2020
BALALA STATION CASE STUDY
NARRATIVE REPORT

Prepared by Mark Parsons and Matt Bolton

Balala Station is literally a little piece of grazing industry history. It is the last remnant of a property established in the 1830s that covered 39,000 hectares of the New England Tablelands in north-eastern New South Wales. The original graziers who settled here were partners George Morse and Thomas Tourle, who married George's sister in 1846. In 1841 Morse and Tourle had 2500 sheep between them. In 1900 Balala was owned by the Hudson family, who had taken it over in 1880 and the number of sheep shorn on the property had grown to 44,000, with 1160 bales of wool produced. [1]

Under several generations of the Hudson family, Balala Station was subdivided and various parts sold. Richard Daugherty became the third grazier on the property when he purchased the remaining 1250 hectares in 2010. This portion of land is focussed around the original 1840s homestead and community buildings, and is located 15 km west of Uralla on what was the Uralla-Kingstown coach road. The 'Balala Station Homestead Complex and Outbuildings' are listed on the New South Wales Heritage register.

Balala street scape with the heritage-listed buildings comprising a butcher's shop (the chopping block is still there), a storeroom and shopkeeper's quarters.

[1] https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=2540042

Balala Station comprises undulating country rising from creek flats to low ridges, ranging from 860 to 1000 metres elevation. Belts of erosion-resistant harder rock cross the property. The soils are derived from granite, which forms a sandy to sandy loam soil, and from metamorphosed sedimentary rock, which forms a sandy clay-loam referred to as 'Trap" or Trap Rock" soil. These are generally low-fertility soils notably lacking in phosphorus and other essential plant nutrients.

Native vegetation in the area is categorised as yellow box grassy woodland. As well as yellow box (*Eucalyptus melliodora*) and Blakeley's red gum (*E. blakeleyii*), the overstorey includes other box and stringybark-type eucalypts and Rough-barked Apple (*Angophora floribunda*). Aerial photographs taken in 1956 show that the tree cover on some parts of Balala was sparser then than it is today. Regeneration has evidently led to denser tree stocking to the extent that some grasses are suppressed and there is therefore little grazing potential.

An assessment undertaken in 2018 shows that flora and fauna biodiversity is higher in the more sparsely grassed, and hence under grazed areas. This reflects the wider range of habitat available with the larger trees and where understorey vegetation, including grasses, is more vigorous. Approval has been obtained to thin some areas of overly dense stands on the property.

Balala transect of tree cover in 2018 showing dense regrowth coverage

Balala biodiversity assessment transect of tree cover showing sparse coverage closer to the original woodland structure.

The pastures on Balala comprise the typical perennial native grasses found in the New England Tablelands region, such as Wallaby grass (*Rhytidosperma racemosum*; synonym: *Austrodanthonia racemosa*), Red grass (*Bothriochloa macra*), Weeping grass (*Microlaena stipoides*), Wire grass (*Aristida* species), Parramatta grass (*Sporobolus creber*), Common Wheatgrass (*Elymus scaber*) and Queensland Bluegrass (*Dichanthium sericeum*). [2]

Grazing management – a blank canvas

Despite around 170 years of grazing, there were no dams on Balala Station when Richard took over in 2010. The only stock water was in the Balala, Roumalla and Walkers Creeks. In dry periods these provided a few residual waterholes at best, rather than a reliable permanent flow. The entire 1250 hectares comprised only 6 paddocks, and many of the fences were derelict. Furthermore, there had apparently been no attempts at changing the original native grass pastures, and no known history of fertiliser application. Richard therefore essentially had a blank canvas on which to work.

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[2] https://www.snelandcare.org.au/landwaterwool/FS4_Pastures.pdf

Set stocking on native unimproved pastures with no more than 6 paddocks had been the grazing practice since the first flocks arrived at Balala. This evidently became less and less viable and eventually failed. The previous owners had to sell off portions from time to time to make ends meet and then finally were forced to sell the remainder.

At this point it is significant to point out that Richard grew up in South Africa, and had not previously managed a grazing property. He had however managed a business providing safaris on the Okavango Delta which is famous for vistas of vast herds of herbivores grazing the savannahs together with their predators. He observed the grazing behaviour of elands, a large antelope species which are a similar size to beef cattle, and smaller antelopes more equivalent to sheep. He had also heard of Stan Parsons, who together with Alan Savory led the introduction of training courses on rotational grazing strategies that mimicked the behaviour of herbivores on the African savannahs. Tim Wright has applied those rotational grazing strategies successfully on Lana, adjacent to Balala and part of the original Balala Station. These practices have also been validated from research by Wal Whalley and others at the University of New England which included research undertaken on Balala.

R.D.B. (Wal) Whalley worked in the Botany Department of the University of New England from the early 1960s to the present day. He demonstrated that grazing stock could be used to manage the species composition of pasture, and guide it towards favourable species. The decline towards undesirable species and/or bare ground was not inevitable and grazing animals can help. The grazing model used by most researchers and land managers in Australia worked well in the reliable climates of Europe, but was insufficient to describe and manage grasslands in Australia's variable climate.

The grazing animal has 3 key properties - the ability to slash, trample and fertilise pasture. These can be used to selectively improve pasture species composition and productivity. Dr Whalley also made observations on the phenology and physiology of temperate and tropical native grasses, legumes and shrubs, as an important input to the pasture management. This approach is an alternative to costly, high-input pasture management, where herbicides, fertilisers and introduced species are used routinely. Dr Whalley tested and validated his theories in the grasslands of the New England Tablelands, Australia's rangelands and elsewhere. His ideas have been taken up in the region by many graziers across the spectrum of conventional and regenerative approaches. Dr Whalley is currently co-authoring the 5th edition of Grasses of NSW.

Having met Tim Wright at a Soils For Life sponsored field day on Lana and being encouraged by his advice, as well as also completing a grazing management course, Richard was confident that rotational grazing could be applied successfully at Balala. While other approaches might also work on this property, there are apparent advantages in adopting a system that can make the most of the drought-resilient native pastures and avoid the need for investment in introducing pasture species that need higher nutrient inputs. The intensive grazing under a rotational grazing system has also been found to suppress weeds and is therefore a cost-effective alternative to weedicides.

Improvements

Since taking over Balala, Richard has initiated several improvements aimed at increasing carrying capacity and making the property more viable and resilient in the long term. The goal is to run a self-replacing merino flock for wool and lambs, supported by Angus cattle production. The cattle and sheep are complementary because rotating them in succession ensures that all components of the pasture are used effectively. The key initiatives underway to achieve the goal are:

- taking the first steps to enable rotational grazing to be introduced,
- soils tests to identify key nutrient deficiencies,
- supplementing with introduced species, such as oats using a SoilKee Renovator in areas of higher site quality,
- fencing off riparian areas to help stabilise erosion, and eventually to enable catchment rehydration work to be implemented, and

- obtaining the permits required from the NSW State Government for thinning of over-stocked stands of eucalypts.

Introducing rotational grazing requires installing considerable lengths of fences and providing a water source in each new paddock created. The aim at Balala is to reduce the average paddock size from over 200 hectares to eventually around 10 hectares. So far, about 30 kilometres of fences have been installed around riparian areas and to subdivide paddocks, which now number more than 40. Fortunately, the NSW Office of Environment and Heritage provides grants for a program aimed at protecting habitat for Bell's Turtle, which is considered endangered in New South Wales. This grant goes some way to offset the cost of fencing riparian areas.[3] Seventeen dams have been constructed, together with around 15 kilometres of 50 mm pipe from dams to troughs.

New fencing and trough: one trough and one pipeline to supply three paddocks

Soil tests showed severe deficiencies in phosphorus – which was to be expected given the soil types and the history of Balala – and of sulphur, nitrate and calcium. Lime, chicken manure (from commercial chicken farms) and mono-ammonium phosphate (MAP) is being applied to remedy these deficiencies. MAP was chosen over superphosphate because it provides a higher concentration of phosphate, and therefore smaller quantities are needed. Bentonite and humates are also being applied, to stimulate biological activity.

[3] https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10266

2020
BALALA STATION CASE STUDY
SUMMARY ECOLOGICAL REPORT

Prepared by Matt Bolton and Mark Parsons

Balala Station is situated on the New England Tableland, approximately 10 km west of Uralla in north-eastern New South Wales. It is the remnant of a much larger station first settled by squatters in the 1840s. Present day Balala Station comprises 1250 ha and is a mixed sheep and cattle farm that comprises undulating country rising from creek flats to low ridges, ranging from 860 to 1000 metres elevation

Annual rainfall averages 760 mm, more of which falls in summer than winter. However, drought conditions have prevailed since around 2017. As of August 2019 only 18% of average annual rainfall had been received.

There are two dominant soil types: sandy and sandy loams derived from granite and sandy clay-loams with a clay B horizon derived from ‘traprock’ (interbedded sedimentary and igneous rock).

Native vegetation in the area is categorised as New England Grassy Woodland with components of yellow box grassy woodland. The main overstorey species include yellow box (*Eucalyptus melliodora*) and Blakeley’s red gum (*E. blakeleyii*). Little pasture improvement has been undertaken on Balala since grazing began in 1840, so the current pastures still comprise the typical perennial native grasses found in the New England Tablelands region.

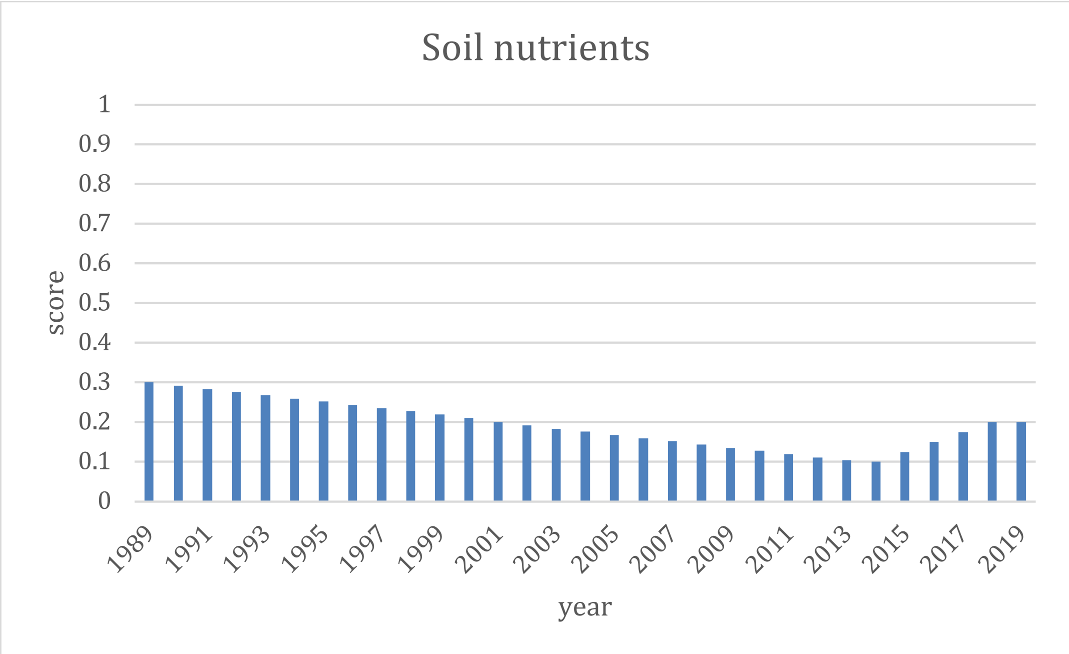
The ecological values[1] of Balala Station were assessed based on the known history of management of the property since 1840 combined with the current manager’s knowledge of the condition of the property when he acquired it in 2014 and his assessment of potential effects of changes in management initiated since then. The ecological values assessed include resilience to disturbance and soil nutrients, hydrology and biology. Because there is little empirical data, the assessment is necessarily based on observations and a subjective judgement of likely effects of management.

