

The influence of effluent - the power to do good



PINE LODGE

Farm Facts

Shepparton, VIC Central North

Enterprise: Dairy

Organic irrigated dairy

Property Size: 261 hectares

Average Annual Rainfall: 500 mm

Elevation: 110 m

Motivation for Change

- ◆ Health concerns and the desire to try natural farming methods

Innovations

- ◆ Using beneficial bacteria to treat dairy effluent for use as fertiliser
- ◆ Laser levelling of paddocks and enhancing the water reticulation system
- ◆ Composting, foliar and bio-fertilisation
- ◆ All organic practices
- ◆ Innovations commenced: 1996

Key Results

- ◆ Irrigation requirements reduced by 30%
- ◆ On-farm waste producing cost-effective fertiliser, improving soil health
- ◆ 10% price premium on product
- ◆ Reduced veterinary costs



Ian and Wendy Klein have taken recycling to a new level, treating dairy effluent to provide rich fertiliser and effectively managing their on-farm water supplies to operate a profitable and organic farm.

After 24 years of conventional dairying, Ian and Wendy began using organic farming methods, actively turning away from the use of chemical or artificial fertilisers, drugs, antibiotics and hormones that are common in today's food production. Their underlying principles were to not pollute the environment or use toxic chemicals and to reduce their environmental footprint – while producing a wholesome food and remaining profitable.

The Kleins no longer have problems with excessive amounts of harmful or toxic nutrients and offensive odours from the dairy effluent. By treating their dairy effluent with beneficial bacteria, they are able to use the modified slurry as a fertiliser, returning nutrients to the soil and lowering costs of fertilising the pasture.

Using foliar sprays and bio-fertilisers to address the condition of the soil has also promoted the storage and cycling of organic matter in the soil, making the pastures more productive. The cows are healthier and require fewer interventions to prevent animal health problems.

The Kleins are also using a third less water after establishing a state-of-the-art water reticulation system for irrigating the pastures, linked to laser levelling of the paddocks.

By focusing on keeping nutrients and water on the farm, Ian and Wendy have developed a successful recycling and composting program. In the Klein's experience, changing from conventional farming practices to working with more natural inputs and processes has reduced their input and veterinarian costs and supports a profitable organic dairy.

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Becoming Organic

Ian and Wendy moved to Pine Lodge from Dandenong in 1972. Ian had previously farmed in the Heatherton Road area, which is now part of Melbourne's sprawling suburbs.

After arriving in the district, Ian and Wendy practiced conventional dairy farming on the property for 24 years using skills and knowledge they acquired and learned from local producers and industry experts.

The Kleins recall, "In the early 1970s we were dealing with some personal health issues that were not responding to treatment using conventional medicines. Together we decided to look into natural remedies and soon observed benefits. This realisation soon caused us to question why we were continually working with conventional farm management practices year after year with our cows and pastures".

"...be open to ideas about investigating and using biological and ecological solutions."

"In 1996 we attended a public lecture given by Professor Ian Brighthope that inspired us to trial natural farming methods on our dairy. This involved us extending what we were doing in our home

with our own health more broadly to the farm and the dairy cows."

After undertaking research, Ian and Wendy agreed to perform a trial for two years. They decided that if they did not see any benefit, or saw decline, in a number of indicators then they would return to previous management practices. Indicators selected included whether the costs of milk production became higher, or the health of pastures or cows declined.

The Kleins elected to go "cold-turkey", changing to organic practices across the farming enterprise in 1996. "We do not use synthetic fertilisers, synthetic sprays for weeds and pests nor antibiotics to prevent the animals from getting sick", Wendy states.

Productivity increases were observed within 12 months and have been consistently improved, though subject to some seasonal variations.

The Kleins continued to inform themselves throughout the change process, and tried various techniques and options until they found what worked for them. This included investment of some capital into new equipment. Ian and

Wendy believe that their dairy enterprise is only as good as their understanding of the ecological and biological processes that underpin it.

On becoming organic, Ian remarks, "Where you, the producer, have observed seemingly intractable problems with animal health, soil and vegetation condition, water quality and waste effluent, be open to ideas about investigating and using biological and ecological solutions."

"Often this involves joining an association or group of like-minded individuals, reading books and searching the Internet to find suggestions for fixing problems."

As advice for others, the Kleins note, "It's far easier than you think and there are now more opportunities to learn how to farm organically".

