

2019

## THE GLENELG STORY

Prepared by Matt Bolton and Greg Hosking



### Introduction

This is a common story in the history of Queensland farming, one of innovation and perspiration, against a backdrop of marginal country, enduring droughts and wide open spaces. It's a story of persistence, resourcefulness and resilience, self-sufficiency, acute observation of nature, the adoption of practical and cost-effective innovations and resilience to drought and floods.

Soils For Life has chosen Glenelg as a case study because it presents strong arguments for controlling total grazing pressure, conservative stocking rates, maintaining high levels of ground cover, promoting improved soil condition through prevention of soil erosion and enhancing soil hydrology, improving the capture and retention of rainwater and overland surface flows for improved pasture growth.

### One Chain and Two Bulldozers...

In line with State Government extension advice at the time, large areas of Glenelg were cleared of woody vegetation by pulling a chain between two bulldozers from 1978 to 1981. This practice was used again in 1989 and continues to be used when needed to control regrowth and promote pasture development. Over time these practices helped make the property a viable and profitable grazing operation. Glenelg can be compared with many other properties in similar landscapes in Queensland and New South Wales where “woody weeds” have rendered much of the landscape suitable only for free ranging goats.

Without appropriate land management, grazing operations in this landscape can lead to signs of desertification, including the encroachment and thickening of woody vegetation with reduced ground cover from more open and productive areas with higher levels of ground cover. The Chambers’ saw an opportunity in this landscape to develop a grazing enterprise based on conservative stocking rates particularly in droughts, reducing grazing pressure, controlling incursions of woody vegetation, developing a perennial pasture using Buffel grass (*Cenchrus ciliaris*) which in turn reduces soil erosion and improves the capture and retention of rain water and overland surface flows. Maintaining a healthy and productive grass sward has also led to a noticeable increase in grassland dependent bird species.

### The Property

Glenelg, near Mungallala, comprises approximately 4,000 hectares (10,000 acres) in a semi-arid part of Australia with pastoral activities being the dominant land use. Rainfall averages 504 mm / year with wide variations in calendar years and most rain falling in the summer months. The dominant (pre-European) vegetation types were Poplar Box, False Sandalwood, Wilga and various acacias, notably Mulga, Bendee and Bowyakka. The property carries sheep and cattle, with kangaroos contributing to total grazing pressure.

### Establishment of the Property

Harry Chambers acquired the first land parcels in 1970 when half of the property was covered with thick woody vegetation. Initially, “Glenelg” was able to carry only 27 head of cattle. Woody plants were controlled over limited areas by ringbarking and later herbicide treatments. Further parcels were acquired over the decade, providing scale for Glenelg to become a viable enterprise by 1978, when it carried 200 head of cattle and 4000 sheep.

Despite the collapse of the wool market in 1991, the Chambers persisted with wool growing.



Figure 1: *Acacia catenulata* (Bendee) thicket.

During the 1980s cattle was lost due to poisoning by *Pimelea* (probably *P. trichostachya* - Flaxweed, Spiked Riceflower). The introduction and maintenance of good ground cover was found to control the problem and by the late 1980s, following several years of spreading seed, Buffel grass became well established over much of the property. The use of Buffel grass is in line with existing pastoral practice across large areas of northern and arid Australia.

A potentially controversial practice in the mid-1980s was the removal of trees along the creek to raise the water table – this aimed to hydrate the landscape by reducing evapotranspiration of trees. This practice, and the 1990, 2010 and 2012 floods, resulted in Mungallala Creek having several permanent waterholes, which had previously been intermittent. The practice of tree removal has now been restricted in most Australian jurisdictions because of the possibility in some landscapes, of salinity encroachment due to a higher water table, increased erosion and a loss of biodiversity. However, at Glenelg, these adverse outcomes are not apparent. An aquifer perpendicular to the creek contributes to the water supply and strong pasture growth is apparent in the riparian zone. The floodplain area was fenced off to control grazing when weeds such as Noogoora Burr grew in abundance.

## Partnership

In 1994, Graham and Jan Chambers took over the business after being in partnership since 1985, as grazing operations continued. The property was mostly devoid of trees by 1997. The need for continued control of regrowth was evident on inspecting a neighbour's paddock cleared of woody vegetation in the 1980s. Mid-storey shrubs such as False Sandalwood grow thickly, with no pasture apparent (Fig. 2). At present, parts of neighbouring properties are essentially locked up with dense thickets, impacting the growth of ground cover and biodiversity far than more open vegetation.





*Figure 2: Woody regrowth three decades after pulling.*

Around 2002 during the drought, kangaroos became a problem because the property’s permanent water holes and pasture enabled their numbers to build up. Wild dogs were also a continuing problem which was managed (but not eliminated) by hiring trappers and shooters. Around 2005, regrowth control became more effective and efficient with the use of a blade plough.



*Figure 3: Wildlife-proof fence. .*

Between 2014 and 2016, the Chambers constructed an exclusion fence (Fig. 3) around the property. Kangaroos were herded off the property before sealing the fence and the remaining population was controlled and maintained at a sustainable level. This has resulted in a dramatic reduction in total grazing pressure and improved maintenance of pasture cover. Parts of the fence across Mungallala Creek are hinged, so that the fence lies flat in floods and can be easily restored to vertical afterwards.

## A Sustainable Enterprise

Property improvements have doubled the carrying capacity of Glenelg to 8000 DSE. However, Glenelg currently carries only 5000 sheep and 200 cattle and this long-term practice ensures that sheep and cattle production remains resilient to drought conditions when compared to neighbours. For example, in the current (2013 to present) drought, all neighbours are hand-feeding or have destocked, while Glenelg has mid-calf high pasture on several paddocks (Fig. 4) and the business has posted a profit in five of seven drought years. Glenelg has maintained a higher than average ground cover level for their local district over a number of years (FarmMap4D-CiboLabs). This demonstrates the ability to store carbon in the soil with all its benefits, and reduce desertification - problems faced by many commercial wool producers throughout Australia.





*Figure 4 Buffel Grass Pasture*

Historically erosion by both wind and water is a common issue in the Mungallala district. Erosion occurs where bare ground is prevalent, especially during droughts. However, the Chambers have dealt with the issue by maintaining good ground cover levels across the property and appropriate control of total grazing pressure.

Clearing of woody native vegetation and the establishment of productive improved pastures are known to have adverse effects on biodiversity, however the presence of relatively high biomass

pasture provides shelter and food resources for grassland-dependent native species such as the Australian Bustard, Brown Songlark and Rufous Songlark. The property provides habitat for a diverse range of other bird species.

## Summary

This is a story of the persistence and resourcefulness of the Chambers family (Harry and later Graham and Jan) over five decades on Glenelg station, Mungallala. Today the property exhibits remarkable resilience to the current drought – even posting a profit in adverse circumstances. Property improvements over the years, combined with a conservative stocking rate, have together developed productive pastures. Management regimes have included clearing of dense woody vegetation, control of woody regrowth, establishment of improved pasture and the control of total grazing pressure through the construction of an exclusion proof fence. High functioning ground cover also provides an ongoing resource for the grazing operation and has led to noticeable improvements in water infiltration, a reduction in soil erosion and increased habitat for grassland-dependent biodiversity.

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## GLENELG CASE STUDY: SUMMARY ECOLOGICAL REPORT

Prepared by Greg Hosking and Matt Bolton

### Key findings

Glenelg is a 4000 hectare grazing property which has been managed by the Chambers family since 1970, located to the south of Mungallala, Queensland. This ecological assessment commences in 1970 which is the year Harry Chambers purchased the first parcel of Glenelg.

Glenelg has been managed under a conservative stocking regime for much of the Chambers management period. Since acquiring the first parcel of Glenelg in 1970 the Chambers have extensively cleared vegetation on the property and established ground cover species. Glenelg has been managed to produce pasture for production and to maintain the ecological health of the property for much of the Chambers management.

The graphical summaries displayed in this report are composed of 10 ecological criteria, the graphical summaries for Glenelg demonstrate that there is a close relationship between the land manager's goals/ideals and the ecological outcomes in each of the four phases:

Phase 1: 1970-1984	Conventional non-regenerative regimes and practices
Phase 2: 1985-2004	Intensive conventional interventions and small-scale trials of revegetation projects
Phase 3: 2005-2014	Transition to broader scale regenerative grazing land management regimes and revegetation projects
Phase 4: 2015-2018	Increasing maturity of regenerative grazing land management regimes and revegetation projects

An assessment over time of the responses to 10 ecological criteria shows that, by phase 4, compared with the previous three phases, most ecological criteria have been assessed as nearly fully achieved or having achieved their reference state (i.e. a scores between 0.8 – 1.0). For example:

- Minimising effects of extreme climatic events across the whole property and its place in the broader catchment, including preparedness for drought and floods.
- Managing pastures for production and to maintain ecological health of the property. Ecological changes include: improving the reproductive potential of pastures and maintaining high levels of ground cover across the property.
- Improving soil health and function. Ecological changes include: soil nutrients and soil carbon, soil hydrology, soil biology and soil physical properties i.e. soil as a medium for plant growth.



## Introduction

Glenelg is located 16 kilometres south of Mungallala, Queensland in the Maranoa Region. The average annual rainfall of Mungallala is 565 mm and it is summer dominant. Mungallala is 410 metres above sea level.

The first parcel of Glenelg was acquired by Harry Chambers in 1970, the final acquisition was made in 1978. Harry managed Glenelg with Graham from early 1980's with Jan joining in 1985. Graham and Jan took over Glenelg in 1994 and have been sole managers since then.

Glenelg comprises 4000 hectares with the original vegetation consisting of Poplar Box, False Sandalwood, Wilga and various acacias, notably Mulga, Bendee and Bowyakka. Much of the original vegetation was converted to Buffel grass pastures after acquisition.

After acquiring Glenelg, Harry Chambers ran 27 cattle on the property. In the years following acquisition, land clearing was conducted extensively across Glenelg to enable pasture growth. By 1978 Glenelg had 200 cattle on it, and the Chambers had started operating a merino wool enterprise.

Treatment of woody vegetation has continued to be carried out on Glenelg up until till 2018, the methods of treatment used have consisted of ringbarking, pulling, tordon herbicide and blade ploughing. The treatments have largely been carried out by the Chambers with machinery they own and repair.

In 1985 Harry Chambers cleared the large eucalypts from the banks of the Mungallala Creek which runs through Glenelg. Harry thought that removing the large eucalypts would raise the water table of the creek and enable water to be present in the creek year-round. Prior to this the Mungallala Creek would run dry each year. The treatments conducted by Harry Chambers were successful, water has been present in waterholes in the Mungallala Creek since 1985. To combat the issue of erosion damage occurring, the Chambers have maintained a high level of grass coverage on the banks of the creek. However, the process of clearing vegetation from waterways is contentious and carries the risk of increasing salinity.

In the 1980's buffel grass was established on Glenelg, Buffel grass is an African species of grass which is highly drought tolerant and nutritious for livestock. The establishment of buffel grass enabled the Chambers to sustainably increase the number of livestock on Glenelg. Roughly 4000 sheep and 200 cattle and 100 goats have been run on Glenelg consistently since the establishment of buffel grass.

Kangaroos and wild dogs have been the major issues facing the Chambers since the late 1990's. During the millennial drought kangaroo numbers on Glenelg increased dramatically due to Glenelg carrying pasture longer than the surrounding region. Wild dog attacks increased as well as much of the region moved from wool enterprises to cattle after the crash of the Australian wool market. In 2013 the issue of wild dog attacks on sheep and kangaroos exerting grazing were making operating a financially viable business on Glenelg near on impossible. To combat the problem the Chambers started constructing an exclusion/predator proof fence around the boundary of Glenelg. The Chambers erected the exclusion/predator fence themselves and completed the task in 2016.

Since the completion of the exclusion/predator fence in 2016 wild dog attacks have ceased. Kangaroo numbers inside Glenelg have also been controlled to a sustainable level, this has enabled the Chambers to control total grazing pressure and better manage their pastures for production and ecological health.

