


INNOVATIONS FOR REGENERATIVE LANDSCAPE MANAGEMENT

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 billion[3]. 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. Despite good practices of a number of land managers and farmers allied to some good science, the realities of an increasingly arid and degraded landscape are 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;
- 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 soils organic carbon (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.

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.

By supporting innovative farmers undertaking regenerative landscape management practices, we can restore the Australian landscape

LANDSCAPE REGENERATION IN ACTION

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 their interrelated nature of soil, water and vegetation, benefits can be experienced across all process drivers regardless of the particular area of focus.

The 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;
- Reducing or ceasing synthetic chemical inputs; and
- Integrating enterprises.

Flow-on outcomes are also obtained by supporting natural cycles. The case studies demonstrate positive results such as improvements in biodiversity, in return further enhancing the resilience of the landscape. Increased biodiversity and groundcover compete with and can eventually replace undesirable species/weeds. The case studies also show how weed invasion can be repressed by reducing chemical inputs and allowing the natural system to thrive. By reducing off-farm inputs, using effective

grazing management and maintaining groundcover, the case studies have demonstrated a reduced need for farm machinery, seed for re-sowing of pastures, synthetic fertilisers and related labour and capital. Reduced input costs result in increased profits.

Regardless of personal goals, case study participants have demonstrated gains across the whole of the farm balance sheet: increase in profits, production volume, water use efficiency, soil health and maintenance and improvement of the natural resource base.

Particular highlights from each case study (CS) are outlined below, grouped under their dominant theme.

FOCUS ON SOIL

- Bill and Rhonda Daly of *Milgadara* in the NSW South West Slopes (CS13) demonstrate the importance of balancing and restoring the physical, mineral and biological qualities of soil through the application of humus compost. As a result, they're experiencing increased crop yields, improved crop quality and an increased stock carrying capacity.
- Colin Seis of *Winona* in the NSW Central Highlands (CS12) has developed and implemented a cropping technique - 'pasture cropping' – enabling three concurrent uses of his paddocks. This technique has led to dramatic increases in soil and soil minerals, increasing soil organic carbon (SOC) by 203% in ten years. SOC has been measured up to depths of 500mm.
- Graham and Cathy Finlayson of *Bokhara Plains* in the NSW North West (CS2) are restoring the soil structure to claypans in the rangelands by using planned grazing practices. Stock are being used to break up the surface of the claypan, which formerly comprised 50% of their land, turning it into productive pasture. Carrying capacity so far has increased from 56 DSE[4] days per hectare per 100mm rain, to over 100.
- In WA Central Wheatbelt, Ian and Dianne Haggerty of the *Prospect Pastoral Company* (CS16) have demonstrated that by supporting the biological activity in their soil, they have been able to convert nutrient-poor sands into productive and resilient soils. They are now are producing consistent crops and 'boutique' fat lambs on as little as 100mm rainfall in the growing season.
- David Clayfield of *Clover Estate* in the SA South East (CS6) introduced biologically-based soil conditioners to balance the mineral and microbial status of his sandy, infertile soils and ceased chemical inputs. Fifteen years on, soils are dark and nutrient-rich and David is 'growing' calves for export as dairy heifers at a rate of 600-700 a year on 100 hectares, using 25% less irrigation water per animal weight produced.
- On the heavy, boggy soils of the Victorian Western Plains, Brian and Sandra Wilson of *Briandra* (CS15) have combined raising crop beds to improve drainage with the application of beneficial fungi to break down crop stubble and the application of bio-amendments to improve soil structure. Both their cropping and sheep production outputs have increased and their soil is visibly improved.
- On their property, *Lana*, on the NSW Northern Tablelands (CS9), Tim and Karen Wright have been applying Holistic Management practices for almost 20 years, using their grazing management as a farm tool, redistributing soil nutrients from areas of high to low fertility through controlled stock movement. This has optimised natural nutrient cycling processes and supported a carrying capacity increase from an average of 8,000 to 20,000 DSE, maintained even through periods of drought.

Samples from a paired-site analysis showing the healthy and carbon-rich soils on Winona *(left) achieved through Colin Seis' 'pasture cropping' technique, compared with a neighbouring paddock (right) which is farmed conventionally*

- Cam and Roxane McKellar of *Inveraray Downs* in the NSW North West Plains (CS14) are producing better quality and more nutritious food after ceasing use of inorganic fertilisers and commencing regular applications of organic compost. This replaces nutrients lost through harvest and allows for recycling of off-farm nutrients by re-introducing composted materials back on to the property.
- Greg and Sally Chappell of *Shannon Vale Station* in the NSW Northern Tablelands (CS3), undertake comprehensive chemical analysis of plant tissue and sap in order to apply organic fertilisers targeting specific deficiencies in nutrient availability. Combined with specific grazing management practices, the Chappells have rejuvenated once weed-infested pastures, improving SOC, fertility, pasture quantity and quality. The Chappells believe that these improvements to the nutritional value of their pastures have directly led to increased growth in their Angus bulls.
- In the Victorian Central North, Ian and Wendy Klein of *Pine Lodge* (CS17) adopted all organic methods across their farm and identified an option to treat the effluent from their 300 dairy cows. By adding aerobic and beneficial bacteria to add oxygen and convert the ammonia into amino acid, the rich effluent nutrients can be returned to the soil as an economically valuable fertiliser, re-establishing the nutrient cycle. Their organic methods have resulted in a decrease in veterinary costs, reduced irrigation requirements and deliver a premium price for their product.

