 days / 2 nights with accommodation at Linga Longa Cottages in Hepburn Springs. An outline of the itinerary includes:

**Real Eggs** – A 2000ha Merino sheep property which diversified their business to include 10,000 hens run in ‘open range’ farming to improve soil and pasture health [www.realeggs.com.au](http://www.realeggs.com.au)

**Jonai farms** – a family farm run on just 69 acres who focus on the ethical treatment of animals [jonaifarms.com.au](http://jonaifarms.com.au)

**Glenlyon Landcare** – a community project to create a walking trail along the Loddon and restore riparian vegetation along a section of the river

**Blampied – Kooroocheang Landcare** – a seed collection project to protect and collect seed from one of the last known pockets of Snow Gum

**Powlett Hill** – a 1200ha family sheep and cropping farm who switched from conventional farming to bio-dynamic farming [www.powletthill.com.au](http://www.powletthill.com.au)

The bus trip is supported through the Corangamite CMA’s Regional Landcare Facilitator program.

Three horse properties near Lake Connewarre, south of Geelong, recently hosted a group of enthusiastic horse owners interested in learning about different property designs and horse-keeping systems. As two of the properties had been designed with both horse health and land health in mind it provided a great opportunity to discuss some of the environmental implications and challenges of keeping horses on small acreages. The different designs included:

- **A ‘Paddock paradise’ system;** This 3.7 acre property has an electric fence laneway / track around the paddock boundary. There are slow feeding stations and watering points for horses along the track. Keeping horses restricted to the track as a sacrifice area allows paddocks to be rested to better practice grazing management of pastures to reduce soil erosion, and horses can also undertake normal horse behaviours including exercise. The regeneration of native vegetation has been protected through electric fencing.

- **An ‘Equicentral’ system;** The design of this 4 acre property has been based on a horse keeping concept where a central surfaced yard with one watering point is connected to several grazing paddocks. Horses can be kept as a herd with only one paddock being grazed at a time, so that rotational grazing can be practiced. This design aims to maximise ground cover, reduce bare ground and reduce weed infestations.

- **A traditional layout;** This 4 acre property has individual paddocks with watering points, paddock shelters and pasture in each.

The event looked at what works well and discussed management challenges and benefits with property owners. Over 20 people participated in the day which was a partnership event with the Surf Coast and Inland Plains Network, Connewarre Landcare Group, Connewarre and District Riding Club and the Corangamite CMA Regional Landcare Facilitator program.
Cultivate Agribusiness Central Highlands hosted a thought provoking ‘Ag Conversations’ evening with acclaimed author and NSW sheep farmer Dr Charles Massy, author of “Call of the Reed Warbler - A New Agriculture - a New Earth”. Regenerative farming was discussed with Charles, Stephanie Russo, the Associate Director Natural Value, NAB; Andrew Stewart and family from Yan Yan Gurt West Farm and Otway Agroforestry network; along with Andrew Gray, a Landcare facilitator supporting regenerative farmers from Central Otway Landcare Network. Over 50 people attended the event at the Mount Rowan Farm Campus of Ballarat Grammar. The event was supported by the Corangamite CMA’s Regional Landcare Facilitator program.

**DR CHARLES MASSY**

*Call of the Reed Warbler: A New Agriculture - A New Earth*

‘Charles gained a BSc in Zoology at ANU (1976), before going farming and developing a prominent Merino sheep stud business (Severn Park). He still manages the family’s grazing property in NSW while teaching at universities and consulting in the fields of Merino breeding and landscape design.

He has chaired and served as a Director on a number of national and international review panels and boards of business, research organisations and statutory wool bodies, involving garment manufacture, wool marketing, R&D, molecular genetics and genomics. Charlie has engaged in freelance journalism since 1977, and has published books on Merino sheep history and the political destruction of the Australian wool industry.

His concern about land degradation and the Anthropocene crisis led to him completing a PhD in Human Ecology (ANU) in 2012. This resulted in his new book, *Call of the Reed Warbler: A New Agriculture – A New Earth* (UQP Sept. 2017) concerning the emergence of a regenerative agriculture in Australia and cause for hope.’