"We suggest that you give such solutions 'a go' on small areas at first before applying to larger areas. Be prepared to wait for results, remembering that problems were often slow to manifest themselves, so 'fixes' may also take some time."

Ian and Wendy's business plan was to implement a number of strategies to make the farm more viable, as well as environmentally friendly. This focussed on converting the entire farming enterprise to organic production and recycling as much as possible.



Around 300 cows produce milk on the Pine Lodge organic dairy

Dairy Operations

"We started small; the dairy comprised a relatively small milking operation of around 80 Friesian and Jersey cows in a six bail shed. In those days our operation was based on establishing and managing irrigated improved pastures using synthetic fertilisers, for example, superphosphate and applying chemical sprays to control weeds."

Production was successful and Ian and Wendy considered the farm had potential to become more productive and be a much larger operation. Over the years they progressively increased the scale of the operation to what would be considered medium-sized in Australian terms. The Kleins now run approximately 300 milking cows, some dry cows, bulls and other young stock on the 261 hectare property. The daily milking of the 300 cows takes place in a 60 bail shed. The dairy represents a major piece of infrastructure on the farm.



The Klein dairy has increased from a six to a 60 bail shed, producing significant amounts of effluent



A by-product of a large dairy is effluent. The milk shed is equipped with high pressure hoses delivering dam water for washing the floor of the shed and the holding yard. Effluent is mainly a slurry comprising wash down water, manure, urine and other waste.

Large amounts of slurry were accumulating on the Klein farm, collected in a pond next to the dairy. For many years the slurry was regarded as waste because of the high concentrations of ammonia, phosphorus and potassium that would 'burn' the pasture if it were not first allowed to air-dry over some time.

Periodically the slurry was dried in the sun before being spread over the pastures. However, more product was being generated than the Kleins could effectively use.

Ian notes, "Because of our increasing herd size and intensification of production we needed to find improvements in managing and disposing of livestock effluent so that it prevented pollution of surface and ground water. As a result our effluent pond was an increasing concern to us. It was characterised by anaerobic bacteria and the sludge was high in ammonia. While we knew the sludge contained potentially beneficial nutrients, but these were unavailable for immediate use on the pastures".



Dam water is used to wash down the dairy



From Effluent to Fertiliser

Wendy remarks, "In the first 24 years we did not regard the dairy shed slurry as an asset. It was a smelly mess. We reluctantly managed it and because our knowledge of ecological and biological systems was rudimentary we could not see the opportunity before our eyes".

"Our experience and advice meant we just did what everyone else was doing."

With their new approach to natural methods on the dairy, Ian and Wendy aimed to modify the slurry in the pond to achieve higher levels of oxygen by introducing aerobic bacteria. By adding beneficial bacteria to convert the ammonia into amino acid, this made the sludge an economically valuable fertiliser, which could be used as required.

Ian notes, "As a result we no longer had an excess of organic matter and toxic nutrient levels, it also ameliorated the pH to an acceptable level, reduced the offensive odours and removed suspended solids and salts in the slurry".

The once problematic effluent is now contained and managed in a large holding pond and after being treated is used as fertiliser for the pastures. The results are noticeable.

"When we spread the modified slurry onto the pastures we began to observe almost immediate benefits. Where a strip of pasture is missed during spraying, you clearly see that the grass is less vigorous and not as bright green in colour."

The effluent-based fertiliser is complemented by the other natural biological and ecological activities being performed at Pine Lodge in support of recycling nutrients.



Milking shed effluent is contained in a large holding pond



The effluent tanker is used to spray treated effluent onto pastures - with visible results

Recycling through Compost

Composting has become a key part of the on-farm recycling program, with all plain cardboard boxes, calf shed bedding, untreated sawdust, domestic wastes and even dead stock composted for farm fertiliser. The Kleins view these activities as reducing the farm's environmental impact, as well as supplying free fertiliser and helping to build humus in the soil. They also see that it gives the opportunity to learn more about composting and the benefits to be gained from it.

Others in the community who want to be a part of what the Kleins are doing are now saving cardboard and other materials to add to the compost heap. By performing their own recycling program through composting, materials destined for land fill are much reduced.

In Wendy's words, "As nothing, other than produce, leaves the farm, the nutrients contained in the soil stay where they are needed – in the soil – hence no nutrients (or chemicals) find their way into waterways to contribute to blue-green algae problems of some of our water storages".