Glenelg has been drought declared since 2013, however they haven't had to supplementary feed their livestock since 2014/15. The exclusion/predator fence around Glenelg combined with their

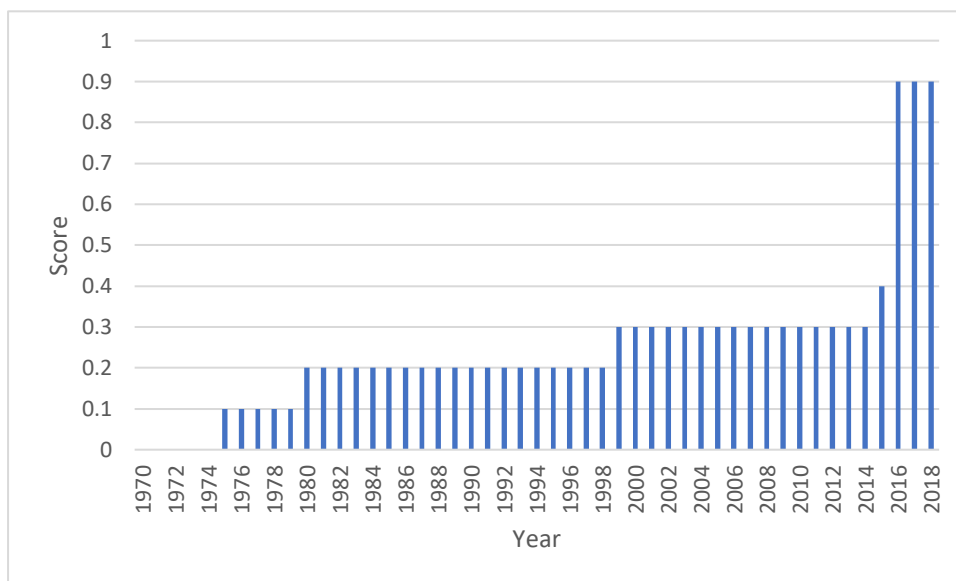
traditionally conservative stocking rate has largely enabled the Chambers to continue operating normally throughout the drought.

## Assessment of ecological and biodiversity outcomes

### Regenerating pastures and vegetated areas to minimise effects of extreme climatic events

The ability of Glenelg to withstand extreme climatic events i.e. drought, has improved since 1970 (Figure 1).

Clearing woody vegetation and establishing pastures has increased the ability of Glenelg to cope with drought since 1975. The construction of the exclusion/predator fence in 2014/16 significantly improved the resilience to drought of Glenelg. The continued presence of water in the Mungallala Creek has also helped improve Glenelg's resilience to drought.

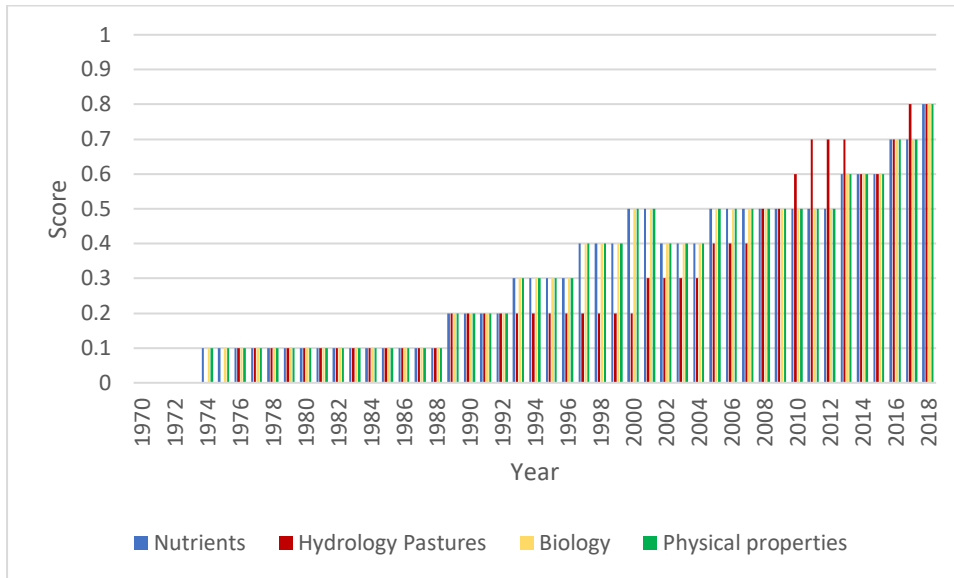


**Figure 1. Minimising the effects of the extreme climatic event - drought - in response to changes in land management regimes.**

### Managing soils to prevent erosion, restore eroded areas and to maintain ecological health, productive capacity and water quality

Soil indicators have improved significantly on Glenelg since 1970 (Figure 2). The improvement is due to the management practices undertaken by the Chambers. Upon purchasing the first parcel of Glenelg in 1970 the Chambers commenced a management plan to improve ground cover and pasture growth on Glenelg. The soil indicators are directly tied to the health of the ground cover. Ground cover provides organic matter to the soil, reduces erosion and improves the percolation ability of the soil.

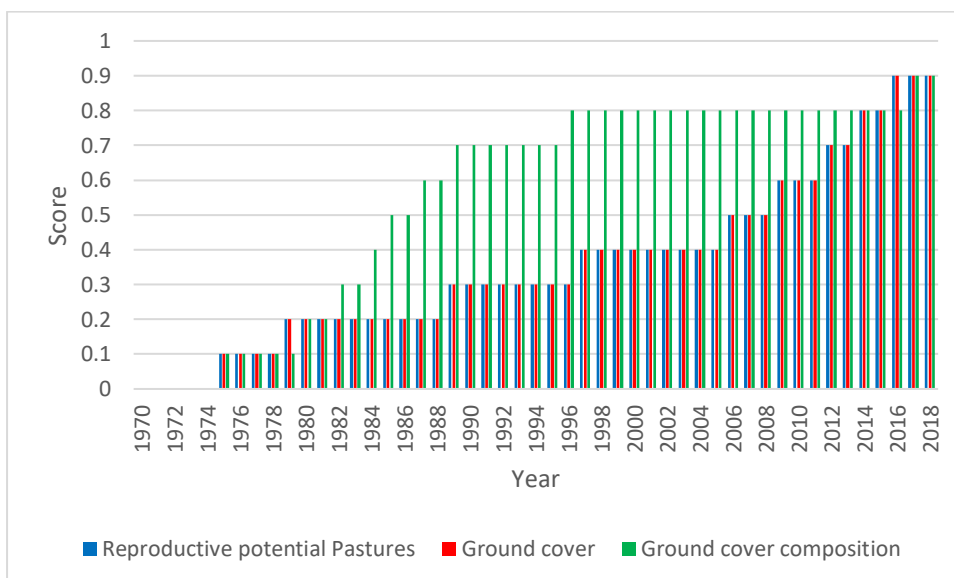
The Chambers have gradually improved ground cover across Glenelg since 1970, in the early years this coincided with the removal of woody vegetation and in recent times the completion of the exclusion/predator fence around the boundary of Glenelg.



**Figure 2. Status of soil indicators over time at Glenelg**

### Managing ground layer vegetation for production and to maintain ecological health

Prior to 1980 much of Glenelg was covered by dense woody vegetation, the presence of the woody vegetation stopped ground cover species from growing. The Chambers have conducted numerous woody vegetation treatments over the years to promote the growth of ground cover, due to these land management practices the number of ground cover species has increased significantly. The conservative stocking regime utilised on Glenelg and the construction of the exclusion/predator fence along with the woody vegetation treatments have significantly improved ground cover and its reproductive potential (Figure 3).

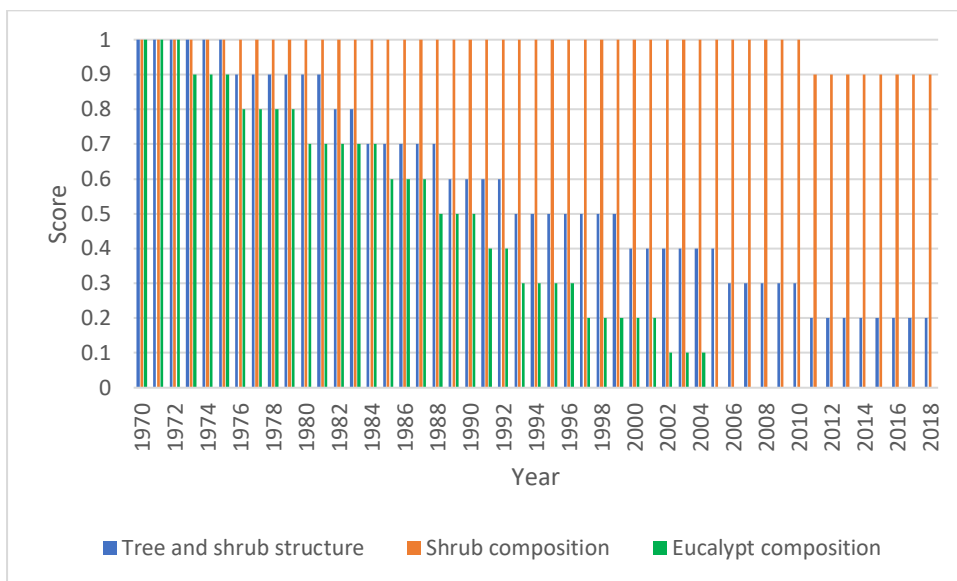


**Figure 3. Status of ground layer vegetation for production and to maintain ecological health over time at Glenelg**



## Managing trees and shrubs for production and to maintain ecological health of the property and watershed

In 1970 Glenelg was entirely covered by woody vegetation and was unsuitable for agricultural purposes. Since 1970 woody vegetation has been controlled on the property to enable pasture growth for production and ecological purposes. The tree and shrub structure and the number of eucalypt species on Glenelg have significantly declined since 1970. The number of shrub species on Glenelg has only marginally declined.



**Figure 4. Status of trees and shrubs for production and to maintain ecological health of the property and watershed over time at Glenelg**

## Managing natural watercourses, riparian areas, natural lakes and wetlands, to protect ecosystems that are sensitive to agricultural land management.

The major watercourse running through Glenelg is the Mungallala Creek. The Chambers have experimented with removing trees from the watercourse and replacing the trees with grass. This land management regime has raised the water table of the Mungallala Creek and resulted in waterholes holding water year-round. Water birds and fish are now present in and around the waterholes permanently. By maintaining a good coverage of grass along the banks of the creek erosion risks are mitigated.

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## GLENELG CASE STUDY: ECOLOGICAL SUPPLEMENTARY REPORT

Prepared by Matt Bolton and Greg Hosking

### Key findings

Glenelg is a 4000-hectare grazing property which has been managed by the Chambers family since 1970. Glenelg is located to the south of Mungallala, Queensland. This ecological assessment commences in 1970. The date reflects the year Harry Chambers purchased the first parcel of Glenelg.

Glenelg has been managed under a conservative stocking regime for much of the Chambers management period. Since acquiring the first parcel of Glenelg in 1970 the Chambers have extensively cleared native woody vegetation on the property and established exotic ground cover species. Glenelg has been managed to produce pasture for production and to maintain the ecological health of the property for much of the Chambers management.

The graphical summaries displayed in this report are composed of 10 ecological criteria, the graphical summaries for Glenelg demonstrate that there is a close relationship between the land manager's goals/ideals and the ecological outcomes in each of the four phases:

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An assessment over time of the responses to 10 ecological criteria shows that, by phase 4, compared with the previous three phases, most ecological criteria have been assessed as nearly fully achieved or having achieved their reference state (i.e. a scores between 0.8 – 1.0). For example:

- Minimising effects of extreme climatic events across the whole property and its place in the broader catchment, including preparedness for drought and floods.
- Managing pastures for production and to maintain ecological health of the property. Ecological changes include: improving the reproductive potential of pastures and maintaining high levels of ground cover across the property.
- Improving soil health and function. Ecological changes include: improved soil nutrients and soil carbon, soil hydrology, soil biology and soil physical properties i.e. soil as a medium for plant growth.

The transformation of Glenelg toward a regeneratively managed property has been achieved through a process of understanding landscape function and planning to manage the land accordingly. Consistent implementation of management ideals has enabled the land manager to reduce total grazing pressure on the property and to maintain water in their creek year-round.

In addition, the management of pastures to maintain ground cover and height has enabled many bird species to live and thrive on Glenelg. A field survey of birds conducted by Greg Hosking and Matt Bolton in December 2018 recorded 28 species of birds in a Buffel Grass (*Cenchrus ciliaris*) pasture. A species observed of particular note was the Grey Falcon *Falco hypoleucos*, the Grey Falcon is currently listed as “vulnerable” by the Queensland Government.

## Independent scientific assessment

An independent assessment of the land manager’s self-assessment across all 10 ecological response criteria supports information presented by the land manager.

This independent assessment examined a measures of ecological response found inside and outside the Glenelg property boundary: 1) ground cover.

An assessment of ground cover information for Glenelg was derived from a standardised national ground cover dataset (Landsat satellite using a 30m resolution) between 1990 and 2018. This ground cover analysis supports the graphical ecological summaries provided by the land manager, showing an obvious transformation in ground cover at Glenelg. In the 90’s and early 2000’s the property had consistently high levels of ground cover compared to neighbours. In the mid 2000’s Glenelg had mid-low levels of ground cover compared to neighbours, this was due to drought conditions and kangaroo incursions onto the property. In the late 2000’s and early years of the current decade ground cover levels rose and fell on Glenelg in relation to drought. In normal to high rainfall years Glenelg produced more ground cover than much of the surrounding region, in drought years kangaroos invaded Glenelg in high numbers and reduced ground cover levels. In recent years Glenelg has had an exclusion fence constructed around its boundary to control kangaroo numbers. Whilst Glenelg is still drought declared ground cover levels have risen on the property due to a reduction in grazing pressure applied by kangaroos.