The report shows that the condition of all values assessed is assumed to be poorer than they were originally, having been declining steadily since grazing commenced in 1840. This assumption is based on the set stocking strategy used over a long period, leading to loss of soil structure, hydrological function and biological values, combined with negligible fertiliser inputs and pasture improvements to redress losses of nutrients. With the change to rotational grazing and introduction of measures to improve hydrological function since 2014, the expectation is that ecological values will

[1] The ecological values assessed were: Resilience of landscape to natural disturbances – flood, drought and frost; Status of soil nutrients - including soil carbon; Status of soil hydrology - soil surface water infiltration; Status of soil biology; Status of soil physical properties – as a medium for plant growth; Status of plant reproductive potential; Status of tree and shrub structural diversity and health; Status of grass and herb structure - ground cover; Status of tree and shrub species richness and functional traits; and Status of grass and herb species richness and functional traits.

start to improve. While the period since 2014 is notable for severe drought, improvement in some ecological values is already considered to be occurring.

The trend for each of the 10 values is therefore similar – a steady decline followed by a steady increase when management changed in 2014, mitigated by the effects of drought more recently. An example is provided below. For further details and commentary, please see the Supplementary Ecological Report.



Case Study
Balala Station

2020
BALALA STATION CASE STUDY
SUPPLEMENTARY ECOLOGICAL REPORT

Prepared by Matt Bolton and Mark Parsons

Summary

This report on the ecological values of Balala Station is based on the known history of management of the property since 1840 combined with the current manager's knowledge of the condition of the property when he acquired it in 2014 and his assessment of potential effects of changes in management initiated since then. The ecological values assessed include resilience to disturbance and soil nutrients, hydrology and biology. Because there is little empirical data, the assessment is necessarily based on observations and a subjective judgement of likely effects of management.

The report shows that the condition of all values assessed is assumed to be poorer than they were originally, having been declining steadily since grazing commenced in 1840. This assumption is based on the set stocking strategy used over a long period, leading to loss of soil structure, hydrological function and biological values, combined with negligible fertiliser inputs and pasture improvements to redress losses of nutrients. With the change to rotational grazing and introduction of measures to improve hydrological function since 2014, the expectation is that ecological values will start to improve.

Key findings

This assessment identified four phases of land management on Balala (Table 1) which includes production regimes and biodiversity enhancements. Note that over 5 years the standard phases 2 and 3 of the ecological assessments could be considered as operating in parallel, rather than sequentially. The fourth phase is in its initial stage and unfortunately full implementation of regenerative practices has been delayed by the current drought.

Information presented in this assessment has been compiled by interviewing the land manager to document the response of the land types to these land management regimes over time. Measured data such as soil tests and biodiversity survey data have been referred to where available to the assessors. The ecological responses have been assessed using 10 ecological

This assessment shows that by phase 4, all functional criteria are considered to have improved, but that there is still room for considerable further improvement (i.e. a scores between 0.8 – 1.0). For example, since the commencement of regenerative practices in 2014:

- The property is becoming more resilient to drought (Criterion A). A similar conclusion is likely for flood proofing.
- Soil health and function has gradually improved. This summary applies to the following ecological changes - soil nutrients and soil carbon (Criterion B), soil hydrology (Criterion C), soil biology (Criterion D) and soil physical properties i.e. soil as a medium for plant growth (Criterion E).
- Vegetation biodiversity has gradually improved. This summary applies to the following ecological changes - tree and shrub structure (Criterion G) and tree and shrub species richness and functional traits (criterion I).
- Pasture status has gradually improved. This summary applies to the following ecological changes - ground cover/ground layer/grass and herb structure (criterion H), ground layer/grass and herb species richness and functional traits (criterion J).
- The reproductive potential of the plant species and plant community (Criterion F) was applied to both the tree/shrub and pasture layers and a similar conclusion to the above criteria was found.

More improvement in these values is expected in future, particularly if and when drought conditions ease.

Table 1. The four management phases at Balala

	Production Regimes	General Observations
Phase 1: 1840-2014	Conventional management practices were undertaken throughout this phase.	• Large numbers of stock were present in the 19th century. • No fertilisers were applied nor improved pastures sown in the modern era, so "conventional" could be interpreted as pre-WW2 style management. • From 2011 to 2014, an external manager agisted cattle on the property.
Phase 2: 2014-2019	During this phase the manager implemented small-scale experiments and interventions with a view to expanding some or most of them in future.	Small scale interventions include: • Tree thinning • Putting branches along the contours. • Applying chicken manure, mono-ammonium phosphate and lime to selected areas • Altering the timing of lambing and calving to suit the seasons with more nutritious pasture.
Phase 3: 2014-2019	In parallel with phase 2, the manager expanded certain	The land manager has:

	practices, especially those consistent with the rotational grazing ideas of Allan Savory.	• Progressively fenced off creeks and subdividing paddocks. • Provided water to each paddock via pipes and troughs.
Phase 4: 2020 and beyond	Full implementation of regenerative practices is expected in the near future.	• Plans to renovate soils and plant improved pastures and cover crops on some of the creek flats. • Plans to rehydrate the landscape, including the slopes. • Recent, current and planned work under phases 2 and 3 is expected to pay dividends for the ecology, production and finances, after the current drought breaks.

Balala in ecological context

Balala Station is situated on the New England Tableland, approximately 10 km west of Uralla. It is the remnant of a much larger station first settled by squatters in the 1840s. The first settlers are reputed to have driven a mob of sheep from Bathurst, lost them in the Moonbi Ranges, only to later find them grazing on the pastures of the creek flats of what is now Balala Station. The previous owners periodically sold off portions of the property to settle debts. Neighbouring Lana Station[1] was created out of the old Balala as a soldier settlement block after the First World War.

Present day Balala Station comprises 1250 ha and is a mixed sheep and cattle farm carrying 4.8 DSE per hectare. The Station comprises undulating country rising from creek flats to low ridges, ranging from 860 to 1000 metres elevation.

Roumalla and Walker Creeks flow through the property, but Ballala Creek enters onto a floodplain area. The hills on Balala provide a range of aspects across many compass points (Fig. 1).

[1] https://www.soilsforlife.org.au/case-studies/lana

Figure 1. Hilly topography and creek

Rainfall averages 760 mm per annum with a distinct seasonality (Fig. 2). However, Balala currently has a rolling average of 410 mm and as of August 2019 had received only 18% of its average annual rainfall. In the past 8 years, only 2016 has been above average. Winter temperatures are severe and lead to haying-off[2] the native pastures and a distinct "winter feed gap" (Alford et al, 2003; Ayers et al., 2001).

[2] Where the grass and other vegetation dries off and some or most nutrients are lost and therefore unavailable to grazing animals.

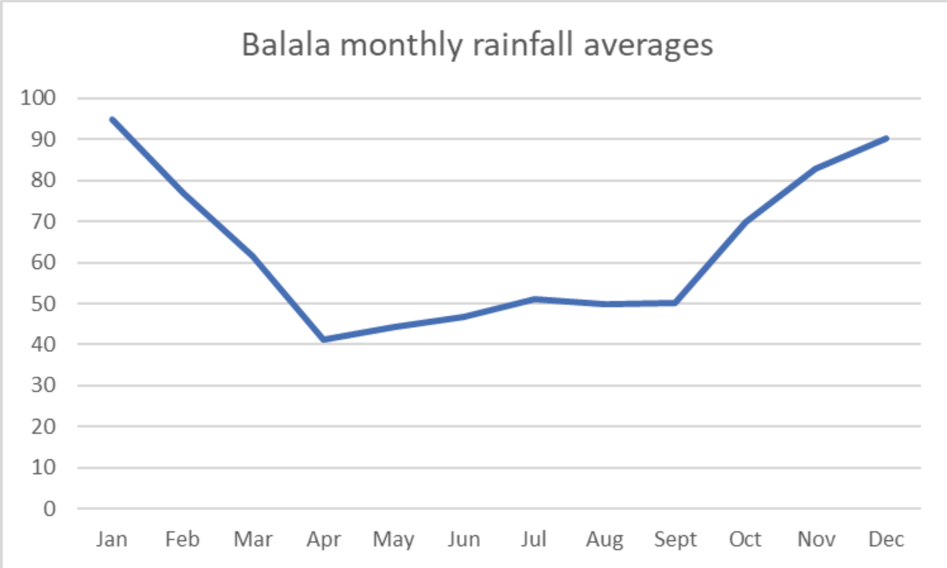


Figure 2. Balala rainfall seasonality

Balala has two underlying geologies (Fig. 3):

- Granite, as part of the New England Batholith (Anon, 2019; Jessop et al, 2019), and
- "Traprock", interbedded sedimentary and igneous rocks. Belts of erosion-resistant, harder rock cross the property; these are metamorphosed traprock near the granite inlier.

Figure 3 Drainage line with granite geology on the right and trap rock on the left.

These geologies have given rise respectively to sandy loam soils and sandy clay-loam soils. These are “light”, low-fertility soils with typical deficiencies including phosphorus, sulphur and other essential plant nutrients. The soils are increasingly deeper and more fertile towards the bottom of the soil catena[3] (Fig, 4).

Figure 4 Trap rock texture contrast soil: (sandy clay-loam A horizon and clay B horizon)

Native vegetation in the area is categorised as New England Grassy Woodland (Keith, 2006) with components of yellow box grassy woodland (Fig 5). As well as yellow box (*Eucalyptus melliodora*) and Blakeley’s red gum (*E. blakeleyii*), the overstorey includes other stringybark, peppermint and box-type eucalypts and Rough-barked Apple (*Angophora floribunda*). There are biodiversity corridors and linkages throughout the property. The endangered Bell’s Turtle is found on the property and habitat is being managed under a recovery plan (OEH, 2019).

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[3] The change in soil processes and types from ridges through slopes to valley floors.