Irrigated Pastures

The Pine Lodge property is within the Goulburn Valley irrigation region of north-central Victoria. The main water storage for this region is Lake Eildon, which is on the Goulburn River about 100km south-east. Water stored in Lake Eildon is released into the Goulburn River when needed for irrigation. Water for the Shepparton Irrigation Region is diverted from the river at Goulburn Weir, about 50km south of Shepparton.

Pine Lodge is situated in a temperate climate. The long term average rainfall is approximately 500mm, compared with average yearly evaporation of around 1500mm. With hot and dry summers accounting for this rainfall deficit, irrigation is required year-round to maintain plant growth.

Most of the farm's land cover is irrigated dairy pasture. Most paddocks are around three to four hectares with several larger paddocks around 20 hectares. The small paddocks have been laser levelled to provide a gentle slope to enable small bays to be flood irrigated. Farm water for the stock and irrigating the pastures is supplied from a large farm dam and from irrigation water purchased from the regional water authority.

Ian notes, "We have developed a complex system of small and larger paddocks that are irrigated using flood irrigation. Almost all the 261 hectares are irrigated at varying stages in the course of a year. The system of channels is linked to a major storage and reticulation dam on the farm".

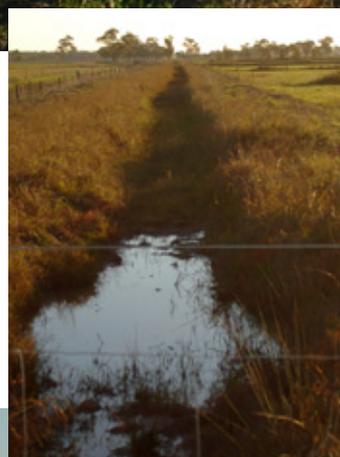
Flood irrigation using a border check system is used. The irrigation bays range from 200 to 400 metres long. The Kleins also established a water reticulation system for capturing and reusing irrigation and rain-fed surface flows. Any water runoff goes to the lowest point on the farm, which has a large recycle system – to be used again for irrigation.

Rain water, held in a 255,000 litre tank, is reserved for washing milking equipment and cleaning the milk storage vat. Dam water is used to wash down the dairy.

Increased pasture and milk production meant more profit that enabled the Kleins to improve the standard of water reticulation and flood irrigation. "We laser level the bays that are growing pastures with a light re-grade as required to give us much higher water use efficiency. We have also installed a water reticulation system that captures runoff from irrigation and overland flows from high rainfall events. The benefits of this large water holding capacity are: no

water leaves our farm except in major flood events; we recycle the water more effectively and we only purchase additional water when needed."

Pastures used to be irrigated every six days during the summer months. Thanks to the better soil structure and increased water-holding capacity now achieved, irrigation is only required each 9 or 10 days.



Top: Irrigation supply channel

Below and inset: Pine Lodge irrigation bays



Healthy Soils, Healthy Pastures

The soils of the property are classified as loams and clay loams developed from alluvium deposited over many years by the Goulburn River and previous streams. Soil mineral balance has been of greater concern than organic carbon levels.

Ian comments, "In 1996 we ceased using synthetic weed and pest control and applying synthetic fertilisers. Instead we applied numerous conditioners to the soil including gypsum, lime and dolomite as well as molasses and guano. By making this move to more biologically-based approach to farming, we began to observe a number of changes in our farm".

"Our farming enterprise is like our family's health. We use natural inputs and products to maintain good health and well-being.

As a result of the application of the soil bio-fertilisers, the Kleins have observed improvements in the health of their soil. More worms are visible, and the soil has better structure and nutrient

balance. The Kleins regularly have soils tests done on each paddock to determine which nutrients are limiting production. Based on the test results, the soil conditions are addressed to achieve the highest levels of productivity. Wendy happily reports, "Finally, the calcium level in our soil is close to where it should be!"