This independent ecological assessment highlights the importance of a local land manager understanding, and planning for, and implementing well-informed land management regimes that aim to achieve sustainable ecological outcomes. These results support the conclusion that Glenelg is an outstanding example of understanding ecological function and managing for it in an agricultural setting.

## Assessing responses to land management regimes according to the ecological criteria

This Detailed 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.

Prior to undertaking a field visit to Glenelg in December 2018, the landowners, Graham and Jan Chambers, were asked to document the production systems that have been developed and implemented at Glenelg including land management regimes associated with the following: soil and vegetation condition (pastures, shrubs and trees); weeds and pests; surface and ground water and



animal production. That production history aimed to document land management phases which lead up to the current regenerative landscape management.

This included a collation of all relevant available published and unpublished ecological data and information about the farm and how it was managed (Attachment A).

## Assessment of Response Criteria

This ecological assessment commences in 1970 when the Chambers family purchased the first parcel of Glenelg.

### A. Resilience of landscape to natural disturbances – Drought/Flood Preparedness

#### ***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). A major natural disaster or natural disturbance event can occur at any time. Some disturbances give a warning, such as a wind storm 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***

Drought and flood are the major natural disturbance events affecting Glenelg.

#### ***Results and Interpretation***

Phase 1 extended from 1970-1984 and was associated with high density set stocking causing overgrazing and clearing land for pastures. Much of this phase was dedicated to establishing pasture species and controlling woody regrowth. Water infrastructure was underdeveloped and stock watering points were few and far between, the ability of the property to cope with drought was severely limited by these factors.

During this phase the fencing on the property was not designed to cope with flooding events, when floods occurred damage to fencing was costly and extensive as well as time consuming to repair. The risk of erosion due to flooding events was also high. The properties ability to cope with flooding events was low and they posed a severe risk to the enterprise.

In Phase 2 the land manager started low density set stocking. Pasture establishment of Buffel Grass was conducted throughout this phase. Buffel Grass is a highly drought tolerant species with sufficient nutrients for livestock. The establishment of Buffel Grass marginally improved the capacity of the property to cope with drought events. Water infrastructure was also improved during this phase.

In 1985 the land manager started clearing large trees from a section of creek running through the property. The land manager theorised that the trees were consuming much of the water available in the creek and causing it to run dry frequently. After removing the trees from the creek banks the land manager established a ground layer of grasses to stabilise the creek banks from erosion. Permanent water holes appeared in the creek after the trees were removed causing the water table to rise and provide water for livestock, fish and other wildlife year-round.

In Phase 3 the land holder improved water infrastructure on the property.

In Phase 4 the land manager constructed an exclusion fence around the property to control total grazing pressure applied by kangaroos on the property. The ability to maintain kangaroo numbers at a

sustainable level on the property greatly improved its capacity to cope with drought events. Livestock were grazed to maintain and improve ground cover levels during this Phase. The exclusion fence erected around the property was designed with areas that had the capacity to lay flat on the ground when pushed over by a flood event. This reduced the damage a flood could cause on the property.

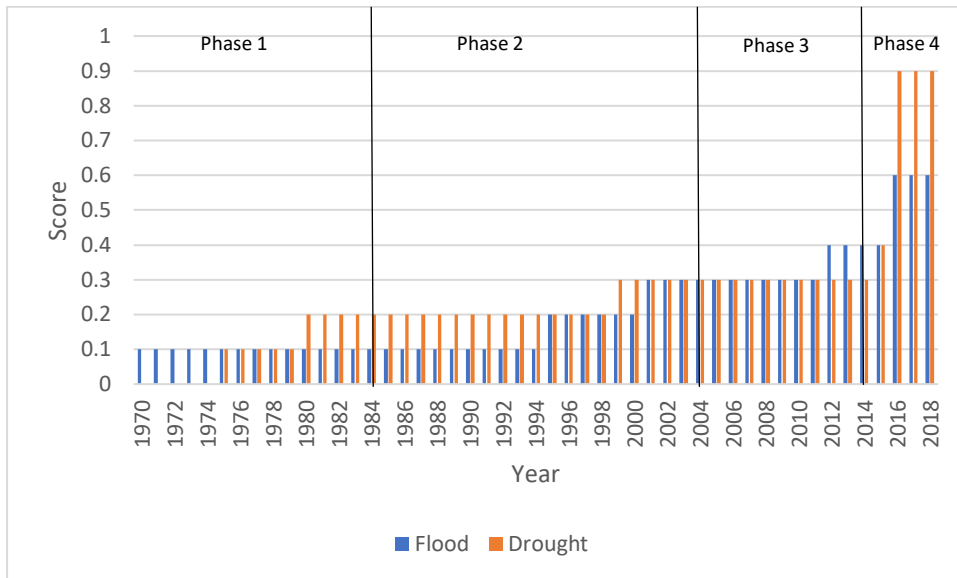


Figure 1. Resilience of Glenelg to severe climatic events- Drought & Flood.

## 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. Thus, SOM releases nutrients for plant growth, promotes the structure, biological and physical health of soil, and is a buffer against harmful substances.

### ***Assumptions and definitions***

Glenelg is situated within the Australian Rangelands (<http://www.agriculture.gov.au/ag-farm-food/natural-resources/vegetation/rangelands>), which is a low rainfall region with typically hotter and drier climate conditions. Due to the climate and the location and size of properties in the rangelands, soil testing and adding inputs such as compost to improve soil health have traditionally not occurred. According to the CSIRO maintaining and building a high ground cover level is critical to improving soil nutrients in the Rangelands.

### ***Results and Interpretation***

During Phase 1 the ground cover layer on Glenelg was being developed, at the time of acquisition the property could only support 27 head of cattle due to the lack of ground cover and the density of woody vegetation. Soil nutrient levels were low during this Phase due to a lack of regularly active photosynthesizing vegetation providing organic matter to decompose in the soil.

In Phase 2 the land manager successfully established a ground cover layer of vegetation. The presence of ground cover improved the soil nutrient levels of the property by providing a source of organic matter.

In Phase 3 the land manager maintained the ground cover layer as above.

In Phase 4 the land manager constructed an exclusion fence to keep kangaroo numbers at sustainable levels within the property. By managing kangaroo numbers, the land manager controlled total grazing pressure on the property, this improved soil nutrient levels on the property by increasing ground cover.

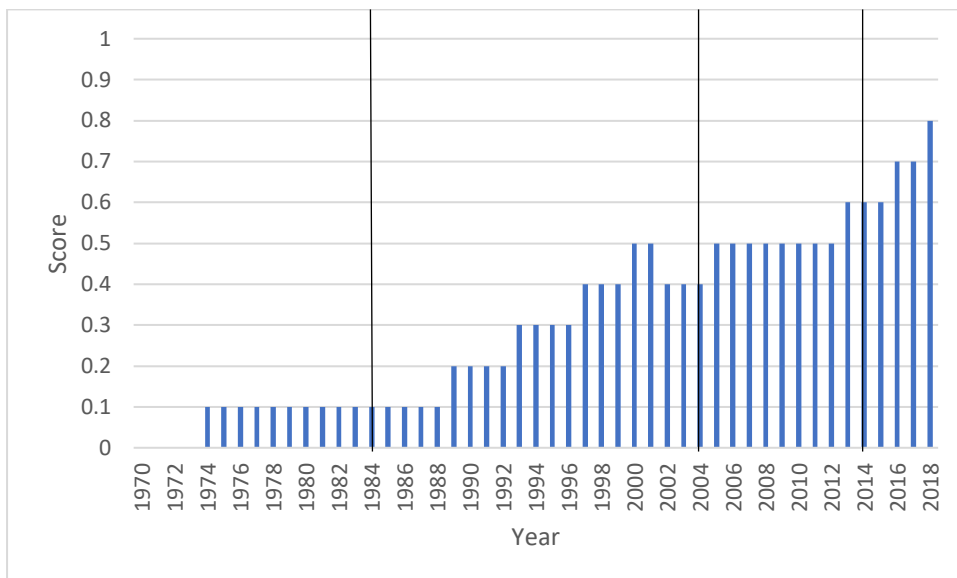


Figure 2. Status of soil nutrients.

### 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 ecological function.

#### ***Assumptions and definitions***

Ground cover was utilised as the key indicator of soil hydrology for pastures on Glenelg. Maintaining appropriate ground cover levels is essential for all the soil indicators within the Rangelands. Soil hydrology of the creeks of Glenelg was also assessed due to the innovative methods utilised on Glenelg to maintain water in their creeks year-round.

#### ***Results and Interpretation***

Phase 1 – as above.

In Phase 2 the land managers started clearing vegetation from the creek banks and established a grass cover on the banks of the creeks. Water holes in the creek were also enlarged due to major flooding.



In Phase 3 the hydrology of the pastures improved due to the maturation of the ground cover level and the improving physical properties of the soil enabling water infiltration. Development of the creeks continued in the form of maturation of the ground layer on the creek banks and further enlarging of water holes due to flooding.

In Phase 4 the hydrology of the pastures suffered from an excess of kangaroos combined with drought conditions. After the construction of the exclusion fence and the subsequent controlling of kangaroo numbers the hydrology of the pastures improved due to a better ground cover vegetation layer.

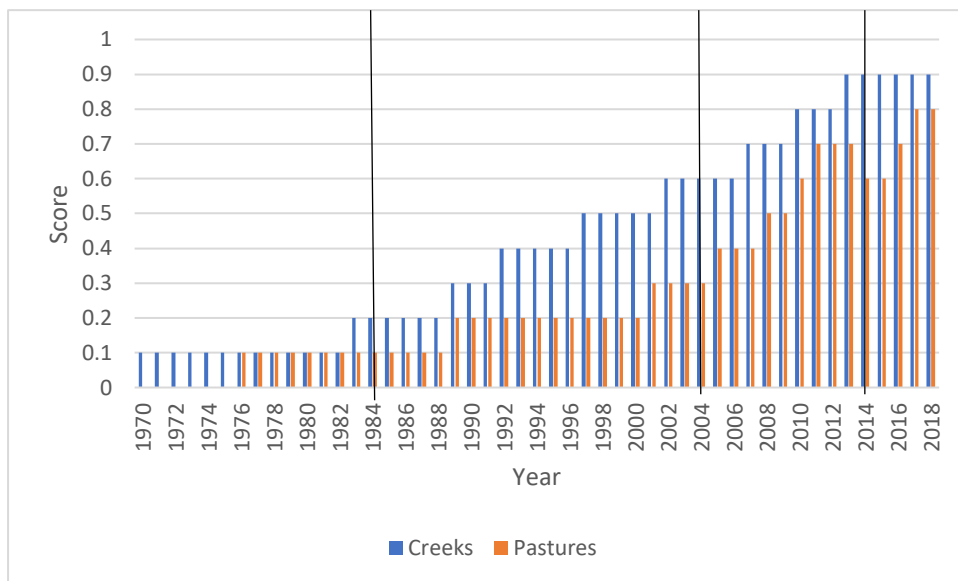


Figure 3. Status of soil hydrology – Creeks & Pastures.

#### 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's 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, invertebrates including arthropods and worms also form a vital part of a soil food web.

##### ***Assumptions and definitions***

Soil biology are reliant on plants to provide sugars as a food source. Groundcover layers were utilised as a surrogate to assess the status of soil biology on Glenelg.

### ***Results and Interpretation***

Phase 1- as above.

Phase 2- as above.

Phase 3- as above.

Phase 4- as above.

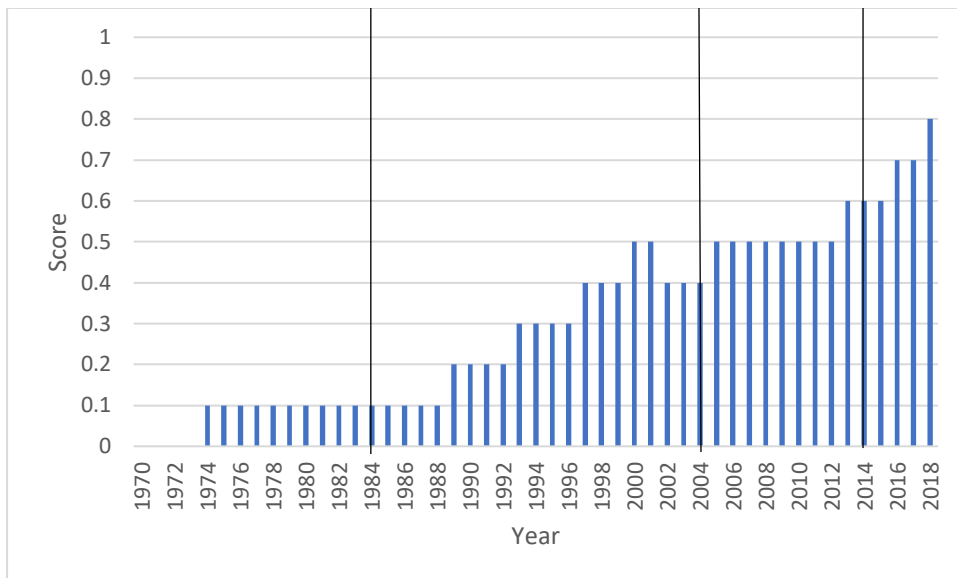


Figure 4. Status of soil biology.