Charles’ personal story began when despite a love of nature, he realised his landscape management was working against these ideals. The 1979-83 drought was a turning point where he discovered he could do things better. He started replanting lost native vegetation and other activities to help heal the land in a time of stress.

During the time of running an innovative Merino Stud, Charles noticed many of his early adopter clients across six states were also early adopters in regenerative agriculture. He began to ask why they had changed their world view.

As he became more and more involved in this new approach to land management, the decision was made to go back to university and do a PhD examining transformative change in such farmers.
If you look around at agricultural field days, you’ll be most likely met by a sea of men and very few ladies. This is despite 50% of the population being female and women often playing a significant role on the farm.

This observation has provided a great opportunity to involve women on farms more in farming related extension activities, as another mind to proof decisions, eyes to pick up things that are amiss and a fresh perspective to improve farm business efficiencies. Landcare event participation feedback has shown that a key barrier to women’s involvement in agriculture is confidence in their knowledge. There is a willingness to learn and often greater fundamental understandings than they give themselves credit for. The ingredient missing is a space to iron out some questions and have their exciting understanding affirmed by someone from off-farm.

Southern Farming Systems, together with the Corangamite CMA’s Regional Landcare Facilitator program, developed a pilot program called ‘Women on Farms’ to work to better support rural women in the catchment. The pilot program consisted of a series of four technical workshops that were delivered to two groups of women over twelve months, one in the Woady Yaloak Catchment area and the other in the Geelong Landcare Network area. Throughout the four workshops, participants had opportunity to connect with other women on farms and industry experts on a range of topics. Each workshop had a theory and practical component, with an emphasis on group discussion and answering questions. The workshops aimed to provide a technical starting point for women to either brush up on knowledge they already possess and create a space to learn new information about mixed production systems.

The ‘Women on farms’ workshop series pilot program has been designed so that is replicable; meaning that it can be delivered by Southern Farming Systems in other regions. This has since occurred with the program now being delivered in our neighbouring Glenelg Hopkins CMA.

The program has been very successful, attracting new participants, with 70% of participants not previously members of Southern Farming Systems, and over 50% were not members of Landcare.

Topics have included soils, climate change, pastures, crops and livestock production.
Wild space play grounds are gaining popularity for children to spend more time in play areas made from natural materials, creating an atmosphere of a wild space as children interact with each other and their environment.

Otway Agroforestry Network member, Nic Theodore, was contracted by the Lorne kindergarten to build a wild space playground. Nic used thinnings from a sugar gum (Euc. cladocalyx) seed orchard, which also acts as a shelterbelt to protect livestock, soil and pasture. Sugar gum is an ideal species for a wild play area as it is durable and strong with a density of about 1100 kg/m³.

When the seed orchard was integrated into the Yan Yan Gurt West agroforestry and sheep farm it was not envisaged that one day thinnings would be harvested to build a wild play area to yield a good return from each tree. Tree product markets are unpredictable but constantly evolving as demonstrated in this case study.

The seed orchard was established in 2003 and so far the products include:- small logs for shiitake mushroom production; modest sales of sugar gum and spotted gum (Corymbia maculata variegata) seeds although there are plenty in storage; wild playground logs and honey. Further thinnings are destined for firewood and the plantation is also being managed for sawlogs.

There are three rows of diverse native plantings surrounding the seed orchard to protect seed trees and to enhance pollination and at the same time adding biodiversity to the farming system and contributing to integrated pest management. Other advantages of biodiverse farm plantations include nutrient cycling, sequestering carbon into the trees and eventually the soil, enhancing food and fibre security, improving property value and making the farm a more pleasant environment in which to live and work.

Establishing connected multi-purpose plantations as an agroforestry system can provide a biological infrastructure for the farm, which is good risk management for regenerative farming in the face of climate change.

An informative read on regenerative farming is:- “Call of the reed warbler – a new agriculture a new earth” by Charlie Massy. For further reading on agroforestry refer to Rowan Reid’s book: “Heartwood – the art and science of growing trees for conservation and profit” (Google Bambra Agroforestry Farm)

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Nic Theodore measures sugar gum log for play ground whilst Josh Rigg is de-barking.

Photo by Andrew Stewart
Playground step construction

Climbing ladder

Insect hotel

Climbing pyramid

Photos this page by Beth Diviny
THANK YOU

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