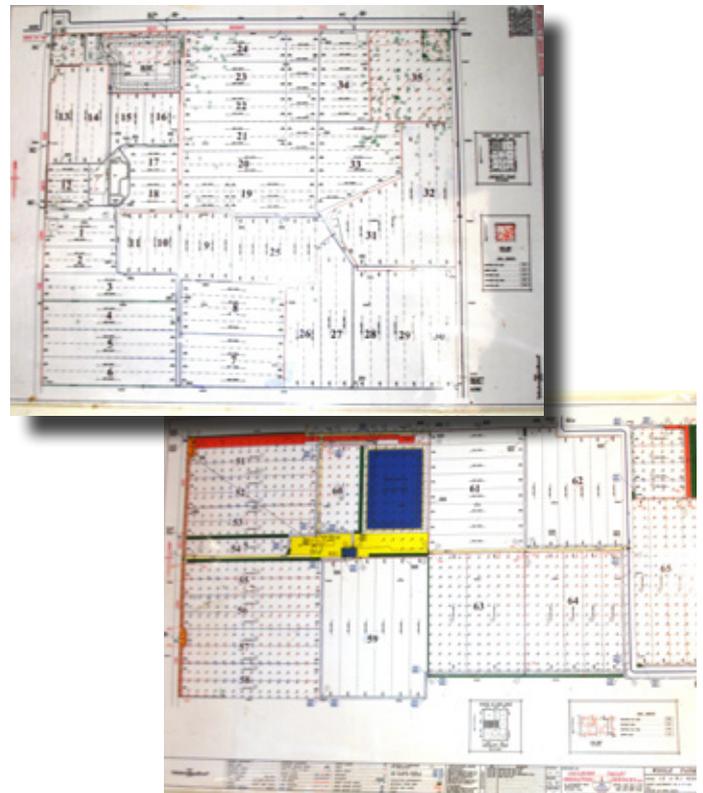
Wendy also notes, "I have farm (independent) soil tests for the past 14 years and it is very rewarding to see the benefits of our farming practices in increased organic matter in the soils. This helps conserve nutrients and water in the soil – much needed for the climate we now farm in".

The change in management to biologically-based practices also saw the Kleins be more careful in stimulating ecological processes. When combined with integrated pasture and pest management systems, this has seen pastures become more productive, growing for longer periods through the year, and significantly fewer interventions required to prevent health problems in the cows.

The enterprise involves intensive management of perennial and annual pastures. A rotational system of summer (perennial) and winter (annual) pastures is followed.

Each three to four hectare paddock is sown to perennial or permanent pasture comprising white clover and rye grass. This is irrigated regularly to maintain high levels of production. These paddocks are grazed every 28 days. Every year each paddock is treated with an effluent/bacteria mix after summer grazing and then irrigated again.

In winter the cows graze on the 20 hectare paddocks, which are annual pastures on subterranean clover. In February-March these pastures are watered to provide growth for the winter months.



Pine Lodge farm plan

The system of smaller and larger paddocks and the use of electric fencing has gained efficient pasture utilisation throughout the growing season.

A foliar spray comprising lime, molasses and borax in a rain water base is also applied to each paddock each year.

The farm has few weeds and pests due to the intensive management of the pastures. Keeping internal irrigation channels clear for irrigation purposes is sometimes a problem, as herbicides cannot be sprayed to suppress vegetation growth. Though not as successful as spraying, the Kleins are using other methods and looking at the vegetation in a new light.

"We manage excessive biomass in the channels by using two people with whipper-snippers. Excess vegetation growing in the irrigation channels has benefits in that it cleans the water", Ian notes. Any other weeds are managed by slashing or mulching, ultimately returning nutrients back into the soil.

A small section of the farm has a reasonable cover of remnant grey box (*Eucalyptus microcarpa*) trees which are encouraged to regenerate. As a certified organic farm, 5% of the property must be maintained for biodiversity. Wendy notes, "Grey box were the predominant large trees in this area, and we have tried to plant other species indigenous to this area... with enormous effort we managed to get a large percentage of the trees through the drought, only to see many get swamped in the last two years and die of wet feet". Regenerating trees are protected using tree-guards to prevent the cattle from damaging the young trees.

Wendy observes that there are now more birds, frogs, worms, dung beetles, spiders, bats and beneficial wasps. The dam is near a large remnant vegetation area and is also a haven for bird life.

No chemicals have been used for 16 years, and pests are not seen as a problem at all.

On being organic, Ian notes, "An added benefit has seen us lower our costs for weed control and pest management".

Production and Personal Highlights

Wendy states, "When evaluating the farm's environmental performance, I would look at where the farm was 15 years ago and where it is now - and the improvement and benefits - both environmentally and financially - are obvious".