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

#### ***Why track changes and trends in soil physical properties?***

Declining soil surface condition involves the depletion of nutrients, soil organic matter and of key elements of the soil biology from the soils. Soil degradation is the result of high levels of bare ground, water erosion, wind erosion, chemical and physical deterioration. It is often associated with unsuitable land management regimes. Over time loss of the soil's physical properties will have consequences on production, economic, other ecological criteria as well as social outcomes.

#### ***Assumptions and definitions***

The physical properties of the soil are closely related with over grazing. Over grazing reduces ground layer vegetation which limits the potential root depth of plants. Over grazing can also cause compaction resulting in reduced rates of water infiltration and a deficit of soil moisture.

### ***Results and Interpretation***

Phase 1- as above.

Phase 2- as above

Phase 3- as above.

Phase 4- as above.

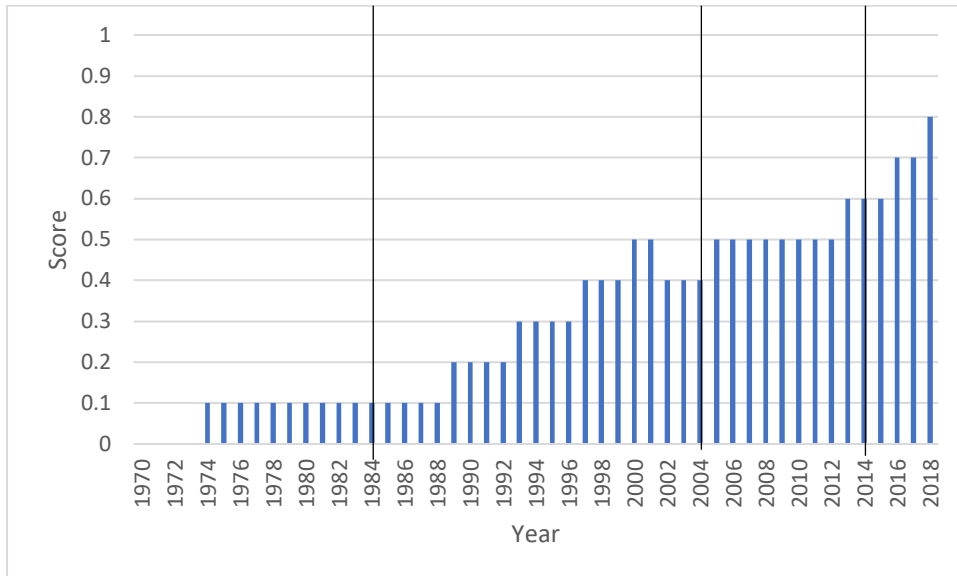


Figure 5. Status of soil physical properties.

## F. Status of plant reproductive potential – reproductive potential of pastures

### ***Why track changes and trends in reproductive potential of pastures?***

An understanding of successful reproduction, germination, establishment and development of plants is important in managing agri-ecological ecosystems. This understanding of successful plant reproduction is vital for the manipulation of planned production outcomes - e.g. grazing regimes can prevent seed-setting by undesirable or invasive plants and for increasing the longevity of perennial pastures before they need to be resown.

### ***Assumptions and definitions***

Reproductive potential is the relative capacity of a species to reproduce itself under optimum conditions, including trees, shrubs and grasses.

Overgrazing can limit the reproductive potential of pasture species, if species are constantly overgrazed they will not have a chance to produce and set seed. If pasture species are stopped from setting seed regularly species suffer and bare ground will become more prevalent. A major issue currently facing land managers who conservatively stock to maintain ground cover, is the number of kangaroos invading their properties. Kangaroos move through the landscape looking for pasture, particularly in times of drought when feed is scarce. Traditionally land managers have not had the capability or the infrastructure to stop incursions of kangaroos onto their properties. This changed recently with exclusion fencing products becoming widely available. Exclusion fencing has given the land holders the ability to control animal incursions onto their properties.

The reproductive potential of pastures was split into two categories, Buffel Grass and native grasses. Buffel Grass has been actively established on Glenelg due to its drought tolerance and nutritional content. In some areas on Glenelg native grass pastures have been replaced by Buffel Grass affecting their reproductive potential.

### **Results and Interpretation**

In Phase 1 woody vegetation had to be cleared to establish pasture species on Glenelg, native grasses replaced the woody vegetation in this Phase.

In Phase 2 buffel grass started to become established due to the management regimes of the land holder. The reproductive potential of native grasses declined when faced with competition from Buffel Grass.

Phase 3- as above.

In Phase 4 Buffel Grass had become firmly established due to the construction of the exclusion fence reducing total grazing pressure. The reproductive potential of native grasses also improved due to the exclusion fence.

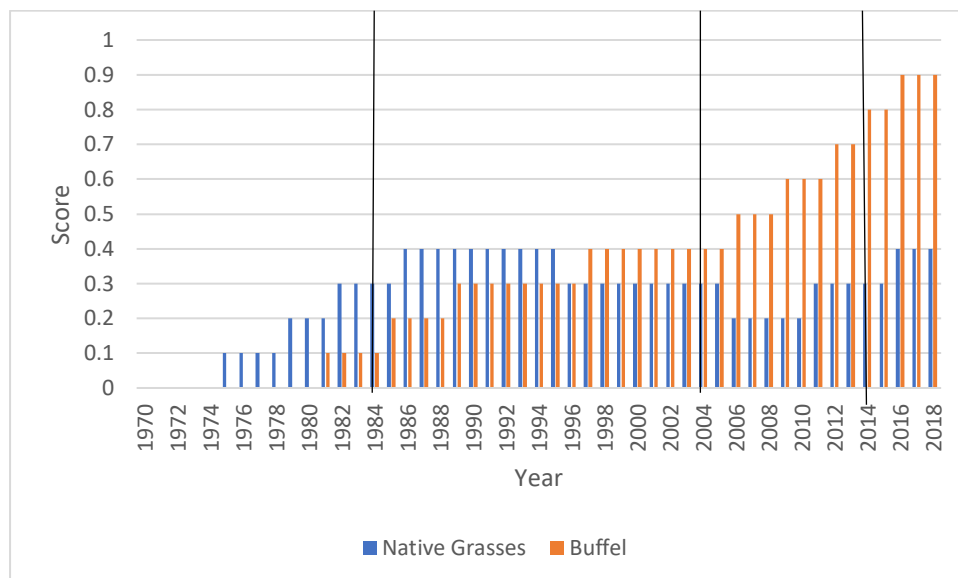


Figure 6. Status of reproductive potential of pasture species.

## **G. Status of tree and shrub structural diversity and health**

### **Why track changes and trends in extent of tree cover?**

Tree cover on grazing land in the Rangelands is actively monitored and controlled by graziers to maintain pastures in a productive state. Woody weeds in the Rangelands overshadow ground layer vegetation and severely affect its status. Controlling of woody weeds is required to maintain ground layer vegetation and enable grazing for production.

### **Assumptions and definitions**

If woody weeds are not controlled ground layer vegetation will be outcompeted and the land would no longer be suitable for production.

Large paddock trees are left intact to provide habitat for biodiversity on the property.

### **Results and Interpretation**



In Phase 1 Glenelg was entirely covered with woody vegetation, any form of significant ground layer vegetation was not present. The land manager commenced clearing of woody vegetation with the goal of establishing pasture species for production. Initially ringbarking was conducted and later vegetation was cleared by pulling with a chain.

In Phase 2 the land manager controlled the regrowth of woody weeds across the property using methods such as pulling, Tordon application and later blade ploughing.

Phase 3- as above.

Phase 4- as above.

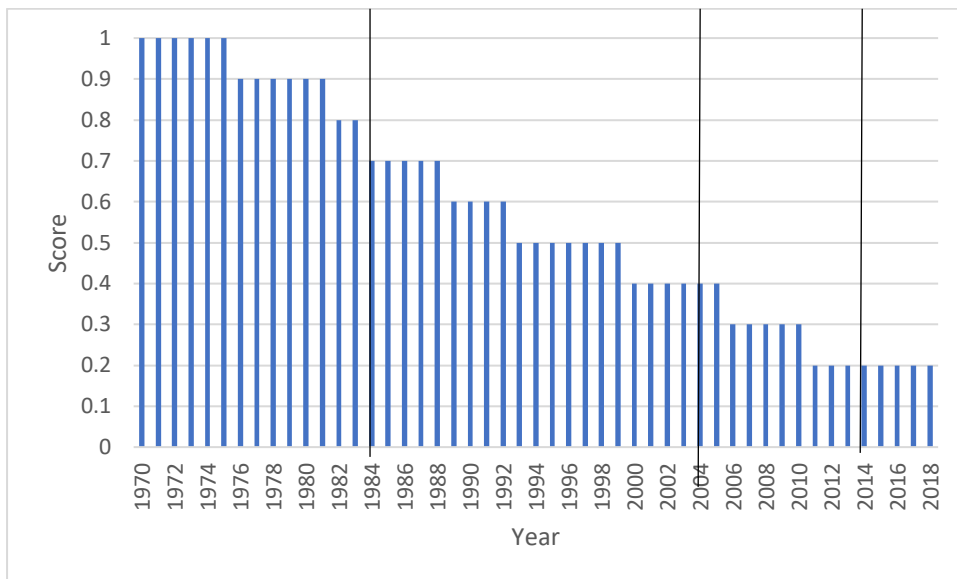


Figure 7. Status of tree and shrub cover.

## H. Status of grass and herb structure - Ground cover

### ***Why track changes and trends in ground cover?***

Ground cover in the Rangelands is one of the key indicators of land health, it is closely related to the soil indicators outlined above. Maintaining healthy ground cover levels is a critical component of farming regeneratively in the Rangelands.

### ***Definitions and Assumptions***

Overgrazing by livestock and kangaroos is the biggest factor in harming ground layer vegetation on Glenelg. The land holders have acknowledged this and have stocked their property conservatively for many years to ensure overgrazing by livestock did not occur. However, since 2000 kangaroo incursions onto the property have been increasing, particularly in times of drought. The construction of an exclusion fence from 2014 has enabled the land holder to stop kangaroo incursions onto Glenelg.

### ***Results and Interpretation***

Phase 1- as above.

Phase 2- as above.

Phase 3- as above.

Phase 4- as above.

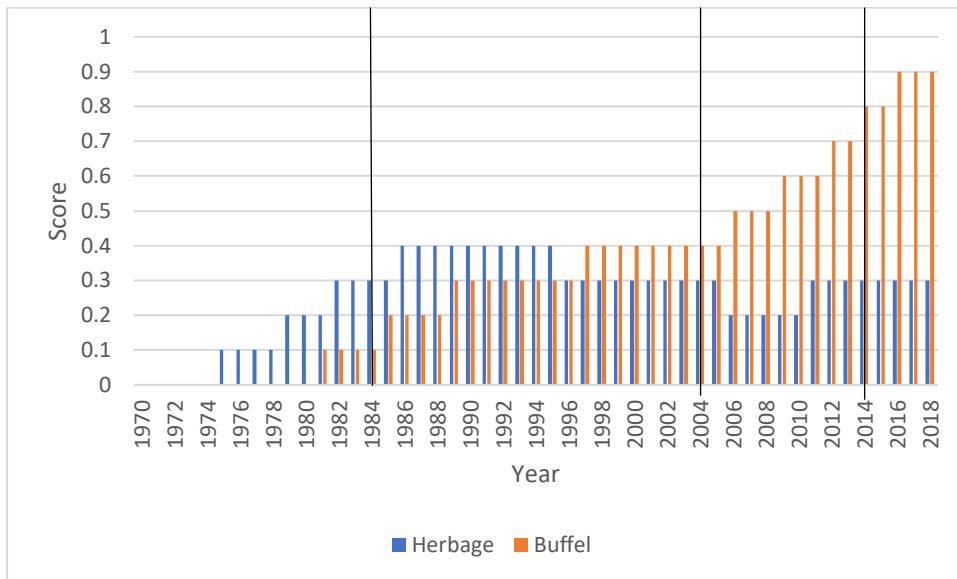


Figure 8. Status of ground cover.