Figure 5 Blakeley's Red Gum Woodland and pasture on Balala

The pastures on Balala comprise the typical perennial native grasses found in the New England Tablelands region, such as Wallaby grass (*Rhytidosperma racemosum*; synonym: *Austrodanthonia racemosa*), Red grass (*Bothriochloa macra*), Weeping grass (*Microlaena stipoides*), Wire grass (*Aristida* species), Parramatta grass (*Sporobolus creber*), Common Wheatgrass (*Elymus scaber*) and Queensland Bluegrass (*Dichanthium sericeum*).[4]

Little fertilising or pasture improvements were performed by the previous owners so Balala was an ideal place for Richard Daugherty to conduct rotational grazing on minimally modified native pastures. The pastures are similar to neighbour Tim Wright's Lana Station which was part of the original Balala station in the 19th century.

The grazing operation consists of self-replacing Merino flock which retains wethers, and an Angus cattle breeding enterprise selling weaners (Fig 6). There are opportunities to trade stock as well.

[4] https://www.snelandcare.org.au/landwaterwool/FS4_Pastures.pdf

Figure 6. Cattle and sheep on Balala

The land manager has established a rotational grazing system with additional internal fencing and watering points. The 11 paddocks purchased in 2011 have been split into 37 paddocks as of 2019 as part of the rotational grazing practice which enables periodic rest of pastures. Each paddock is able to be rested for a full 12 months every 7 years. Other interventions by the land manager include the addition of fertiliser (chicken manure and mono-ammonium phosphate (MAP)), lime on selected areas, laying of fallen tree branches along the contour to encourage water infiltration and thinning of eucalypt regrowth under licence from the vegetation regulator.

In the future the land manager plans to further subdivide some remaining large paddocks and rehabilitate soils and pastures on the productive creek flats. The landscape appears ideal for landscape rehydration, for which the land manager has attended training at the Mulloon Institute.

Assessing responses to land management regimes according to the ecological criteria

This detailed ecological report is underpinned by the Soils For Life *Conceptual Model* and *Assessment Framework* that documents the responses of 10 criteria corresponding to ecosystem function, composition and structure.

During the visit to Balala farm in August 2019, Richard was asked to graphically represent the responses of all 10 criteria. The graphs for several criteria were considered identical to others at interview and were not hand-drawn separately. However, they are presented in this report. Despite the two major geologies and undulating topography, only one land type[5] was considered for the graphs, with predictable variation from ridges to creek flats. The most productive country on Balala was considered to be mid and lower slopes and creek flats.

The chronology of ecologically significant management regimes is at Attachment A.

Assessment of Response Criteria

This ecological assessment commences in 1989 which is an arbitrary date before Richard purchased Balala in 2011. Richard also drew an expected response on the graphs for several criteria, whenever and after the drought breaks.

A. Resilience of landscape to natural disturbances – Flood, Drought & Frost

Why track changes and trends in resilience to major natural disturbance/s?

Resilience to major disturbance/s includes the following factors depending on the agro-climatic region (wildfire, drought, cyclone, dust storm, flood, frost). A major natural disaster or natural disturbance event can occur at any time. Some disturbances give a warning, such as a windstorm or electrical storm preceding a wildfire or a flood. Once a disaster happens, the time to prepare is gone. Lack of preparation can have enormous consequences on farm life including social, ecological, economic and production.

Assumptions and definitions

Since the purchase of the property, the land manager has been improving its infrastructure to implement rotational grazing following the holistic management ideas of Allan Savory (Savory, 1991). This approach is beginning to improve the resilience of Balala to drought.

Several other productivity enhancing practices will also improve resilience to drought in the future. These include the organic matter in the soil to enable it to be even more resilient, and creating more paddocks to allow more flexibility in the system[6].

Planned changes to the timing of lambing and calving will also improve the resilience to the cold season (including frost) and productivity. The land manager has no experience with flood on the property, but improvements to ground cover would be expected to reduce soil erosion in such

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[5] For criterion G, only mid and upper slopes were considered, since there is limited tree coverage on the lower slopes and flats.

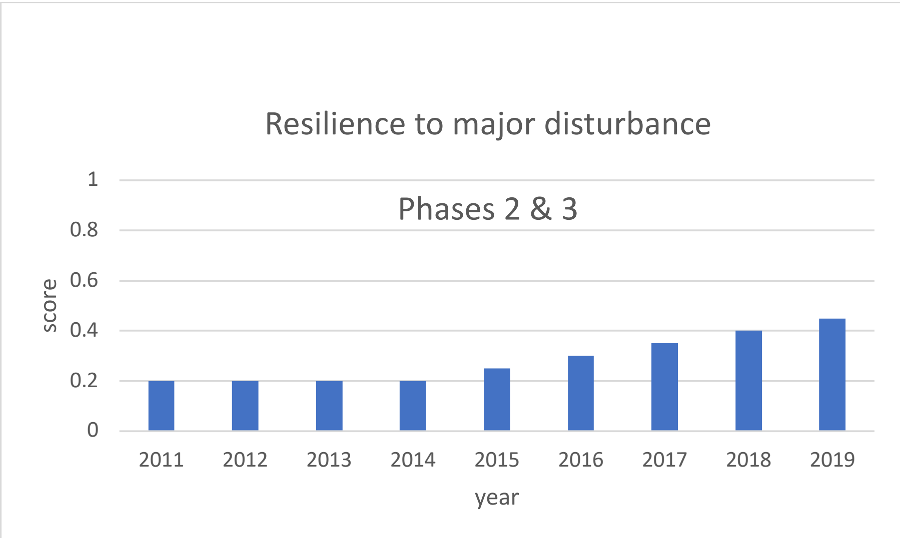
[6] Notes on the graph by Richard Daugherty.

events. The increased fencing and watering infrastructure might imply less resilience to flooding, but much of this infrastructure is above the creek flats.

Results and Interpretation

In Phase 1 the current land manager regards the previous resilience to be "unknown". However, it can be inferred from the graphs for the following criteria that the property had low resilience to extreme climatic events, particularly drought. The relative resilience in 2011 was rated at 0.2.

In Phase 2 the land manager implemented a series of trials and experiments to understand the responses of Balala's pasture and production systems to various innovations which is shown in the table, below. Most of these interventions have been successful and have halted the steady decline of Balala's pastures.



In Phase 3 the land manager has implemented a rotational grazing regime. He is actively fencing off creeks, splitting paddocks and reticulating water to troughs in the new paddocks. These interventions and the rotational grazing have begun to show a definite improvement in the property's resilience. The current drought has however, lessened the rate of improvement. The current state of resilience with a relative score of 0.45 as indicated on the graph, is still well short of ideal – a relative score of 1.

In Phase 4, the land manager is looking to the future and expects the resilience to improve with more years of rotational grazing. Planned interventions include using a "bed renovator" machine on some of the creek flats to efficiently sow improved pastures and rehydrate the landscape (Andrews, 2006, 2007; Dobes *et al.,* 2013; The Mulloon Institute, 2019; Wilson, 2019). These interventions will enhance productivity as well as resilience, especially after the current drought.

B. Status of soil nutrients – including soil carbon

Why track changes and trends in soil nutrients – including soil carbon?

Soil organic matter (SOM) is the basis of soil fertility. As a general rule-of-thumb, for every tonne of carbon in SOM about 100 kilograms (kg) of nitrogen, 15kg of phosphorus and 15kg of sulphur become available to plants as the organic matter is broken down. SOM therefore releases nutrients for plant growth, promotes the structure, biological and physical health of soil, and is a buffer against harmful substances.

Assumptions and definitions

The following figure is an aggregate score of soil nutrient status for all paddocks on Balala. It represents the observed and inferred changes in status with changes in land management practices.

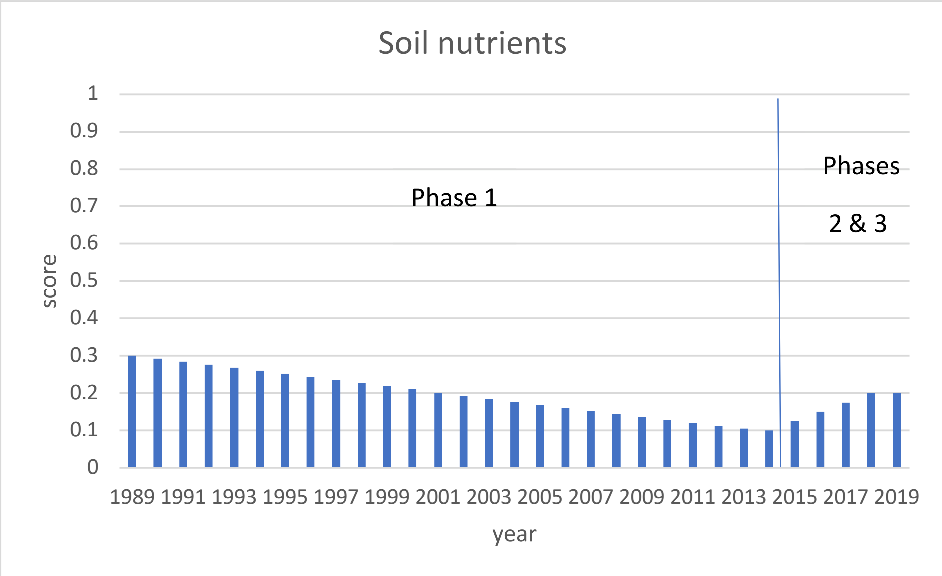
The four soil criteria [B, C, D and E] are inextricably linked and all management is aimed to improve these. Addressing the soil nutrients though inputs is essential. By promoting conditions for continual photosynthesis in plants, the landholder is also improving the soil biology thereby changing the physical nature of the soil. This creates a tilth which improves the capacity to capture rainfall and hence improve the hydrology. This is one of the main aims and objectives of this management practice[7].

Soil organic carbon accounts for less than 5% on average of the mass of upper soil layers and diminishes with depth. According to the CSIRO, in good soils, soil organic carbon can be greater than 10%, while in poorer or heavily exploited soils, levels are likely to be less than 1%.

[7] Notes on the graph by Richard Daugherty.

Results and Interpretation

In Phase 1, the following graph shows a steady decline from a “natural”, low nutrient system to further depleted soils on completion of conventional management in 2014 (relative score 0.1).



In Phases 2 and 3, interventions listed in table 1. above have begun to improve the soil nutrient status. However, the current relative score 0.2 is far from ideal.

Soil samples collected by the land manager have been tested by several laboratories. Whilst some of the results are contradictory, most of the soils on Balala are deficient in phosphorus and sulphur. Calcium and potassium may also be deficient, depending on the soil type and laboratory. Some micronutrients or trace elements may also need to be supplemented, as for example, light soils often have a boron deficiency (Dear and Wier, 2003) and/or molybdenum deficiency (soilquality.org.au, 2019). One of the paddocks may have an aluminium toxicity problem.

In Phase 4, the soil nutrient status, including carbon (c.f. Wilson and Lonergan, 2013), is expected to improve dramatically once the current drought breaks, as planned interventions are increased and with more intensive rotational grazing (see references in Sanderman et al., 2015).