Ian points out, "The enterprise is profitable - but as for most agricultural businesses, the drought made life very difficult for a long time". Even with the challenges of drought, both animal and soil health are greatly improved and financial inputs reduced as a result of the changes the Kleins introduced. They aim to achieve a balance between inputs and outputs regarding pasture productivity and milk yield.

Wendy adds, "The farm is viable, partly due to the free fertiliser the farm now generates from the continuous recycling of waste products produced on the farm, no chemicals are purchased and all water is recycled".

"We made a few mistakes and lost a few good cows along the way - but we composted the dead animals and made fertiliser out of them."

On average the Kleins are obtaining greater than a 10% price premium compared to other producers. They are achieving this because of the natural product and through systems of management that can produce regular and reliable milk yield from season to season.

"Even if we were not getting a price premium, we would still farm the way we are because of the benefits to us personally and to the wider society", Wendy says.

By changing from conventional farming practices to working with more natural inputs and processes the Kleins:

- have much richer looking and biologically active soils and more earthworms
- have improved soil friability making it much easier to work, therefore using much less fuel
- have dramatically reduced veterinarian costs



Remnant grey box woodland forms part of the dedicated biodiversity patch on the property



"Our farming enterprise is like our family's health. We use natural inputs and products to maintain good health and well-being. The same is true for our farm. We aim to have active, ecologically healthy, functioning soils that produce high quality pastures; that feed healthy cows producing safe and wholesome milk."

Ian and Wendy have confidence that their management systems are having a minimal impacts off-farm. Their approach is to, where possible, grow all animal feed requirements on farm so that they are satisfied with the quality and health of the products they are producing. This approach offers considerable benefits both private and public.

Wendy comments, "We are not using anything detrimental to us, our animals or our environment – so we all benefit from that, even people who don't know us or how we farm".

"We aim to live with and work close to nature, understanding the seasons and cycles of life. Our systems of management are built on understanding ecological and biological processes. By improving the health of our soils, water and pastures and cows we have peace of mind that our environment is healthier than when we first began. We can also assure those who use our farm produce that it is of a high standard for human health and wellbeing."



This case study is an excerpt from the Soils for Life report:

Innovations for Regenerative Landscape Management: *Case studies of regenerative land management in practice*

REPORT SUMMARY

The Need for Change

Despite good practices of many of our land managers and farmers linked to some good science, the realities of an increasingly arid and degraded landscape will impact significantly not only on the productivity and viability of agricultural enterprises, but also on the health of our environment and the wellbeing of every Australian.

Landscape degradation is an issue of national and global concern. Landscape management practices including, but not limited to agriculture, forestry and fire have caused significant damage and in the process have altered the earth's natural biosystem. Consequently the precious resources of soil and water necessary to sustain life are being lost at unsustainable rates.

Unprecedented global challenges are arising in the face of this massive degradation of the landscape.

Soil erosion due to traditional agriculture is occurring at a rate between 10 and 100 times faster than the soil's natural formation process (pedogenesis)^{1,2}. Healthy soils are necessary to provide sufficient amounts of food with quality nutrition and fibre to meet global requirements.

Three billion people globally already have inadequate water and sanitation. It is assessed that 80% more water will need to be accessed by 2050 to feed the potential global population of more than nine billion³. Unless all limited soil and fresh water resources are understood and wisely managed, we are at risk of escalating social disruption and regional instability.

Even with its significant land area, Australia is not immune to the consequences of landscape degradation and increasing future needs. The realities of an increasingly arid and degraded landscape are already being experienced across the country. These include:

- increasing acidification, particularly in the south-east;
- declining soil health, caused by the loss of soil organic carbon (SOC);
- erosion;
- severe salinity;
- diminishing river flows;
- high evaporation and runoff rates;
- decreasing availability of groundwater; and
- reduced resilience to impacts of extreme and variable weather events such as drought, flood and fire.

The current state of the Australian natural landscape is further challenged by stresses from our changing climate, unsustainable management practices (such as reliance on high energy inputs), increased mining activity and urban expansion.

The national and global challenges being faced are interrelated and can be best met through a comprehensive coordinated approach focused on improved regenerative environmental management practices.