## 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?***

Tree and shrub species richness refers to the number and diversity of species present. It is a useful indicator to track the affects the land management regimes have had on the ecological health of the property.

### ***Definitions and Assumptions***

Eucalypts and shrubs were assessed on Glenelg. The species of eucalypt on Glenelg were seen as woody weeds and they have been actively controlled and removed from the landscape to promote pasture growth for production. Other species of trees which do not spread across the landscape at the same vigorous rate as the eucalypts have been retained on Glenelg as shade for stock.

### ***Results and Interpretation***

In Phase 1 the eucalypt species were actively removed from the landscape and their revegetation attempts were controlled. Shrub species were not an issue and were not targeted for removal.

Phase 2- as above.

In Phase 3 some species of shrubs were removed from the landscape by blade ploughing.

Phase 4- as above.

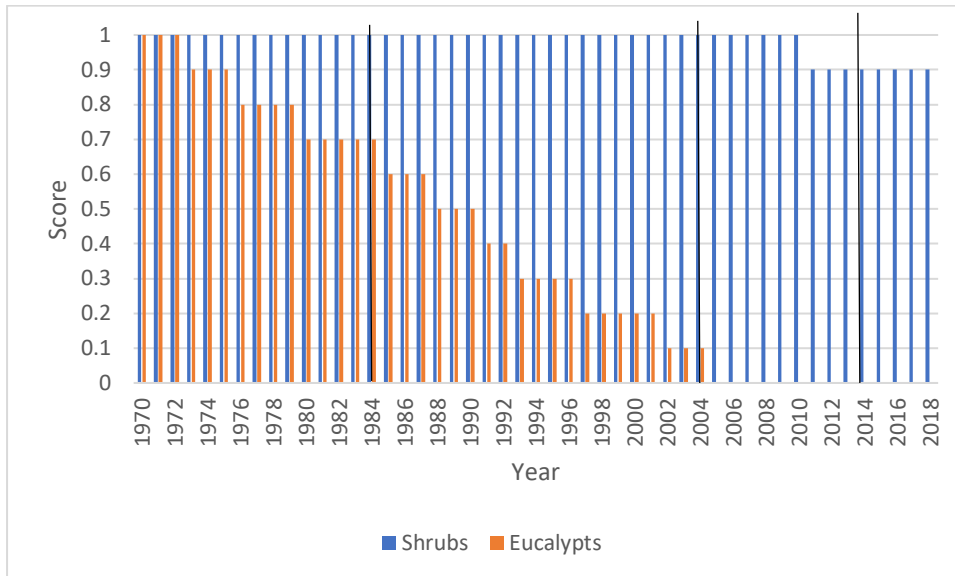


Figure 9. Status of tree and shrub species richness.

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

### ***Why track changes and trends in grass species diversity?***

Functional richness refers to the number 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. Any decrease in functional richness and evenness decreases an ecosystem's productivity and stability. How an ecosystem is managed in a production setting will determine its productivity and stability.

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.

### ***Results and Interpretation***

In Phase 1 the number of grass and herb species increased as woody vegetation was removed from the landscape enabling understory growth.

Phase 2- as above.

Phase 3- as above.

In Phase 4 species of grass and herbs which had never been observed before appeared, due to the reduction of total grazing pressure caused by the construction of the exclusion fence.

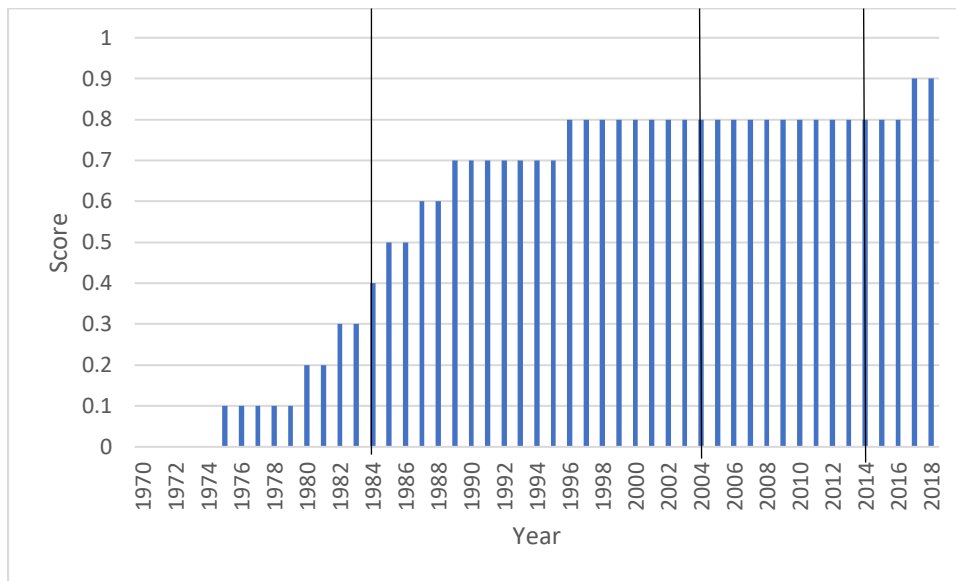


Figure 10. Status of grass and herb species richness.



## Attachment A

### Production systems

1970

- Harry Chambers acquired the first parcel of Glenelg
- Commenced woody vegetation treatments in the form of ring barking
- Half the property supported 27 head of cattle

1978

- Purchased the last parcel of Glenelg
- Woody vegetation treatments had occurred continuously from 1970 across the property
- 200 head of cattle were now run on Glenelg
- Started a merino wool operation on Glenelg
- Commenced scrub pulling as a wood vegetation treatment

1981

- Graham joined the partnership
- The entire property was scrub pulled

1985

- Jan joined the partnership
- The Mungallala Creek was cleared of trees

1989

- Pulled the entire property again
- 8000 sheep were shorn on Glenelg, they were fed on the pulled vegetation
- Pimelea poisoning was an issue throughout the 1980's; cattle were lost. Managed to mostly control pimelea by maintaining good ground cover levels
- Buffel grass took hold on Glenelg in the late 80's

1990

- Water holes in the Mungallala Creek were enlarged due to major flooding

1994

- Graham and Jan Chambers took over Glenelg

1997

- Woody vegetation removed entirely from the property

2002

- Kangaroos started to become a major problem during drought years

2005

- Blade ploughing commenced on Glenelg

2010

- Waterholes enlarged again on the Mungallala Creek, due to major flooding

2012

- Waterholes enlarged again on the Mungallala Creek due to major flooding

2013

- Glenelg was drought declared
- The most recent fire occurred on Glenelg
- Half the cattle were sold due to drought conditions
- Pulled mulga to feed sheep
- Galvanised burr came when ground cover levels were low

2014

- Mulga ran out on the property, no longer available to feed sheep in drought time
- Fed cotton seed to the sheep in 2013-2014 summer
- Commenced construction on the exclusion/predator fence

2016

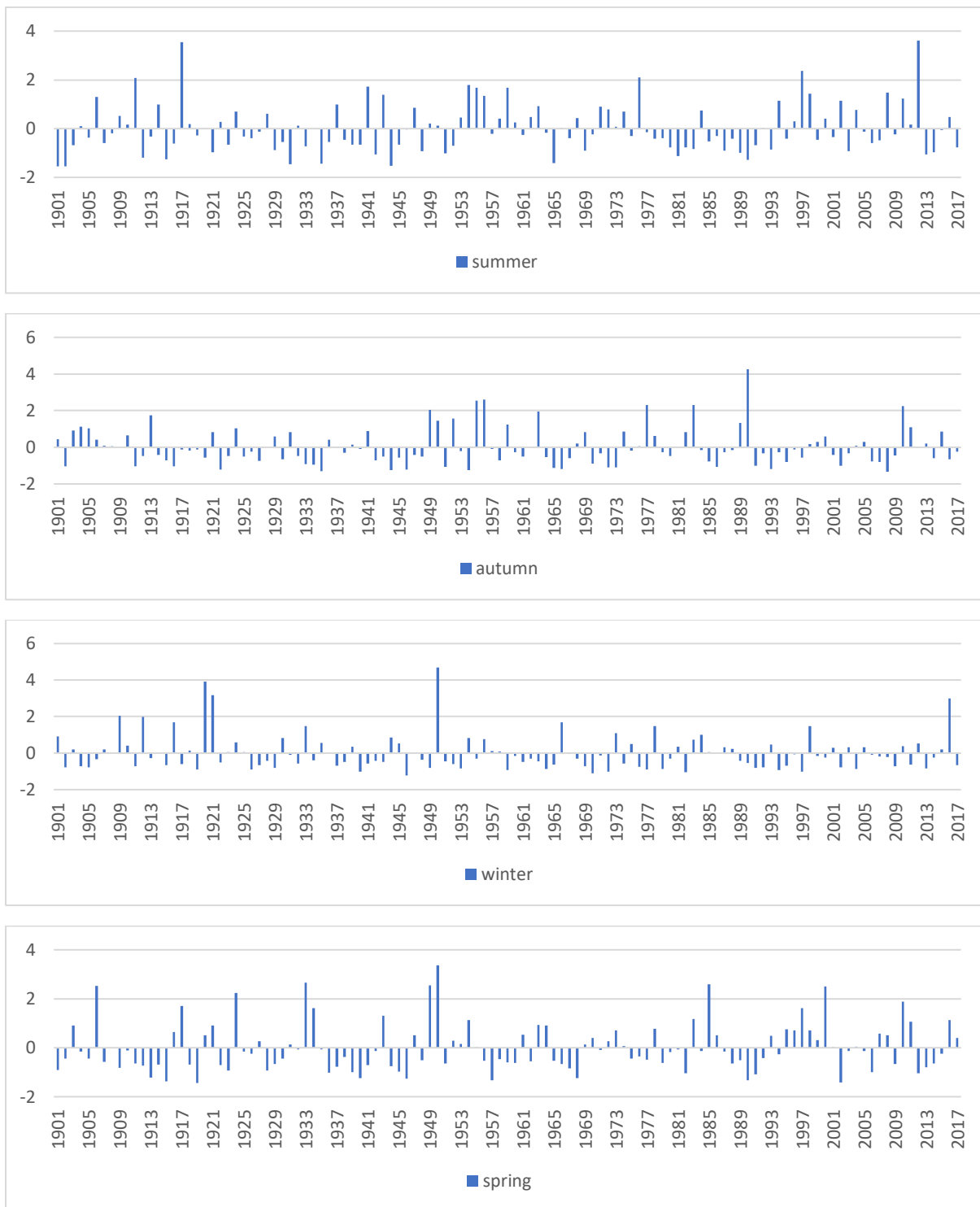
- 4-5000 kangaroos were driven off the property whilst construction of the exclusion/predator fence was underway
- Finished construction on the exclusion/predator fence

2017

- Kangaroos were shot in the 12 months after the exclusion/predator fence was completed

## Attachment B

Patterns of seasonal rainfall derive from modelled monthly rainfall data for Glenelg showing variants around the mean.







2019

## GLENELG CASE STUDY: ECONOMIC REPORT

Prepared by



### Introduction

Glenelg is a 4000Ha grazing property located near Mungallala in Queensland with its primary income derived from the sale of wool. The property is stocked with approximately 4,100 sheep (2,000 breeding ewes), 180 breeding cattle and 60-100 wild goats. Cattle are sold regularly, sheep are sold once they reach a certain age and the wild goats found on the property are sold once they reach critical mass and become a nuisance on the farm.

The Chambers have implemented a number of regenerative practices in order to improve the productivity and sustainability of the property. In particular, control of woody regrowth and the establishment of an exclusion / predator fence has significantly improved productivity and profitability.

This economic report will illustrate the positive effects that regenerative practices have on the profitability and productivity of the property, by comparing current financial and production figures to historical figures and industry benchmarks.

Please note – in the interests of privacy the data throughout this economic report has been ‘de-identified’. That is, the data has been reported so that it does not represent the owner’s actual financial position, rather it proportionally highlights the changes brought about by incorporating regenerative farming practices. In particular, we have used an index to proportionally represent the financial figures. Where two datasets are compared, we index both sets of data to the benchmark data.

All data in this analysis is presented on the basis of the financial year.

Due to data availability, some years may be missing throughout our analysis.

#### Report Data Sources:

Industry Benchmarks – MLA Farm Survey Data  
(<http://apps.agriculture.gov.au/mla/>)

Financial Data – GST & JL Chambers Financial Accounts

Seasonal Conditions and Rainfall Data – Australian Government Bureau of Meteorology

Industry Insights – Published Industry Reports by:

- Meat and Livestock Australia
- Australian Bureau of Agricultural and Resource Economics
- Department of Agriculture
- Department of Primary Industries
- Rural Bank Australia
- Australian Wool Innovation Limited
- Making More From Sheep

## Key Findings

We have compared the financial accounts and production data for the Chambers' sheep enterprise to specialist sheep producer benchmark data ('the Average Farm'). The flock size for the Average Farm is 2,500 to 5,000 sheep. This benchmark has been sourced from MLA Farm Surveys.