C. Status of soil hydrology - Soil surface water infiltration

Why track changes and trends in soil surface water infiltration?

Soil physical properties have a direct relationship to soil moisture. Soil texture and structure greatly influence water infiltration, permeability and water-holding capacity. Of the water entering a soil profile, some will be stored within the root zone for plant use, some will evaporate, and some will drain away. In agro-ecological settings, by increasing water infiltration, permeability and water-holding capacity this will usually act as a stimulus to improve ecological function.

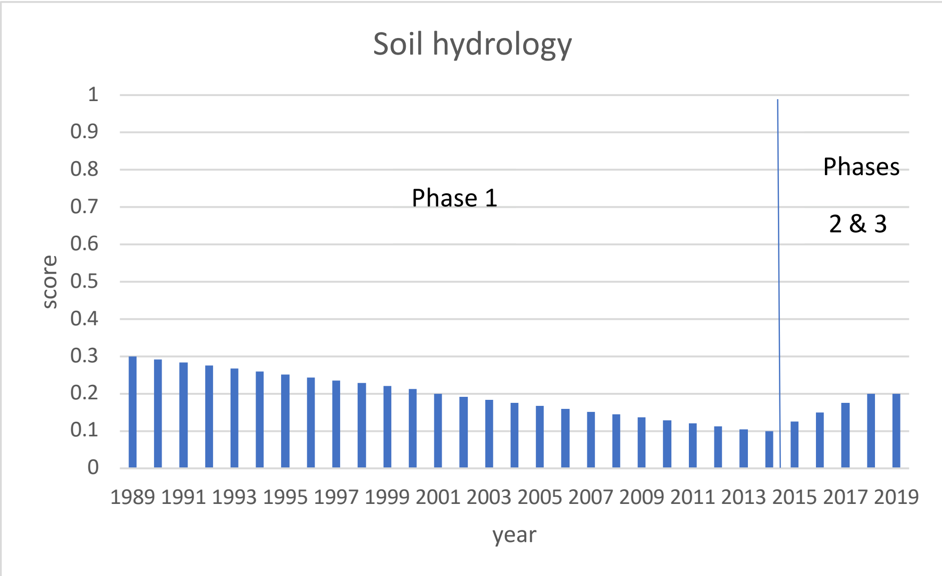
Assumptions and definitions

The following figure is an aggregate score of soil hydrology for all paddocks on Balala. It is identical in shape to the soil nutrient status outlined above in that it represents the observed and inferred changes in status occurring with changes in land management practices.

Results and Interpretation

In Phase 1, the following graph shows a steady decline from a "natural" system to soils with compacted surfaces on purchase in 2011 (relative score 0.1).

In Phases 2 and 3, interventions listed in table 1. have begun to improve the soil hydrology, including an improved infiltration rate (relative score 0.2).



In Phase 4, the soil hydrology, including carbon, is expected to improve dramatically once the current drought breaks, as planned interventions are increased and with more intensive rotational grazing.

D. Status of soil biology - Soil biology

Why track changes and trends in soil biological activity?

Soil biology affects plant and animal production by modifying the soil physical, chemical and biological environment within which plants grow and persist. The ratio of fungi to bacteria is important for land managers to understand - too many bacteria can indicate an unhealthy and unproductive soil. Soil fungi contribute to:

- natural processes (litter transformation, micro-food web participation and soil engineering);
- the decomposition of organic material resulting from compost applications and disturbance from cattle grazing; and

- enhancing nutrient distribution for plant health and productivity.

In healthy soils, there is a good balance between fungi and bacteria, and invertebrates including arthropods and worms are usually present. Collectively these form a vital part of a plant nutrient supply web.

Assumptions and definitions

Decomposition of plant and animal residues is a dynamic process involving trophic levels. While some of the residues are being broken down for the first time by the litter transformers called detritivores, other residues have already been sequestered by soil microflora, which are in turn consumed by microfauna predators.

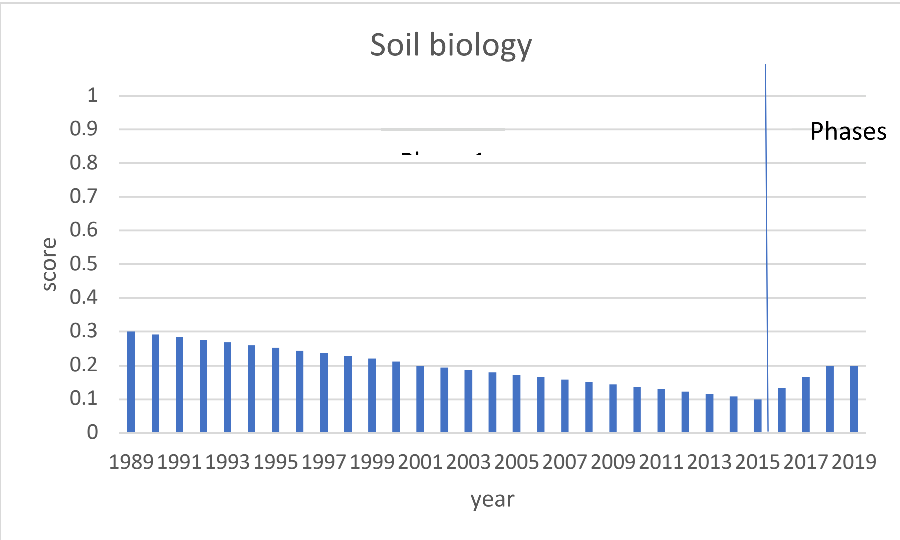
The following figure is an aggregate score of soil biology for all paddocks on Balala. It was considered by the land manager to be identical in shape to the soil physical properties, below, in that it represents the inferred changes in status in relation to changes in land management practices.

Results and Interpretation

In Phase 1, the following graph shows a steady decline from a “natural” system to soils with depleted biology on commencement of regenerative management in 2015 (relative score 0.1).

In Phases 2 and 3, interventions listed in the table 1. have begun to improve the soil biological activity.

Phase 4 is expected to deliver improved soil biological activity associated with improved carbon, nutrition and hydrology.



E. Status of soil physical properties – as a medium for plant growth

Why track changes and trends in soil physical properties?

Soil is a medium for plant growth, given the right environmental conditions. In the case of the soils found on Balala, all soil physical properties would probably benefit from additional soil organic matter. Amongst other benefits, sandy loams would retain more nutrients and sandy clay loams would have improved infiltration and aeration. In the longer term, the rotational grazing regime should enhance all or most soil physical properties.

Assumptions and definitions

Indicators of improving landscape function over time include soil surface rain-splash protection, cryptogam cover; reduction in soil surface erosion type and severity, reduction in washed/deposited materials, presence of biological structures, e.g., perennial tussocks to intercept and retain resources during surface flows; and ground cover complexity which influences permeability.

The following figure is an aggregate score of soil physical properties for all paddocks on Balala. It represents the inferred changes in status with changes in land management practices.

" … *2011 when we took ownership of the property was after a period of wet years. The lack of moisture in the system due to unexpected periods of dry years* (since then) *I feel has stalled improvements happening, but it is waiting to be sparked into activity. This is the same as the soil biology* [criterion D] – *a definite lack of moisture in the system.*"[8]

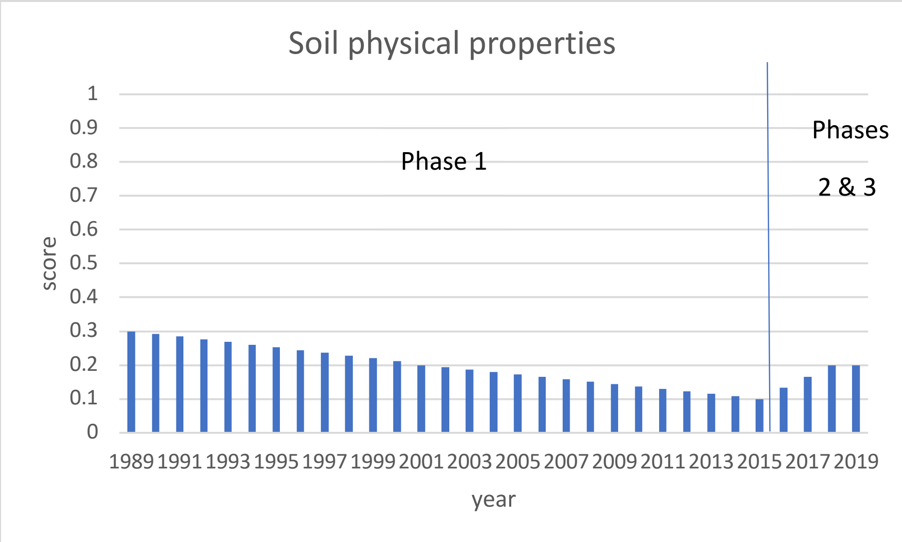
Results and Interpretation

In Phase 1, the following graph shows a steady decline from a "natural" system to compacted soils on commencement of regenerative management in 2015 (relative score 0.1).

In Phases 2 and 3, interventions listed in table 1. above have begun to improve the soil aeration and tilth.

Phase 4 is expected to deliver improved soil physical properties associated with improved carbon, nutrition and hydrology.

[8] Notes on the graph by Richard Daugherty.



F. Status of plant reproductive potential

Why track changes and trends in reproductive potential of plants?

An understanding of plant reproductive potential leads to managing plant reproduction, germination, establishment and development of plants.

Assumptions and definitions

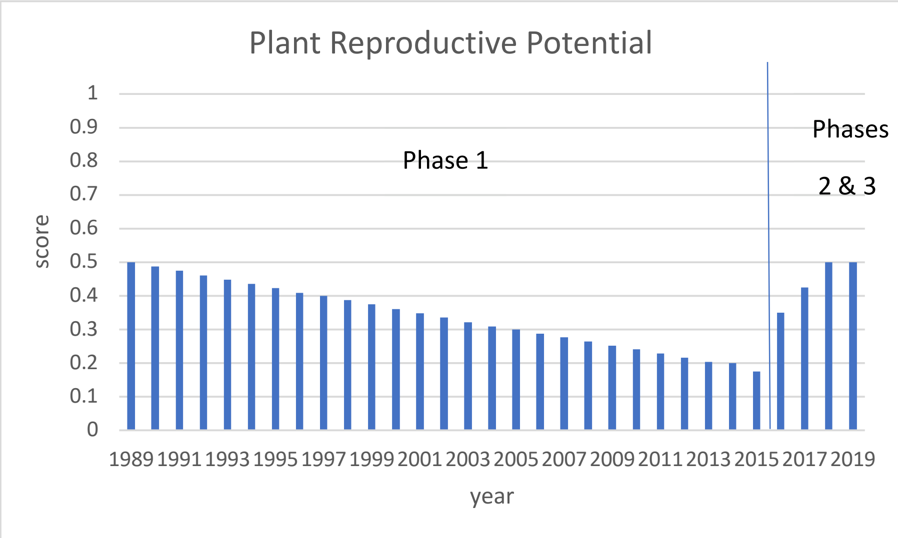
Development of regenerative land management regimes leads to lower costs of production over time.