Landscape Regeneration for our Future

The key process drivers for landscape regeneration are **soil**, **water** and **vegetation**. Together in a natural system, supported by a constant flow of solar energy, these provide a regenerative cycle.

By restoring natural systems through improving landscape management practices, we can maximise water use efficiency, improve soil health, nutrient cycling and biodiversity of vegetation. A properly structured soil, with good levels of SOC, allows greater infiltration and retention of rainfall. Every gram of carbon in the soil can retain up to eight grams of water.

Currently, approximately 50% of rainfall on the Australian landscape is lost to evaporation due to poor soil structure and insufficient groundcover. By improving soil structure – particularly carbon – through increasing organic matter in the soil, we will be able to better capture and retain any rain that falls, making it available to plants for longer.

Through revegetation, groundcover is improved, and subsequently so is the quality of the soil, enhancing water infiltration. In turn, improved soil health and efficiency in water use contributes directly to the ability to support a biodiversity of vegetation and species.

If properly supported, this regenerative cycle can continue to sustain and improve the natural resource base and therefore landscape resilience and productivity.

Restoring these natural cycles and becoming more efficient in the use of natural resources is fundamental to the provision of sufficient food, fibre and water for a growing population. Business as usual is neither viable nor sustainable. Effective practical policies and actions are needed now.

Landscape Regeneration in Action

Innovative farmers are using high performance regenerative landscape management methods and fighting the trend of continued degradation of the landscape with its heavy reliance on external inputs. They are demonstrating sustainable, regenerative practices on their land. With relevant policies and incentives these practices could be extended successfully and quickly to involve a significant number of Australia's 135,000 farmers. Whilst there are always opportunities to learn more, enough is already known to take action now.



Soils for Life has documented some of these regenerative practices in 19 case studies across a range of locations and land-use types. Experiences shared by the 17 innovative farmers and two community organisations in the Soils for Life case studies demonstrate successful action being taken to restore the landscape. Due to the interrelated nature of soil, water and vegetation, benefits can be experienced across all process drivers regardless of the particular area of focus.

The Soils for Life case studies describe a range of techniques being used to obtain positive, regenerative outcomes, including:

- Applying organic composts, fertilisers and bio-amendments;
- Encouraging natural biological cycles and nutrient transfer;
- Implementing time-controlled planned grazing;
- Using grazing management and animal impact as farm and ecosystem development tools;
- Retaining stubble or performing biological stubble breakdown;
- Constructing interventions in the landscape or waterways to slow or capture the flow of water;
- Fencing off water ways and implementing water reticulation for stock;
- Investing in revegetation;
- Pasture cropping;
- Direct-drill cropping and pasture sowing;
- Changing crop rotations;
- Incorporating green manure or under-sowing of legumes;
- Managing for increasing species diversity;
- Controlling weeds through increased competition by desirable species;
- Reducing or ceasing synthetic chemical inputs; and
- Integrating enterprises.

PRINCIPLES FOR REGENERATIVE LANDSCAPE MANAGEMENT

Our case studies show that many different techniques can be applied to regenerate the landscape. Farmers and land managers commonly tailor a variety of methods to their own landscape and personal preferences. There is no single solution to landscape regeneration.

The following principles consistently emerge as underlying their regenerative practices – regardless of location or enterprise. These can be applied by other landholders as a basis for their own regeneration journey.

- Improve the structure of soil, through enhancing organic matter content
- Use and conserve rain where it falls
- Manage holistically
- Care about the land as a resource
- Commit to education and constant learning
- Search out communities of interest for help and advice
- Work on best land and extend from there
- Strive for maximum groundcover, for the majority of the time
- Manage times of plenty for times of shortage
- Reduce reliance on off-farm inputs
- Observe, measure and respond

Notes:

- 1 United Nations Environment Program, 2012, UNEP Year Book 2012: Emerging issues in our global environment, <http://www.unep.org/yearbook/2012>
- 2 Pimentel, D., 2006, 'Soil erosion: A food and environmental threat.' Environment Development and Sustainability, 8, pp119-137
- 3 Barlow, M., 2007, Blue Covenant: The Global Water Crisis and the Coming Battle for the Right to Water, McClelland & Stewart

CASE STUDY 17 - PINE LODGE VIC

Other case studies and the full *Soils for Life* report are available at: www.soilsforlife.org.au.

The production of the report was supported by funding provided by the Federal Government's *Caring for Our Country* initiative.

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