### Productivity

Glenelg's high business performance results from the Chambers' conservative stocking rate. Rather than stocking to capacity, the Chambers have made a deliberate decision to maintain a consistent level of productivity, reducing the variability of poor seasonal conditions. This in turn has allowed the Chambers to preserve ground cover, soil and enhance pasture growth, and achieve consistent revenues year on year.

This highlights the productivity of the pastures allowing the Chambers to produce and sell consistently over the years, regardless of seasonal conditions.

The Chambers completed the construction of an exclusion fence in 2016 to reduce the number of pest species, preserve pasture and improve livestock welfare. This further improved productivity on Glenelg and in addition, the exclusion fence has allowed labour hours to be reduced.

### Profitability

In terms of profitability, Glenelg performs significantly better than that of the Average Farm. The analysis shows that the Chambers' improved productivity has allowed them to achieve a higher income whilst lowering their expenses. Due to the enterprise management employed by the Chambers, they have been able to continue minimising expenses despite prolonged drought and poor seasonal conditions.

The Chambers' experience significantly lower expenses than the Average Farm. We have compared the following key expense items for Glenelg with the benchmark; Livestock Materials; Seed, Fodder and Fertilizer; Repairs and Maintenance; Fuel and Oil; and Chemicals.

Key takeaways from expense analysis:

- Livestock Materials expenses are consistently lower than the Average Farm, despite experiencing lower than average rainfall.
- Seed, Fodder and Fertilizer expenses are much lower than the Average Farm due to the Chambers' management practices such as erosion prevention and the maintenance of ecological health of the landscape
- Repairs and Maintenance expenses continue to remain significantly lower than the Average Farm, even while implementing the treatment of woody weeds which require heavy machinery use.
- Fuel and Oil expenses are high during years where the Chambers treat woody vegetation. However, on average Glenelg experienced lower Fuel and Oil expenses than the Average Farm during 2013 to 2018.
- The Chambers use their chemical expenses to remove trees and increase the size of water storage, however this expenditure remains significantly lower than that of the Average Farm.

## Benchmarking

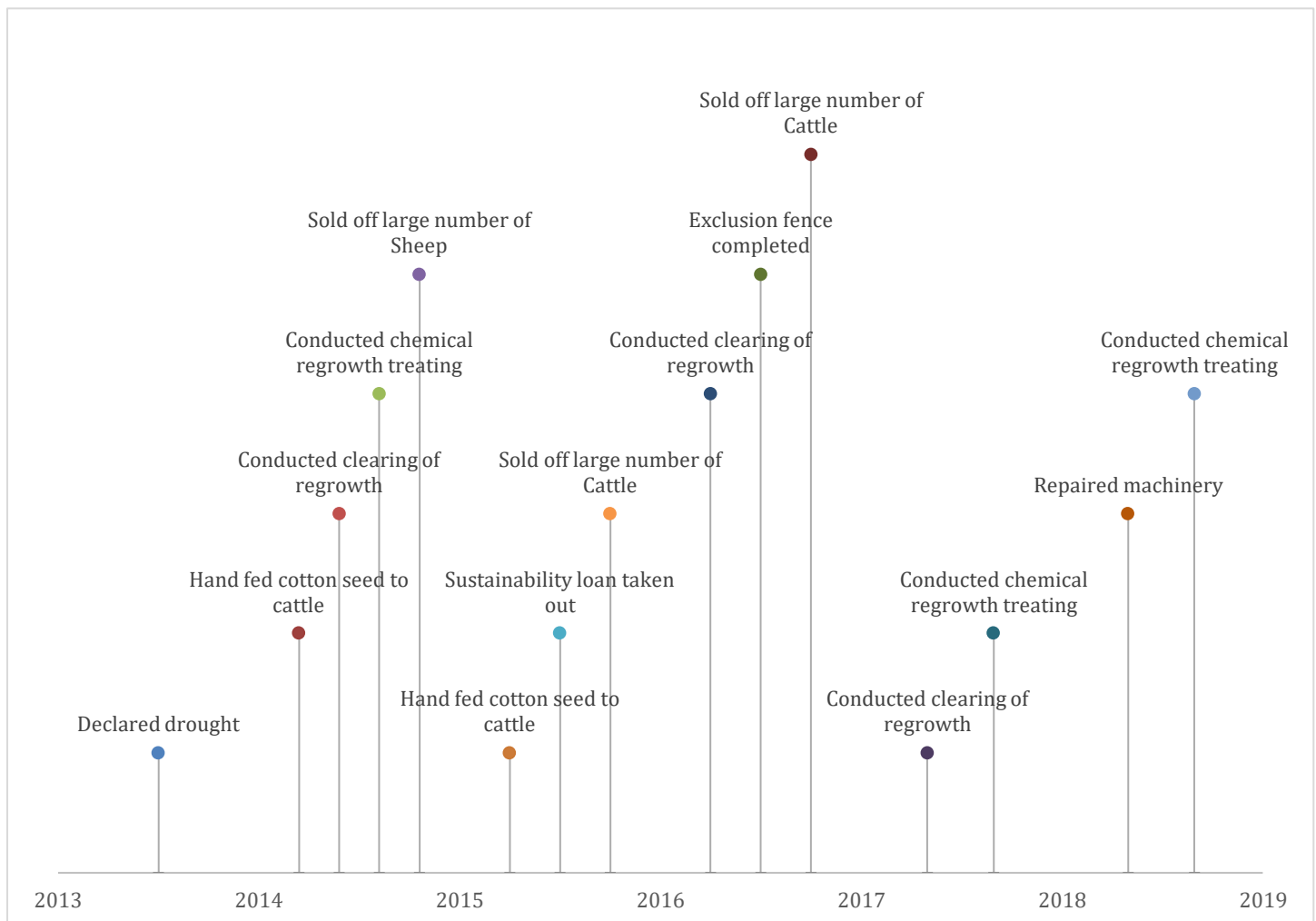
In order to illustrate the success of the Chambers' enterprise, we have compared their financials and productivity data to relevant industry benchmarks. In particular, we refer to the 'Average Farm' as the main indicator for our analysis.

The Average Farm is a Specialist Sheep Producer with a flock size of 2,500 to 5,000. This benchmark has been sourced from MLA Farm Surveys.

Where appropriate, we have used other industry benchmarks to indicate Glenelg's performance.

## Glenelg Timeline

Figure 1 outlines a timeline of major events that have occurred at Glenelg over the period analysed throughout this report. The events outlined are those that had major impacts on Glenelg's financial performance and productivity. The consequences of these events will be explained further in our analysis.



*Figure 1 Glenelg Major Events Timeline*

## Productivity

### Consistency

The Glenelg property is not stocked to capacity although they could potentially double their current stocking rate. This is a deliberate decision to maintain a consistent level of productivity and reduce the variability of poor seasonal conditions. Glenelg's consistent high performance is a result of this enterprise management.

By not stocking to capacity, the Chambers preserve ground cover and soil, and enhance pasture growth by minimising overgrazing. This in turn reduces stress on land-owners during difficult seasons. This practice allows the Chambers to set stocking rates every year reducing the risk of overgrazing in dry seasons. Stocking the property in this way has allowed the Chambers to achieve consistent revenues year on year, with little need to rely on debt financing. The Chambers also have the capacity to diversify their production to limit the effect market forces (such as wool prices) have on yearly revenue.

### Expense per Kg Wool Produced

Figure 2 outlines the total expenses per kg of wool produced by Glenelg and the Average Farm. As can be seen, Glenelg consistently experiences a lower expense per kilogram of wool produced than that of the Average Farm.

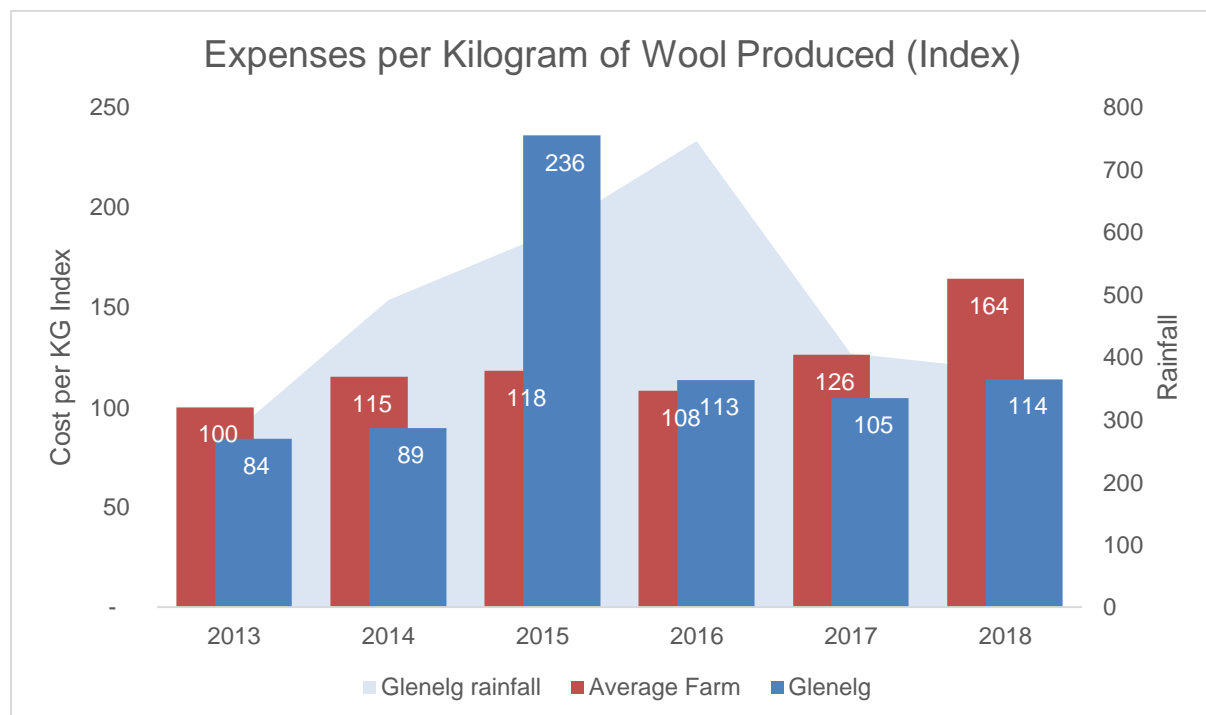


Figure 2 Expense Per Kilogram of Wool Produced (Index)

#### Data Insights:

- In 2015, Glenelg experienced a high expense per kg of wool produced. This is resulting from a drop in wool sales due to a large sale of sheep in 2014.



## Diversified Productivity

As well as wool sales, the Chambers generate income through livestock trading. Typically, small numbers of sheep and cattle are sold each year. Wild goats are sold as required.

Livestock trading is an important income source to Glenelg facilitating a steady revenue stream across variable seasons

Figure 3 below outlines the cattle sales for Glenelg and that of the Average Farm. As can be seen, Glenelg's cattle sales are fairly consistent throughout most years. However, in 2015 and 2016 Glenelg experienced a significant increase in cattle sales. This is in part due to the fall in wool sales (as noted previously).