Planned grazing and resting paddocks – also including sabbath paddocks.[9]

Results and Interpretation

In Phase 1, the following graph shows a steady decline from a “natural” system to difficult plant reproduction on commencement of regenerative management in 2015 (relative score 0.1).

[9] Notes on the graph by Richard Daugherty.



In Phases 2 and 3, the land manager practices a rotational grazing management regime, which promotes plant reproduction, germination, establishment and development of plants (see references in Sanderman et al., 2015). The ground cover structure on the property appears to be consistently higher than conventionally-managed properties in the vicinity.

Phase 4 is expected to deliver further improvements in plant reproduction, including improved relative cover of palatable pasture plants (Lodge and Whalley, 1985).

G. Status of tree and shrub structural diversity and health

Why track changes and trends in extent of tree cover?

Tree cover in agricultural landscapes provides important ecosystem benefits, including: mitigation of soil erosion, shelter for pastures, improved animal welfare, enabling added revenue from stacked enterprises, habitat and breeding sites for pollinators and predatory insects, birds and animals, improved salinity management, improved interception of rainfall and improved aquifer recharge management.

These comments refer to the upper and mid slopes and not the creek flats.

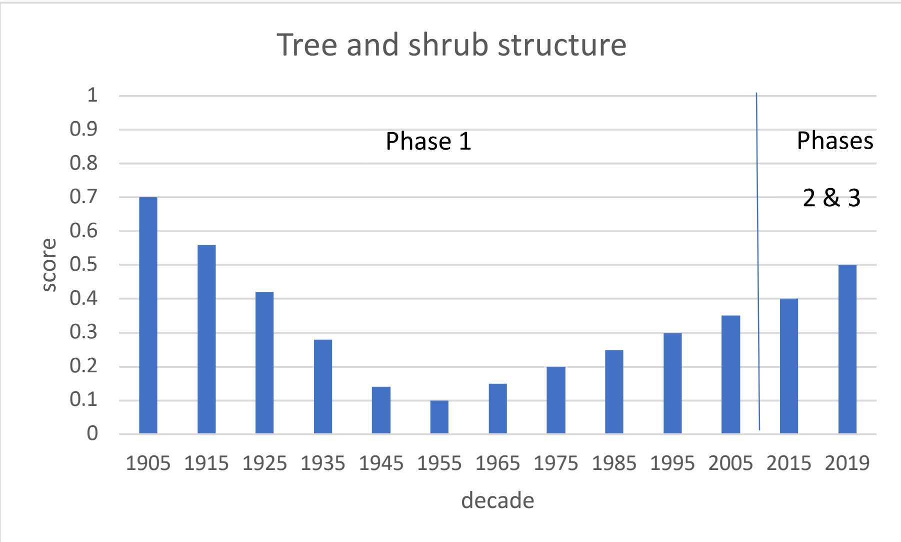
Assumptions and definitions

Originally the hills on the farm would have consisted of eucalypt woodlands. These were progressively cleared by ringbarking. There remain limited trees and shrubs on the lower slopes and flats, but upper and mid slopes are revegetating naturally.

Regrowth has improved on the mid and upper slopes because of rest and less grazing pressure to eat regrowth. The objective is to maintain or aim for 30% tree cover in paddocks to achieve a balance between regrowth and grass production, especially allowing for the allelopathic nature of Blakely's Red Gum leaf litter. The 1950s aerial photographs show that the woody vegetation cover was far sparser then than it is now.[10]

Results and Interpretation

In Phase 1, the following graph shows a steady decline from a "natural" woodland and open woodland system to maximum clearing in the 1950s (relative score 0.1). Regrowth was then allowed to prosper and thickening in some areas was out of control (relative score 0.4).



In Phases 2 and 3, some of the interventions listed in table 1. have begun to improve the tree and plant structure such that regrowth has less impact on production and large trees provide appropriate ecosystem services, as outlined above (relative score 0.5).

Phase 4 is expected to deliver improved tree and shrub structure. It remains to be seen whether the short bouts of intense grazing under the rotational regime will control the regrowth. Different results might be expected between sheep and cattle grazing, but no predictions for the future were made by the land manager.

H. Status of grass and herb structure - Ground cover

Why track changes and trends in ground cover?

The quality of ground cover provides essential protection to keep the soil cool against direct, searing summer heat by reducing evaporation, protecting bare soil against raindrop splash and wind erosion. A dense matted ground layer of pasture grasses slows overland flows during the

[10] Notes on the graph by Richard Daugherty.

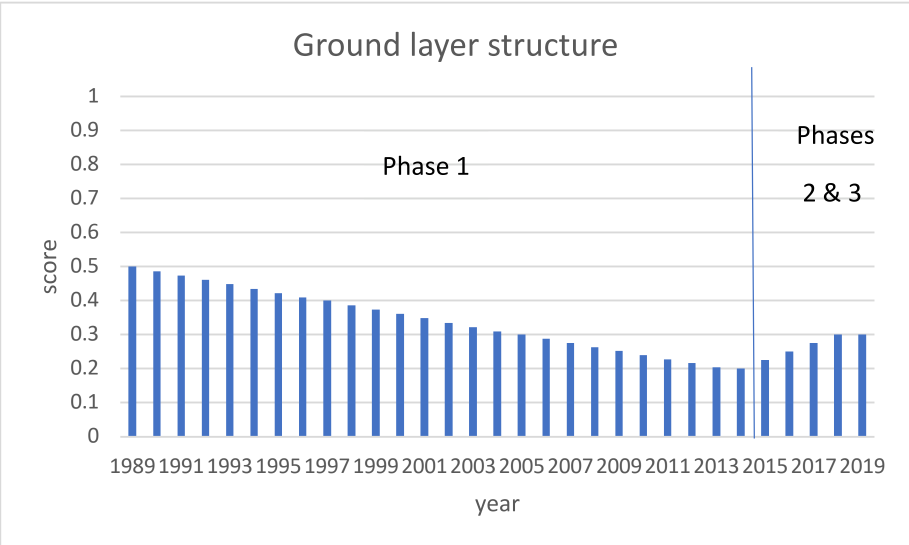
intense rainfall events and assists with infiltration of rainfall, thus mitigating soil erosion and replenishing soil moisture.

Assumptions and definitions

Maintaining ground cover has been made easier through holistic, planned grazing. Ground cover is expected to continue to improve as the number of paddocks increases, therefore increasing carrying capacity.[11]

Results and Interpretation

In Phase 1, the following graph shows a steady decline from a "natural" system to sparse pastures when conventional management ceased in 2014 (relative score 0.2).



In Phases 2 and 3, the land manager practices a rotational grazing management regime, which promotes plant reproduction, germination, establishment and development of pasture plants. The ground cover structure on the property appears consistently higher than conventionally-managed properties in the vicinity.

Phase 4 is expected to deliver further improvements in ground cover after the drought breaks and when rotational grazing has been fully implemented (see references in Sanderman et al., 2015).

[11] Notes on the graph by Richard Daugherty.

I. Status of tree and shrub species richness and functional traits

Why track changes and trends in the status of tree and shrub species richness?

Grazing land management regimes typically result in a reduction in the numbers of species of trees and shrub species as the landscape is modified for pasture production. Grazing animals can inhibit the regeneration of trees and shrubs species.

These comments mainly refer to the upper and mid slopes and less so to the creek flats.

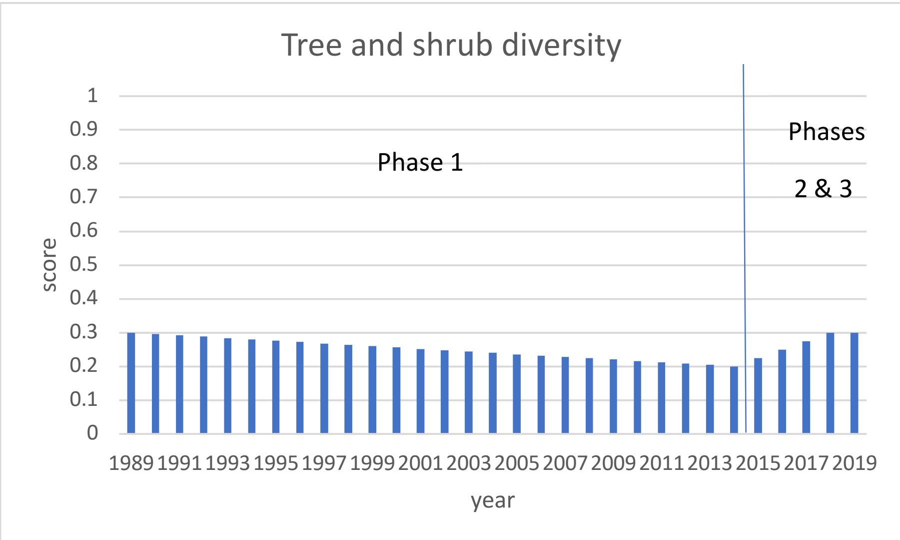
Definitions and Assumptions

Functional traits refer to the types of species inhabiting a place and what is/are their roles in that place and functional diversity reveals how evenly the species are distributed in an area. A decrease in functional richness and evenness decreases an ecosystem's productivity and stability. As a generate rule, the more functional traits of plants found in an area indicates an area is not intensively managed.

"*I feel that the biology living in the increased ground cover has improved functional traits of a complete ecosystem. This resting will increase species diversity.*[12]

Results and Interpretation

In Phase 1, the graph below shows a steady decline from a "natural" system to low tree and shrub diversity on completion of conventional management in 2014 (relative score 0.2).



In Phases 2 and 3, some of the interventions listed in table 1. have begun to improve the tree and shrub diversity and the appropriate ecosystem services, as outlined above.

[12] Notes on the graph by Richard Daugherty.

Phase 4 is expected to deliver improved tree and shrub diversity. It is clear that the drought will impact this criterion in the near future; otherwise, the land manager made no predictions for the future.

J. Status of grass and herb species richness and functional traits

Why track changes and trends in grass species diversity?

In many grazing land management regimes, the variety of pasture plants (annuals and perennials) can improve production, protect natural resources (soil and water) and build the capacity of farming systems to adapt to future production and environmental challenges. The intensity of the grazing management system will determine the health and vitality of pastures and their longevity.

The selection of the perennial pasture species for a grazing production system, should be based on considerations of climate, soil conditions and performance of pasture species under different management regimes.