Establishment of weirs on Gunningrah *has lead to significant gully restoration in as little as two years - 2006 (left), 2008 (right)*

FOCUS ON WATER

- Craig Carter and his partner Nicky Chirlian of *Tallawang* on the NSW North West Slopes and Plains (CS10) constructed leaky weirs for their creeks, mainly constructed from dead trees. Later, in conjunction with plantings of native reeds, these structures created a ponding effect and retarded water flow. Six years on, previously bare soils and gravel beds are covered with regenerating plants and considerable siltation is evident as the vegetation traps sediment carried from upstream. While inflow varies with rainfall, outflow is constant due to improved water retention in the soil and subsequent hydrological processes.
- Charlie and Anne Maslins of *Gunningrah* in the NSW Southern Tablelands (CS8) have also constructed over 30 weirs across streambeds and gullies on their property since the mid 1990s. Combined with time-controlled planned grazing, these approaches have had significant impact on water infiltration and retention, healing erosion and increasing bank stability providing a greater ability to handle high flood flows. The Maslin's profit is now much more stable, regardless of rainfall.
- Ben and Graham Forsyth of the 480,000 hectare *Three Rivers Station* in the WA Mid West (CS5) are constructing major earthworks to try and protect their land from the infrequent but heavy rainfalls which have washed away topsoils and caused massive erosion. After de-stocking their property in response to increasing landscape degradation, they are now investing in regeneration activities to build perennial grasses and enable effective planned grazing in the future.
- On the million-plus hectare property of *Beetaloo Station* on the NT Barkly Tablelands (CS4), managed by the Dunnicliff family, a network of bores and pumps connected by hundreds of kilometres of 75mm pipe are being established in order to access previously untouched grazing land and support a potential stock rate of 100,000 head of cattle – or more.

FOCUS ON VEGETATION

- On *Dukes Plain* in the Southern QLD Brigalow Belt, Shane and Shan Joyce measure the financial benefit of increased vegetation in their pastures, after observing the increased production of paddocks with regenerated stands of brigalow (*Acacia harpophylla*) than those that had been cleared. The trees provide protection from wind shear on both moisture loss and animal performance in cold, as well as a barrier to frost impact on leaf production. Combined with time-controlled planned grazing facilitating capture, infiltration and retention of rainfall, the Joyces have obtained a 30% increase in production and significantly reduced inputs.
- John and Robyn Ive of *Talaheni* in the NSW Southern Tablelands are using revegetation to capture rainfall higher in their property to lower the water table and subsequently reduce salinity problems. They have used innovative techniques, employing strategic grazing to exploit variable seasonal conditions, and using livestock to disturb hard ground surface to facilitate germination. In total, more than 200,000 trees have been established on their property. Data from regular monitoring over 20 years shows a significant decline in watertable levels and salinity levels of groundwater, suggesting that they have achieved success through revegetation and other on-farm actions.
- Also in the NSW Southern Tablelands, Martin Royds and his partner Trish Solomon of *Jillamatong* (CS7) demonstrate an unswerving commitment to looking after their pastures by stocking accordingly, and actively managing their grazing practice and rainfall infiltration. Martin has trialled a number of paddock configurations to gauge the carrying capacity of his land, ultimately adopting a design which enables his stock to move from areas of high to low fertility, spreading nutrients. Along with effective water management techniques, Martin is able to maintain green pastures year-round.

Revegetation has been fundamental to the Ive's approach to regenerative landscape management on Talaheni, *converting bare soils with visible saline seeps (1982, top) to productive pastures (2012, below)*

MAKING THE CHANGE

Changing from conventional to regenerative landscape management practices involves making a commitment and constantly challenging and testing decisions made to ensure that they are economically, environmentally and socially sustainable. This can be challenging for many farmers and land managers, a process which can be greatly aided by coordinated support.

The case studies on the *North East Catchment Management Authority* (CMA) in Victoria (CS18) and the Tasmanian Natural Resource Management body, *NRM South* (CS19), provide two of many possible examples of effective means which could be used to provide the required encouragement and support to farmers and land managers to adopt regenerative landscape management practices. Respectively, these organisations' particular programs provide farmers and land managers the ability to understand and respond to soil tests through practical action and advice, and provide low-risk supported trials for time-controlled planned grazing.

IN CONCLUSION

On the individual level, the Soils for Life case studies show how triple bottom line outcomes – economic, environmental and social – can be achieved. However, the potential for these outcomes to be experienced on a national and global scale is also clear. These include, but are not limited to:

- soils that are increasing in organic content, microbial and biotic activity, with restored carbon and essential nutrients for plant growth to revegetate the landscape and provide the basis for sustained nutritious food and fibre production;
- environments that are resilient and can better cope with extremes of climate such as flood and drought, whilst positively influencing climate remediation;
- water efficiency to maximise the use of every drop of rain that falls onto the landscape;
- sustainability, through cycling essential plant nutrients rather than introducing off-farm inputs such as chemical interventions;
- landscape biosystems that are healthy, regenerative, productive, profitable and encourage diversity; and
- better returns to farmers and land managers through profitable production, maintenance and improvement of the natural resource base, leading to more balanced and healthier lives.

Read the full report at www.soilsforlife.org.au

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

Endnotes

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

4 DSE is a stock measurement, 'dry sheep equivalent' based on the feed requirements of a 45kg wether. This can be multiplied for various types of stock, eg., a ewe with one lamb is measured as 1.5 DSE, and a dry cow is equivalent to 6-8 DSE, depending on weight.

SOILS FOR LIFE REPORT SUMMARY

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

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