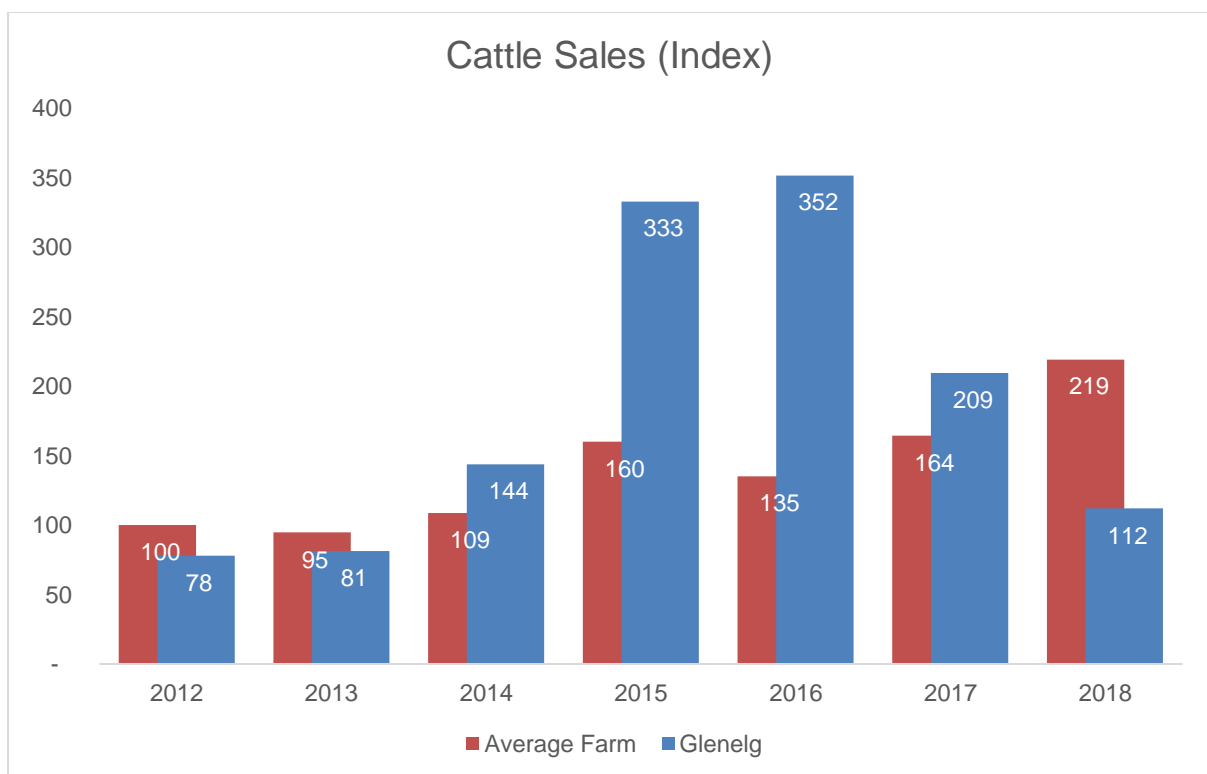


Figure 3 Cattle Sales (Index)

## Exclusion Fence

In mid-2016, the Chambers completed the construction of an exclusion / predator fence. This fence was established to reduce the number of pest species in an effort to preserve pasture and improve livestock welfare.

The establishment of the exclusion / predator fence also reduced the labour hours (whether it be by the Chambers themselves or through hired professionals) associated with pest and predator control.

Figure 4 below illustrates the annual sheep losses and mortality rate for Glenelg. This is compared to possible Glenelg losses at an industry benchmark of a 15% mortality rate.

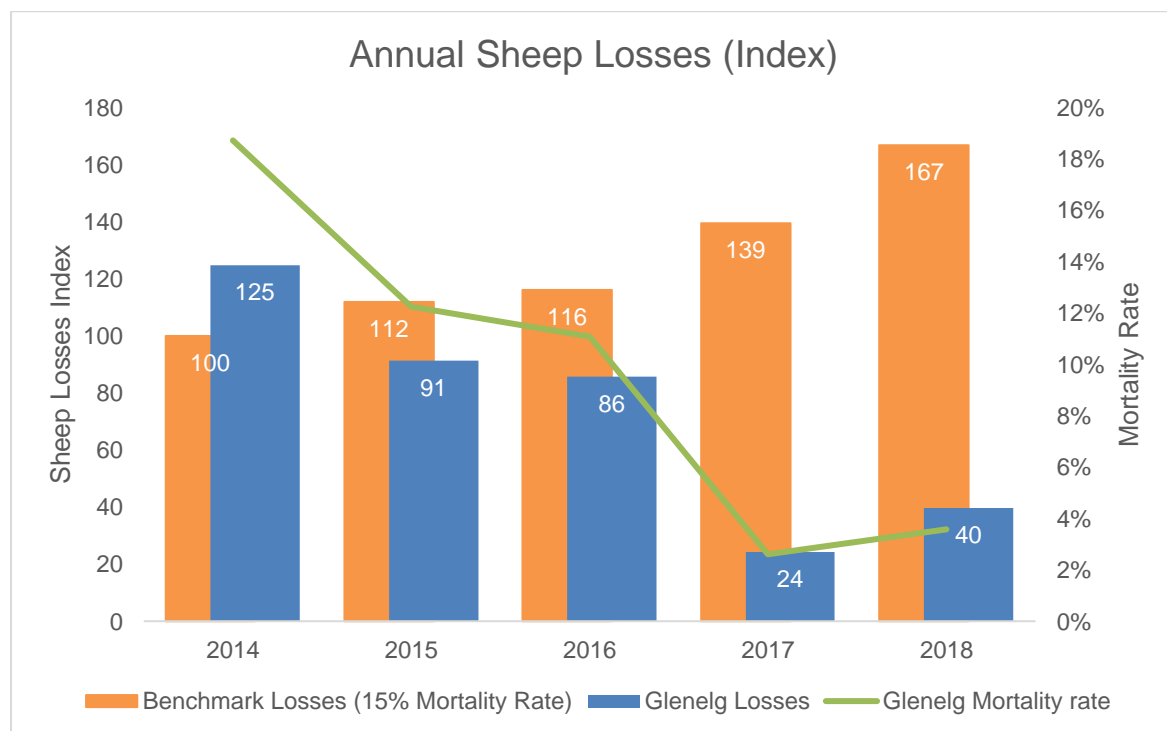


Figure 4 Annual Sheep Losses (Index)

### Data Insights:

- The exclusion fence was completed in mid-2016, resulting in a significant fall in sheep losses in 2017 and 2018.

## Profitability

### Business Profit

Figure 5 below illustrates the business profit for Glenelg and the Average Farm. Glenelg consistently achieves higher profit each year than other farms in the industry.

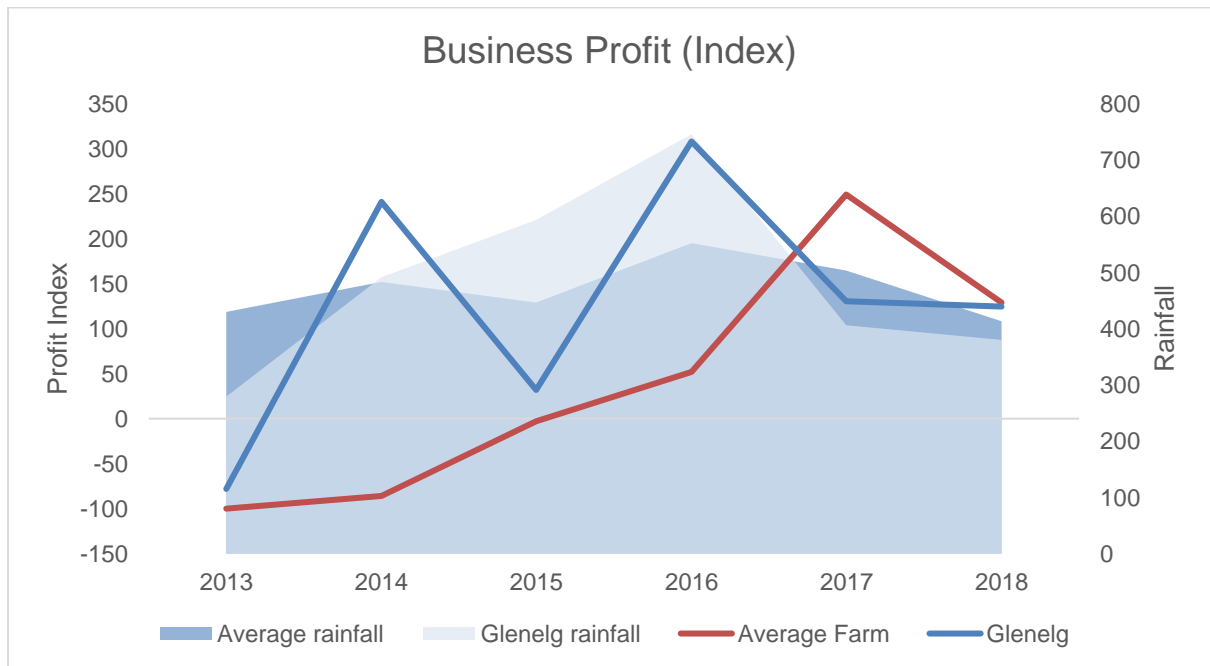


Figure 5 Business Profit (Index)

#### Data Insights:

- In 2015, Glenelg experienced a fall in profit. This was due to a decrease in wool sales resulting from a large sale of sheep the previous year.
- There was a fall in profit in 2017 and 2018 due to increased depreciation expenses resulting from the completion of the exclusion fence.

## Expenses

Glenelg's key expense items since 2013 have been compared to the Average Farm benchmark. It was found that Glenelg has significantly lower expenses than the Average Farm. The following graphs outline detailed expenditure year-on-year since 2013, where data was available. The following are the key relevant expense items assessed in this report:

- Livestock Materials
- Seed, Fodder and Fertilizer
- Fuel and Oil
- Repairs and Maintenance
- Chemicals
- Interest

### Livestock Materials

Figure 6 below outlines the comparison between Glenelg's livestock materials expense and that of the Average Farm. Livestock materials include; dips, drenches and other similar materials.

Over the period of 2014 to 2018, the livestock materials expense for the Average Farm is higher compared to Glenelg. However, in 2013 the livestock materials expense for Glenelg was marginally higher to that of the Average Farm.

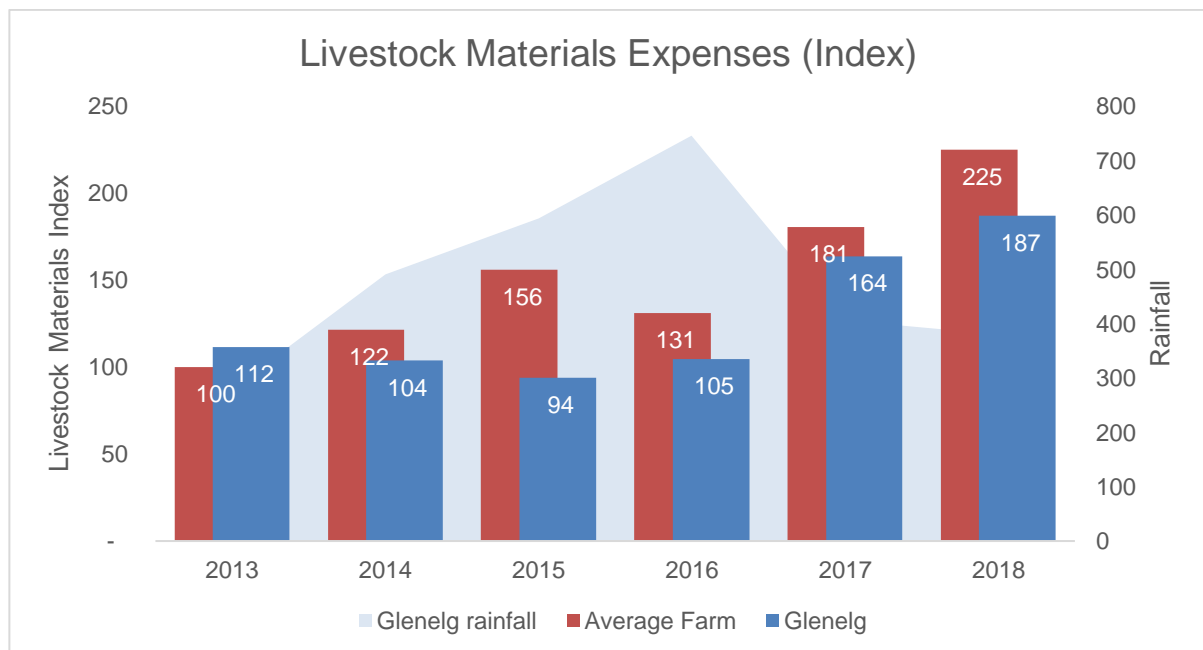


Figure 6 Livestock Materials Expenses (Index)

#### Data Insights:

- Glenelg experienced higher livestock materials expenses than the Average Farm in 2013 due to the significant drought they experienced.
- Since 2013 Glenelg has consistently experienced over 20% lower livestock materials than the Average Farm – even in 2017 and 2018 when there was lower rainfall.

## Seed, Fodder and Fertilizer

Figure 7 below illustrates the difference between the seed, fodder and fertilizer expenses for Glenelg and the Average Farm. Glenelg's expenses from 2013 to 2018 remained significantly lower than the Average Farm.