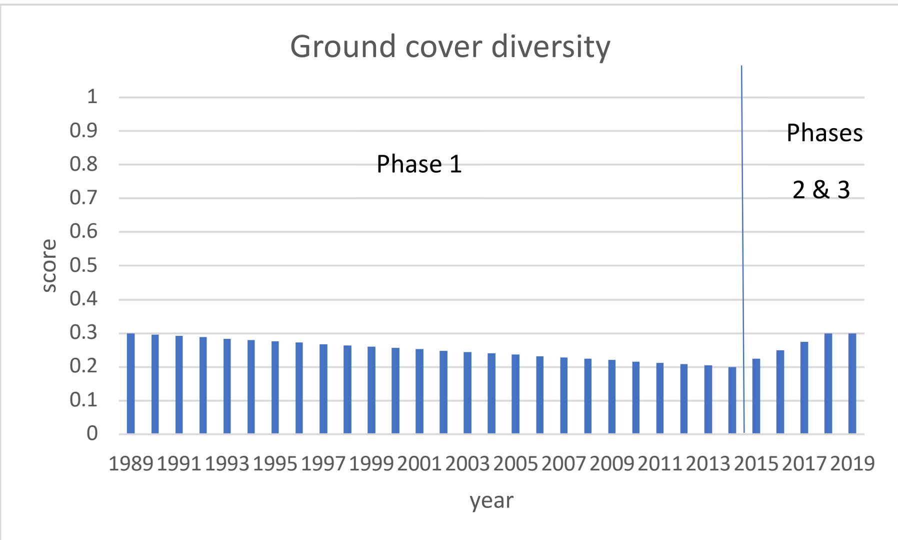
Assumptions and definitions

Functional traits refer to the types of species inhabiting a place and what is/are their roles in that place and functional diversity reveals how evenly the species are distributed in an area. A decrease in functional richness and evenness decreases an ecosystem's productivity and stability. As a general rule, the more functional traits of plants found in an area indicates an area is less intensively managed.

In an agricultural setting, functional traits refer to the diversity of plant species found in an area and this is closely related to productivity and stability.

See also notes from Richard Daugherty in the previous criterion (i).

Results and interpretation



In Phase 1, the graph above shows a steady decline from a “natural” system to low pasture diversity on completion of conventional management in 2014 (relative score 0.2).

In Phases 2 and 3, some of the interventions listed in table 1. have begun to improve the pasture diversity and the appropriate ecosystem services, as outlined above

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Attachment A

Chronology, Balala, NSW

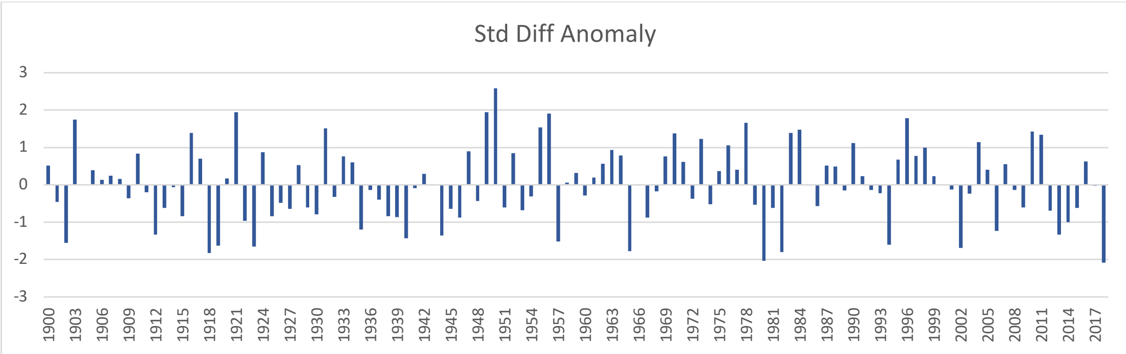
The following chronology was established by discussion with the land manager and from published sources for each of the phases 1-4:

1840s	• Sheep driven from Bathurst escaped at the Moonbi Ranges, but were found on the flats of Balala. • Balala established as a squatter's run - 39,000 hectares. • Original homestead built, eventually being supplemented with numerous additional buildings resembling a small township[13]. • Balala carried 2,500 sheep.
1854	• A post in the current cattle yards bears this date as a blaze.
1880	• Balala taken over by the Hudson family. • Devon cattle introduced, but sheep remained more numerous. • A post office opened at Balala in 1881.
1880s & 1890s	• Balala was a stop on the Uralla-Kingstown-Bundarra stagecoach run and included facilities to change horses.
1900s	• 44,000 sheep carried - produced 1,160 bales of wool.
1919+	• Several soldier-settlement blocks, including the present-day Lana station, were split off from Balala.
1900s to 2011	• Under several generations of the Hudson family, Balala Station was further sub-divided and various parts sold. • Property ran 2 DSE per acre for most of the 20th century.
1956	• Aerial photos of the extent of the current Balala station showed that tree cover was sparser than at present. The trees on the better parts of Balala were previously removed - most likely by ringbarking.
2011	• Richard Daugherty (RD) purchased Balala (1250 ha) from the Hudson family. • 2011-2014: property leased to another grazier at the instruction of the bank.
2014	• Management of Balala taken over by RD.
2019	• Well below average rainfall for the previous 2.5 years; 7 of the past 8 years have had below average rainfall.

[13] https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=2540042

Attachment B

Patterns of annual rainfall derive from modelled monthly rainfall data for Balala[14] showing standard deviations from the mean.



[14] Source: Bureau of Meteorology modelled 5-kilometre resolution rainfall data.

Acknowledgements

Shane Cridland provided the seasonal rainfall record from modelled annual rainfall data for Balala (Attachment B).

2020
BALALA STATION CASE STUDY
ECONOMICS REPORT

Prepared by RSM

Introduction

Balala Station is located near the Northern Tablelands in Uralla, New South Wales. The farm is a 1250-hectare grazing property with primary income derived from wool and a self-replacing super fine merino flock. Richard and Sarah Daugherty have owned and managed the farm for eight years.

The property has been farmed since the 1830's and was farmed as a set stock grazing operation using perennial native grasses. This had resulted in a farm with ageing and outdated infrastructure and land that was considered unable to sustain grazing rates as a profitable "going concern". In a short seven years, Richard and Sarah have invested significantly, building 40 paddocks out of the original 6, digging an additional 17 dams, and installing water reticulation. They have trialled and adopted technology to provide them with information and data to make decisions, including individual EID's for animal management, soil testing and monitoring. The farms now faces drought conditions and the Daugherty's are adjusting and managing stocking rates to mitigate reduced rainfall.

From an economic perspective, the financial statements do not illustrate the real story of the farm's evolution and financial performance. Significant capital investment into the property's infrastructure has occurred, made possible for the Daugherty's due to the availability of off-farm income. The infrastructural transformation of this property is significant, this case study illustrates what is achievable when transforming farm infrastructure to support regenerative practices and how viable a business that responds resiliently and effectively to drought can be achieved.

This economics report will review the business challenges Richard and Sarah have faced with managing income and cash flow, while undertaking significant capital investment on infrastructure, building stocking rates and rehabilitating the land. This report will outline lessons learnt and provide insights into the decisions made to develop the farm infrastructure and balance investment and cash flow.

Overall, the risk profile of the farm business has improved substantially in the past 8 years - largely due to a strong focus on outcomes and goals; and relentless drive and hard work to build infrastructure and implement the sustainable and regenerative practices.

The Journey

"Farming with nature and not against it." Richard Daugherty

The journey that Richard and Sarah undertook to build their business was challenging. Richard initially leased the property for three years, which was an opportunity to "*not be able to go in like a bull in a china shop and buy stock - spend, spend, spend"* but gave him valuable time to work off farm on neighbouring properties learning husbandry and rural skills, focus on attending courses and education and most importantly *"Seeing the seasons, feeling the land and understanding the difficulties."*

By the time the lease was completed, and Richard and Sarah were able to commence operating their new sheep and cattle business, Richard had developed very clear plans around the farming methods to be implemented and the infrastructure for the property. Key to this was his farm plan, which included significant capital works:

- Creating 10 ha paddocks to optimise planned grazing goals, and provide management options and flexibility to manage stock
- Building 17 deep dams for water accessibility and management
- Revitalising farm infrastructure including wool shed and stock yards

Implementing this plan has been difficult to manage financially and during this program of improvements it has often been a struggle to balance investment, debt and expenditure. As Richard has stated *"A couple of years ago juggling between working cash flow capital spending got into the pointy end and was very stressful trying to figure out how it all would work but we got there in the end, luckily".* Richard was able to seek alternate income sources to sustain capital investment through:

- **Lease Income** – property was leased for 3 years.
- **Grants** – Successful application for "Caring for our country" Landcare grant to fund off creek watering points and more recently have received drought funding grants to further develop infrastructure.
- **Off farm income –** Sarah is employed off farm**.**
- **Diversification –** Sarah has co-established "Red 8 Produce" a mobile abattoir business which provides alternative revenue.
- **Business Loans –** To purchase breeding stock to rapidly increase capacity.

Lease income was largely invested in initial capital infrastructure, which set up the platform in which to operate. This left limited funds to buy breeding stock, and was supplemented with a business loan to more rapidly build stock numbers to generate subsequent revenue. Grants provided some supplemental income for infrastructure works such as water reticulation. During this period, income was under-pinned by Sarah's off farm employment.

The following table outlines the "past, current and future" state of the business and the property and illustrates the rapid development and infrastructure implemented, along with the vision for the future.

Past/Current and Future State Resources – Evolution of Balala Station

Criteria	2011 "Past State"	2019 "Current State"	2025 "Future State"
Infrastructure Fixed Assets Machinery/ Equipment	6 paddocks 2 dams 0 reticulation systems Ageing and outdated infrastructure St John's Wort weed issues Set stock grazing practices	40 paddocks 17 dams 15kms reticulated water points Upgraded on farm infrastructure as above, also upgraded stock yards, restumped wool shed Water management measures / infrastructure e.g. erosion control measures to slow water Soil management e.g. liming, chicken manure, soil balancing	80 paddocks 17 dams Increase reticulated water points Land management using natural sequence farming principles, rehabilitated water cycling through the landscape Fenced deep water dams to protect stock
Finance Income Debt Cash Flow	Farm leased to provide income source, 0 production Reliant on income from off farm employment Cash flow challenging and reliant on loans, grants and other income sources to stay operational	Stocked 60% DSE Cattle and Sheep Less reliance on off farm income Diversity of farm income from initiatives such as Red8Produce business Cash flow continues to be challenged by drought conditions, but adapting	Reduce ongoing capital investment, mature the business Reduced debt Ongoing cash flow for re-investment, sustainability and profitability
Production	DSE 6,000 or 2 DSE/AC 0 production (farm leased)	DSE 2,680 or 1-0.8 DSE /AC (has stocked at higher rates but reduced due to drought)	2.5-3.0 DSE / AC 60% of DSE based on average rainfall of 795mm
Workforce Capacity and Capability	No lived Australian farming experience Limited agricultural education	Practical, lived experience Ongoing informal and formal education	Capable and experienced Ongoing and increasingly formalised education
Information Technology Capability Infrastructure	Internet Trial and testing	Monitoring, automation Farm financial and stock management	Individual animal monitoring and management with a holistic, whole of farm perspective.
Farm Risk Resilience Sustainability	Medium-High	Low- Medium	Low

'Key Learnings'

Education and Training

For Richard, attending training courses has given him a sound theoretical understanding of agricultural production, farm management economics, natural resource systems, and using financial information to measure business performance. Business management education has been highly beneficial in developing his understanding of infrastructure spending and where he should focus efforts. Courses that Richard has attended include:

- Farm Planning by the local Catchment Management Authority
- Field Days
- Lifetime Ewe Management
- Bred Well Fed Well
- Ramping up Repro
- Prograze
- Agro Ecology
- Master Tree Grower
- MLA Business Edge
- Holistic Management

Additionally, Richard and Sarah have engaged with university research projects, including National Environmental Science Program (NESP), Bell's turtle project, Regent honeyeater project, and dung beetle studies with University of New England PHD students.

More recently, Richard has been engaged with a regional benchmarking group to develop and has established performance measures to support operational improvements.

Key Successes

- Being open to all learning opportunities and actively pursuing quality courses and education, within budget.
- Connecting with experienced farmers through field days and groups.
- Connecting with the latest research and development in the sector on sustainability and land management.

What would you do differently?

- Undertake larger, higher cost farm business management courses earlier, and invest both more money and time up front in finance, business, and farm practice courses. Richard reflects that "*Years later when the Rural Assistance Authority offered a 50% rebate on education, I then did a Holistic Management course, an MLA Business Edge course and I strongly recommend that I should have done these first up, the savings would've been more effective than the losses incurred from not having done them.*"

Goals, Planning and Outcomes

"One has to be fluid in this environment … so for me the focus on growing grass from the soil up is what my focus needs to be. Our seasons are too variable and having resilience in the environment is what will get you through these difficult times." Richard Daugherty

One of the keys to developing this business successfully and sustaining the rapid infrastructure development is that Richard and Sarah have been focused and goal oriented. At the beginning, they developed detailed farm plans that captured the ambitious level of capital infrastructure development required to deliver their vision of farming using holistic and regenerative principles.

Key Successes

- Living on the land without farming it, while it was leased for three years, gave Richard and Sarah valuable time to learn, plan and prepare.
- Have a detailed farm plan that explicitly detailed the infrastructure requirements. In addition to being a document that focused their thinking and effort, it meant opportunities such as ad-hoc grants or other income sources could be taken up immediately.
- Managing the farm with the long-term vision of holism and sustainability, meant that adapting to challenges did not compromise the end goal.
- Having the outcome clearly outlined, meant that they could be resilient through periods of financial difficulty, be flexible, acknowledge mistakes and adapt as needed.

What would you do differently?

- Infrastructure building was dependent on cash flow and Richard's time, as he was the main worker. Having an ambitious plan was frequently challenged by the realities of farming in Australia - weather, poor seasons and harder country. This affected decisions around how and when works were constructed. *"In hindsight the reticulation would have been better done before the fencing but that's just how cash flow happened."*

Infrastructural Spending and Cash Flow

"Doing it again I would certainly look at spending the money and do courses around finance / business and farm practice one wanted to achieve. It is about getting turnover and gross margins which helped with cash flow and working capital, bumbling along the bottom was stressful. But in saying that it also becomes frustrating if infrastructure like fencing and water isn't in place to be able to operate how one needs too. A bit of a double edged sword…" Richard Daugherty

The infrastructural investment into the property has been significant – both in capital and Richard's physical labour. Capital works include:

- Separating the riparian areas and establishing off-creek watering points
- Establishing 17 dams and 15 kms of water reticulation and troughs
- Substantially increasing the number of paddocks on the property from 6 to 40
- Upgrading / updating stock yards and wool shed
- Improving soil through liming, chicken manure, and soil balancing

Sustaining the cash flow to fund the infrastructural works and balancing operational requirements has probably been the greatest challenge faced by Richard and Sarah since taking on Balala Station, and the pursuit of cash flow has driven many operational decisions. For example, Richard initially thought that he would be able to increase revenue by increasing breeding, however this proved to be a slow and difficult process. He made the decision to seek a business loan which he used to buy stock and rapidly increase the running capacity.

Balancing the requirements to build stock numbers and quality (through investment and breeding) and invest in capital infrastructure to support the soil and water management has resulted in a more resilient property. This is best illustrated by the sustainability of the operation through the recent drought conditions.

Key Successes

- Sourcing grant funding for capital investment such as Caring for Our Country Landcare Grant
- Having infrastructure completed in order to implement changed business operations
- Flexibility in managing stocking rates such as being able to join all livestock groups as a single mob when increasing paddocks and then split up the herds to manage stock as required eg. single sire matings, lambing paddocks, weaning paddocks, maiden heifers.

What would you do differently?

"In hindsight should have looked at the low hanging fruit first and used capital to reduce the mortgage loan and set money aside to have been able to buy stock to set up the business. This generates cash flow which then could have been used to do capital infrastructure works." Richard Daugherty

- Paid down more debt earlier
- Enabled a greater proportion of infrastructure spending to be funded out of farm profit rather than going into additional debt

Technology

Richard has avidly been adopting technologies since he began managing Balala Station. Richard states *"Every year trying to do something different and improve the present. If mistakes aren't being made, then not challenging and trying new things or ideas"*. Richard uses technology to achieve his holistic goal and direction of having a regenerative and sustainable farm business. Technological innovations that Richard has adopted include:

- Livestock genetics ASBV
- Flock profiling
- Stock Books
- Farm4Map
- MAIA Technologies
- Agriweb
- Pasture Cropping
- Decipher

By trialling many different technologies, Richard is able to analyse and monitor data to understand what changes occur and what technologies are improving his management regime.

Key Successes

Richard has taken a "test and trial" approach to technology and has adopted innovations as they have proven useful to the business. Some innovations such as drone technology have not proven valuable and have been replaced with tools such as Decipher.

- Having access to information and data to enable decision making
- Reintroducing water cycling into the land and being able to measure the results and effects of intervention.
- Learning how to stimulate biology and production without the use of chemical fertilizers

Risk Profile

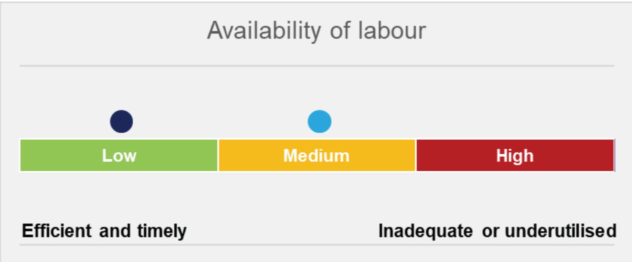
The balance sheet and profit and loss statements disguise the real health of Balala Station's business. There are many measures of success when evaluating properties. The risk profile of the business has consistently reduced, in line with the development and move towards regenerative agricultural practices and sustainability. Long term, the business is better positioned to manage the ongoing risks faced by the agricultural sector and is more resilient.

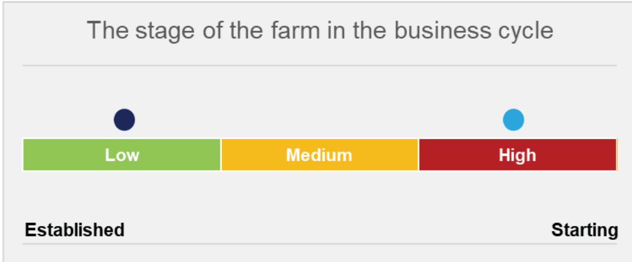
The graphs below illustrate Balala Station's level of risk: which has transitioned overall from Medium to High to Low-Medium.

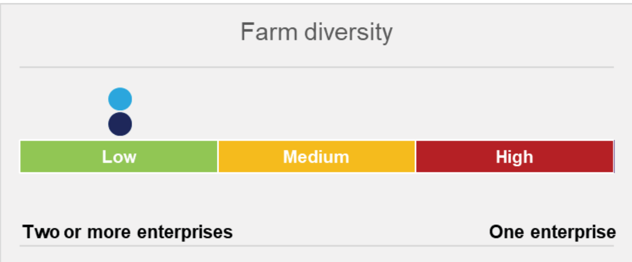
Risk Assessment Balala Station

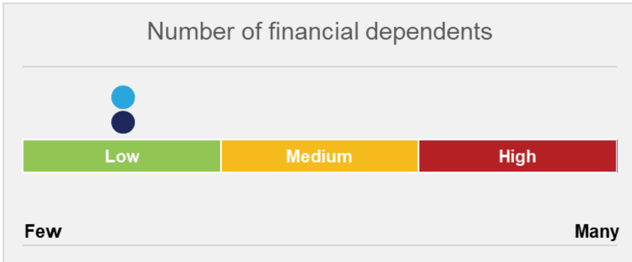
Past State - 2011
Current State - 2019

Operational indictors

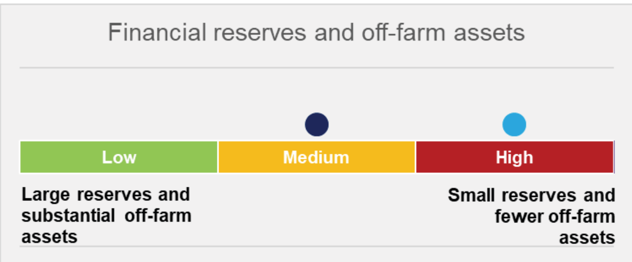


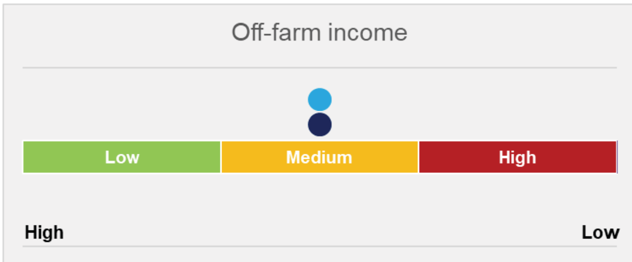


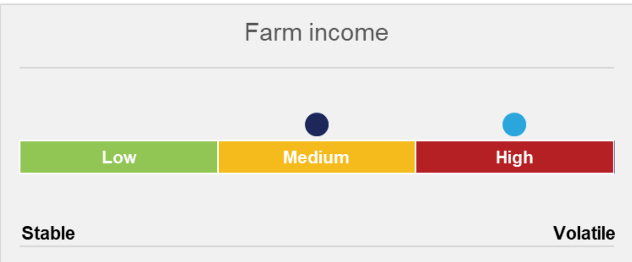


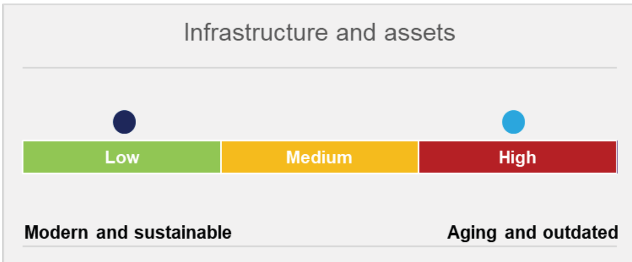


Financial indicators









Conclusion

This case study illustrates that from an economic perspective, substantial infrastructural investment can be made on a property – with off farm income assistance – to develop and implement regenerative practices. Richard and Sarah have overcome significant challenges to get to this point, but are building a sustainable, regenerative and resilient business that is poised to thrive for the future.

The key elements required are:

- **Planning ahead:** analysing the farm's business performance, being financially prepared for future challenges, knowing where to assign expenses and budgeting.
- **Research and education:** having a sound theoretical understanding of agricultural production, farm management economics, natural resource systems and using financial information to measure business performance.
- **Understanding debt and profit:** understanding debt and business management and where to invest to gain profit, better investment strategies and debt management.
- **Valuing land and people:** *"We are farming with Nature and being connected to the land is extremely important. It has enabled a community engagement, academic research connection and very rightly a sense of giving back. We need to manage our lands for all species and not just focus on extractive practices." Richard Daugherty*
- **Confidence to change:** having developed business skills, managing farm finances and stock, and lowering risk profile.

2020
BALALA STATION CASE STUDY
SOCIAL REPORT

Prepared by Matthew Bolton and Mark Parsons

Aim

This *Social Report* for Balala Station will look at the transition process undertaken by the Daugherty family in their adoption and implementation of the principles and practices of regenerative agriculture. It looks at the impacts on family and community and the journey of the decision makers making the transition. It will identify and describe the relationships at the time the decisions were made to make the necessary changes, and the key decision makers involved in the discussions.

Background

This is the story of Richard Daugherty, his wife Sarah Burrows and their two children. It outlines the transition from a non-farmer in Southern Africa to a regenerative farmer in Australia.

Richard grew up in Southern Africa and always liked the outdoors. His early work involved wildlife management, geology, business and construction management. This work became too much indoor-focussed for his liking so he set up his own safari company in Botswana and later ran a horse-trail safari business in Kwazulu-Natal province, South Africa. Understanding and communicating savannah ecology to the public was integral to the success of these businesses. For example, Richard had observed large herds of herbivores at close hand, including their role in the wider ecosystem.

While running a safari business was exhausting, it was also exciting and rewarding to be able to observe nature in the wild and meet a wide range of people. Photographing wild animals and selling prints to tourists was a sideline that satisfied Richard's creative urge for a while and in the off seasons he was able to travel to many places around the world. Through his school and business networks, he met some of the key players in holistic management and regenerative agriculture, such as Ian Mitchell-Innes[1], Allan Savory and Stan Parsons, and absorbed many of their ideas.

In Southern Africa, he met Sarah, an Australian. They married and began a family. The 24/7 work schedule was less practical in these circumstances, so began a search for a more settled lifestyle.

Forming the Vision

Richard had long harboured the ambition to become a farmer as he felt this would incorporate his desire for productive and creative outdoor work and Sarah agreed that farming would provide a settled lifestyle for raising a family. From Richard's early exposure to the advocates of rotational grazing and Sarah's commitment to clean and green products, seeking to run a farm along regenerative lines was a logical step.

For the two years, Richard read the international literature on ecology and regenerative farming

[1] https://holisticmanagement.org/certified-educators/ian-mitchell-innes/

practices. When he read Alan Savory's book[2], he understood the similarity of the rotational grazing approach to the situation of wild animals roaming in southern Africa. Further readings on holistic management in farming enterprises encouraged him to think about prioritising his values and spending more time with family was a key holistic goal.

From a blank canvas and early uncertainty, Richard and Sarah agreed on a number of criteria for selecting a farm. (Their children were 3.5 and 7 years old at this stage, so did not actively engage in the decision-making.) These criteria included that the farm had to be within a reasonable radius of an education centre (and not the School of the Air),and the area, rainfall and land types of the farm had to sustain a family. They began searching for farms in Southern Africa, but the political situation was judged to be too insecure over the long term. Australia beckoned and the criteria were refined. From climate records and other sources, the eastern seaboard of Australia was deemed to have the most reliable rainfall and reasonable soil, but climate change predictions for Victoria were on the dry side. Richard and Sarah sourced viable farm sizes from ABARES[3] publications.

Richard and Sarah visited Australia in late 2010 and looked at properties in eastern NSW and found that properties of suitable size in the Bathurst district were too expensive because of the proximity to Sydney[4]. The New England region seemed ideal. They inspected a number of properties there and while there attended a Soils For Life sponsored field day on Tim Wright's property, *Lana,* near Uralla. Tim was a successful farmer committed to regenerative agricultural principles and practices and to the methodology of Holistic Management. Given the coincidence of views, Richard was a willing recipient of Tim's advice, which included a suggestion that Richard and Sarah consider purchasing the neighbouring property, Balala.

Richard and Sarah liked Balala - it had a fascinating history (see Narrative Report), "good bones" and potential for applying regenerative practices. Richard was confident that rotational grazing could be applied successfully at Balala. The farm was in really good condition at the time (Photo 1) after a run of good seasons and good pasture growth on the destocked property and they agreed to purchase the farm. In the establishment phase, it was agreed that Sarah (and Richard, if necessary) would earn off-farm income to provide financial security for the family.

As their assets in South Africa needed to be sold, they took out a mortgage to purchase Balala and hence the transition process had begun and a point of no return was reached.

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[2] Savory, Allan; Butterfield, Jody (1999) *Holistic Management: A New Framework for Decision Making.*2nd Edn, Island Press. *ISBN 978-1-55963-488-5.*
[3] Australian Bureau of Agricultural Resources Economics and Sciences
[4] Sarah's family lives in Sydney.

Photo 1 Balala Station in a good season (January 2011)

Reality

The bank therefore became a key stakeholder in the Daugherty journey. It mandated that for the first three years, the property must be leased (agisted) and that repayments begin immediately.

Soon after returning to South Africa, Richard and Sarah made the necessary migration arrangements, packed up the household and moved the family to Australia. They took up residency at Balala in late 2011. However, sale of their assets (business and real estate) took another 18 months from purchase date and this put pressure on cashflows. Eventually their sale effectively completed the point of no return in their journey.

As planned, Sarah undertook off-farm work to assist with cash flow and she now has a management role at the University of New England (UNE), Armidale. Richard worked off farm as well during the first couple of years and suitable schooling arrangements were made in discussion with their children.

Now Richard runs the farm, whilst Sarah is effectively an investor in the venture. The first 3 years of leasing the farm consolidated the family's resettlement, but were also somewhat frustrating. With only 6 paddocks, the bank's dictates effectively called for continuation of a conventional grazing regime on Balala and caused a delay in their ambitions for a regenerative regime.

During the leasing time, Richard began exploring the characteristics of Balala's soils and pastures and found that advice from agronomists was contradictory. This motivated Richard to evaluate advice, try things out and observe results for himself. He continued (and continues) to learn about agriculture (both conventional and regenerative) from reading, courses and advice from scientists, practitioners and others. He is a "joiner" of farming and other community groups, such as the Southern New England Landcare and NSW Farmers. He also has strong links to the University of New England, which in turn has long-term links to the Balala location. These interactions have enabled a two-way flow of information on improving management.

On completion of the lease in 2014, Richard was able to get stuck into improving the farm infrastructure in preparation for rotational grazing. Some lessons were learned at this stage, principally that too much capital was being spent too early on fencing and watering points (See photo in Narrative Report). Some of that capital was needed to purchase stock to generate a cash flow. Richard regrets that he did a course in farm finance after this stage, when it would have been very useful beforehand.

Richard and Sarah obviously survived those hiccups and Balala now has nearly 40 paddocks. Sheep and cattle herds were gradually built up and these are grazed in mobs, rotationally, across the farm which enables pasture recovery. In addition, each paddock is completely spelled for a year, on a seven year cycle.

Richard also attended a soil balancing course at the local TAFE which included the ideas of William Albrecht. He then began to improve soil tilth and fertility by liming 70 ha and applying chicken manure and MAP was applied to improve phosphorus levels, with humates also added to avoid side effects and promote soil microbiological activity.

Despite the above practices, which some might consider “out there”, Richard is also open-minded to adopting best practice from conventional agriculture. He has implemented ear tagging[5] on the cattle and closely follows the genetics of his sheep flock via ASBVs[6]. This has proved to be highly beneficial to the cashflow of the enterprise. The buying and selling sheep beyond a core group of breeders is now profitable along with wool sales, and buying and selling cattle is a bonus.

[5] https://www.mla.com.au/meat-safety-and-traceability/red-meat-integrity-system/about-the-national-livestock-identification-system-2015/tagging-livestock/#
[6] http://www.sheepgenetics.org.au/Getting-started/ASBVs-and-Indexes

Photo 2 Balala Station well into the current drought (December 2018)

The mixture of practices outlined above has led to a “new normal” on Balala. Rangeland scientist, Professor Whalley from UNE visited Balala in 2016 and proclaimed that he’d never seen the property in such good condition in his many years of visiting (see Photo2),

The ‘new normal’ for family life included their children making friends and being educated while Sarah set about developing a business for herself. In conjunction with her business partner, Anita Taylor, Sarah is setting up a mobile abattoir business to offer meat from free range animals that are hormone free, antibiotic free and not subject to the risks of live animal transport. Another validation of the new normal was Richard’s 16 year old son, who is studying an agriculture subject at school, wondering why all farmers don’t practice regenerative agriculture.

Richard has a number of improvements in mind for Balala, for example, hydrating the landscape according to the ideas of Peter Andrews and the Mulloon Institute, and renovating pastures on the creek flats. Other ideas include the slowing of water on hillsides to improve infiltration, carbon farming[7] and niche marketing of his produce[8]. However, he is in no hurry for a couple of reasons, including the protection of cash flows (as above). Since 2016, a series of extremely poor seasons has plunged the whole of New England and elsewhere into a severe shortage of feed and Balala has not been immune from this drought (Photo 3).

[7] Once he has evaluated costs, risks and benefits.
[8] For example wool via Organica and meat via Sarah’s company Red 8 Produce.

Photo 3 Drought on Balala (August 2019)

Richard is forever an optimist (Photo 4) but continuing improvements will hopefully increase the resilience of the enterprise to drought. He is drawing on his early work on estimating wildlife carrying capacity, expert advice and his own observations to aim for a baseline 50% stocking rate, with increasing or decreasing numbers from there, based on seasonal quality.

Photo 4 Optimism in the midst of a severe drought.

The 'new normal' doesn't yet match the original vision for a couple of reasons. The costs of implementing rehydration and improved pastures need to be spread over several years and the current severe drought has slowed this transition. An important disappointment is that the lifestyle is still 24/7, with not enough time for family and none for travel. After eight years, this needs fixing, so Richard is exploring cost-effective ways of managing the farm for a few weeks while he takes the family back to South Africa to meet with their extended family.

The family are happy to have a solid home base, but want to follow their own paths in life. It's too early to tell if the next generation will take over the farm. In the case of Richard, he has more to do and is highly motivated to achieve his vision. He and Sarah would do it all over again.