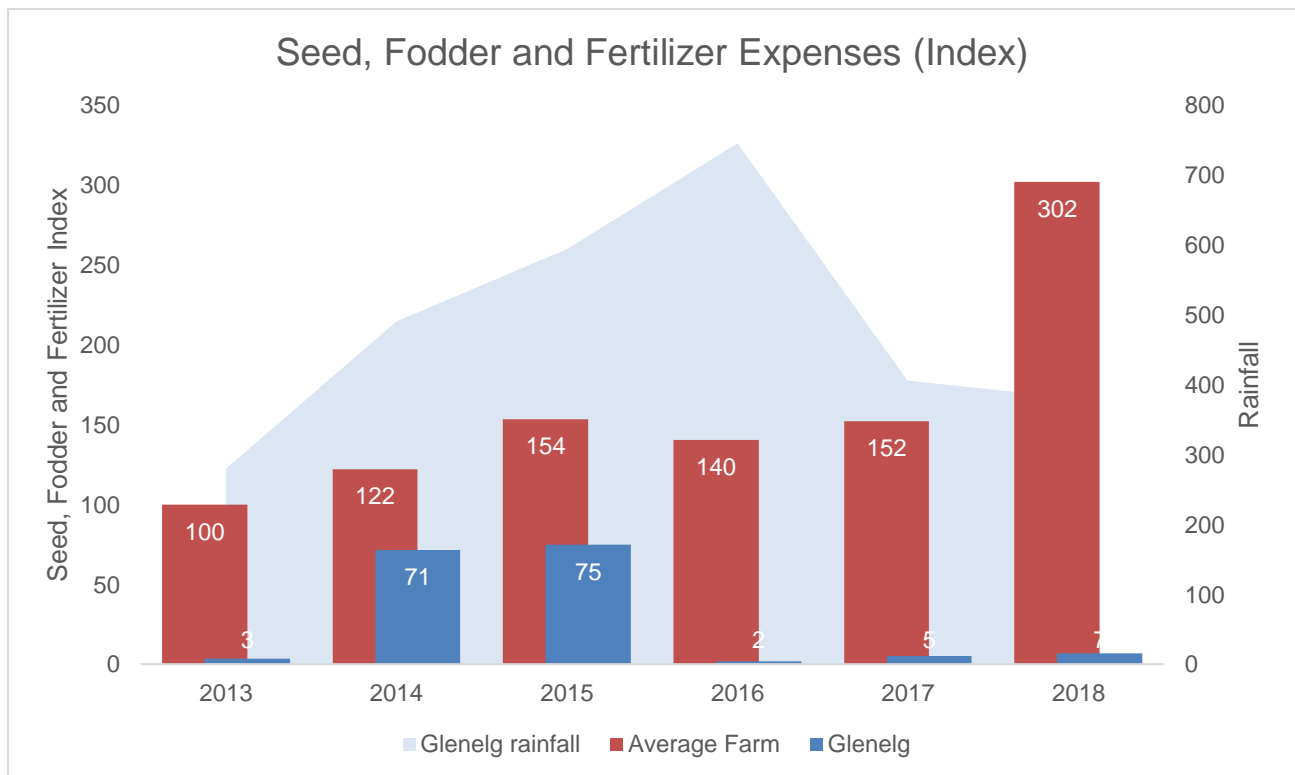


Figure 7 Seed, Fodder and Fertilizer Expenses (Index)

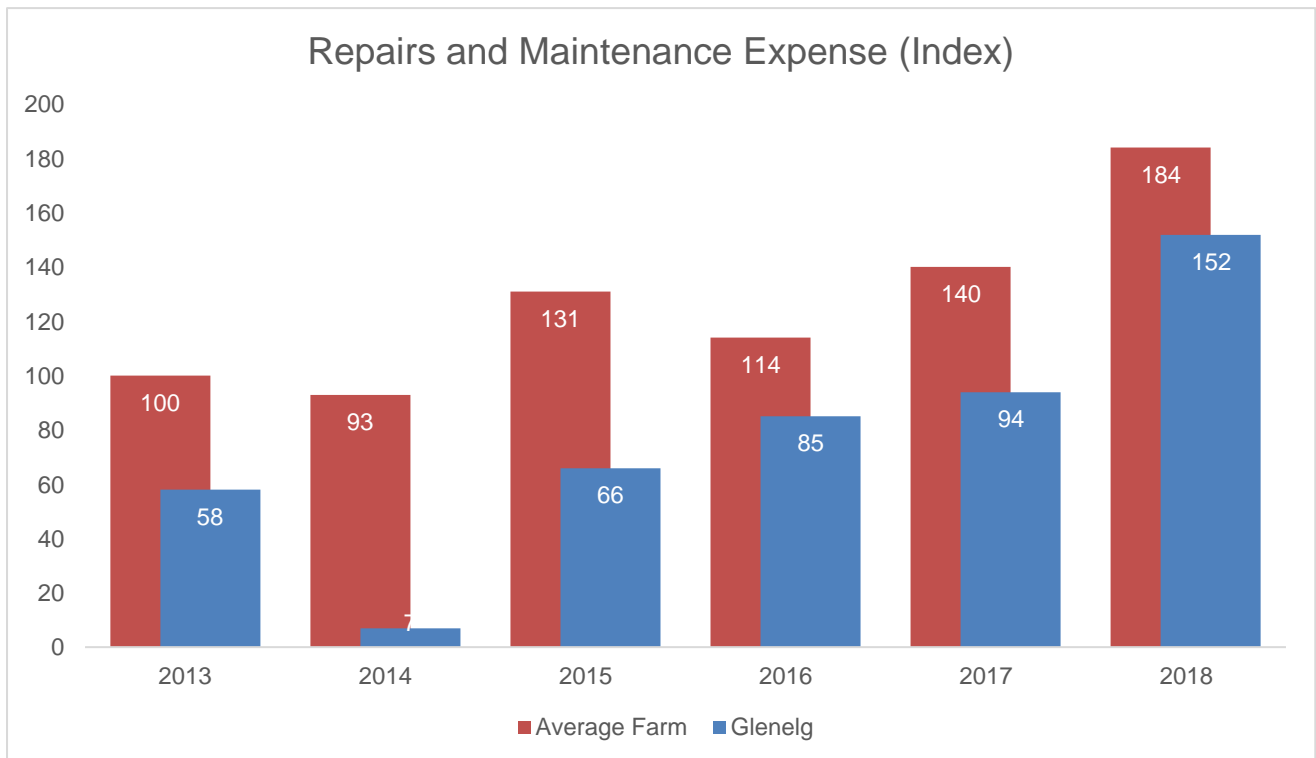
### Data Insights:

- Glenelg experienced low seed, fodder and fertilizer expense in 2013, 2016, 2017 and 2018. This is a result of the management practices undertaken by the Chambers which focused on preventing erosion, restoring eroded areas and improving ecological health in an effort to maintain pasture levels.
- In 2014 and 2015, Glenelg experienced high seed, fodder and fertilizer expenses due to the Chambers feeding cotton seed to cattle during the summer of these years.



## Repairs and Maintenance

Figure 8 below outlines the difference between the repairs and maintenance expense for Glenelg and the Average Farm. Glenelg's repair and maintenance expense from 2013 to 2018 remain significantly lower than the Average Farm.



*Figure 8 Repairs and Maintenance Expense (Index)*

### Data Insights:

- In 2018, Glenelg incurred high repairs and maintenance expense due to repairs to machinery used for the treatment of the woody weeds.

## Fuel and Oil

Figure 9 below illustrates the comparison between Glenelg's fuel and oil expense and that of the Average Farm.

Over the period of 2013 to 2018, the fuel and oil expenses for Glenelg vary in comparison to the Average Farm.

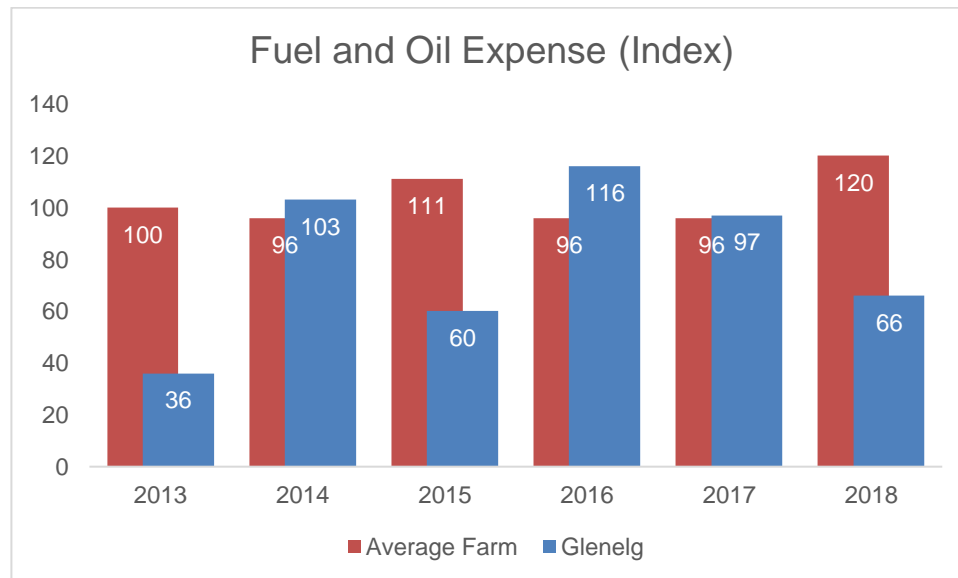


Figure 9 Fuel and Oil Expense (Index)

### Data Insights:

- In 2014, 2016 and 2017 Glenelg had relatively high fuel and oil expense which exceed the Average Farm. This resulted from the treatment of woody weeds primarily done by pulling with a chain and bulldozers, leading to higher fuel consumption.
- Glenelg achieved a lower than average fuel and oil expense during those years when woody weeds were not treated - 2013, 2015 and 2018.

Table 1 below summarises the average fuel and oil expense as an index, for Glenelg and the Average Farm, over 2013 - 2018. It shows Glenelg's average expenditure over this period is lower than the Average Farm.

Farm	Average Fuel and Oil Expense 2013-2018 (Index)
Glenelg	80
The Average Farm	100

Table 1 Average Fuel and Oil Expense 2013-2018 (Index)

## Chemicals

Figure 10 below illustrates Glenelg's chemical expense compared to that of the Average Farm.

Over the period of 2014 to 2018, Glenelg's chemical expense is significantly lower when compared to the Average Farm. In 2013, Glenelg significantly exceeds the Average Farm's chemical expense.

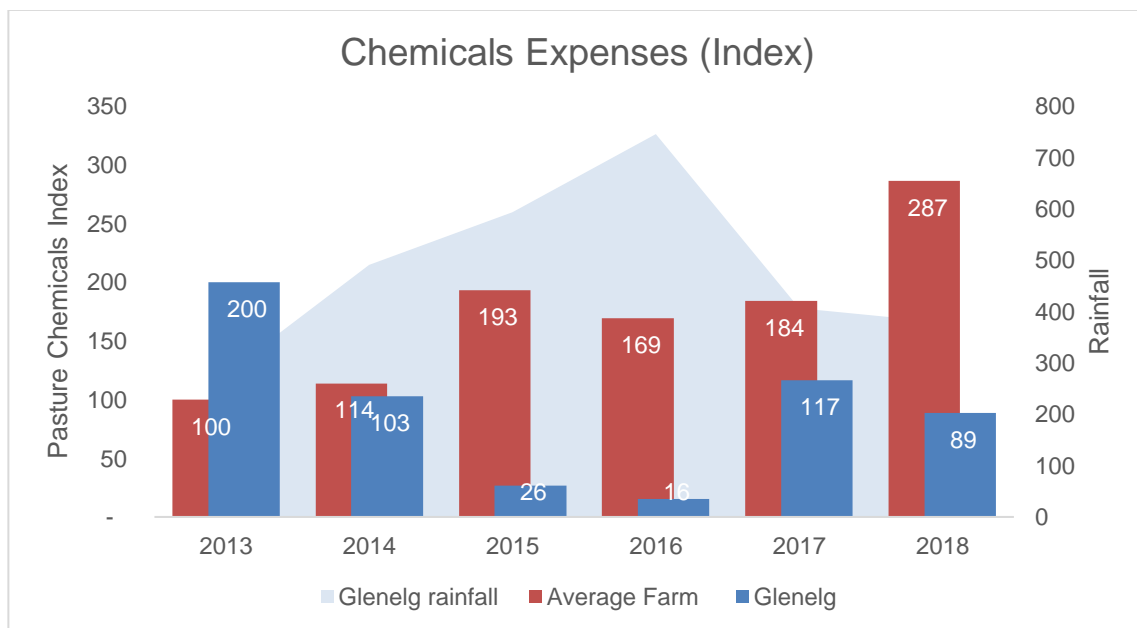


Figure 8 Chemicals Expenses (Index)

### Data Insights:

- In 2013 Glenelg experienced a drought. In order to mitigate future drought situations, the Chambers used chemicals such as torden or grazon to remove trees to increase the size of water storage and hence increase water supply.
- In 2014, 2017 and 2018, there were relatively high chemicals expenses due to treating regrowth.

## Debt Minimisation

Figure 11 below outlines the equity ratio for Glenelg compared to an industry benchmark for performance. The equity ratio illustrates the proportion of assets fully owned by the entity. When interpreting the equity ratio, a higher percentage shows that the entity has used less debt to fund assets, while a lower percentage indicates higher levels of debt used to fund assets.

As seen below, Glenelg's equity ratio significantly exceeds the performance indicator of 70%. This figure of 70% is an indication of a high performing farming enterprise – illustrating how well Glenelg is performing when compared to other enterprises in the industry.

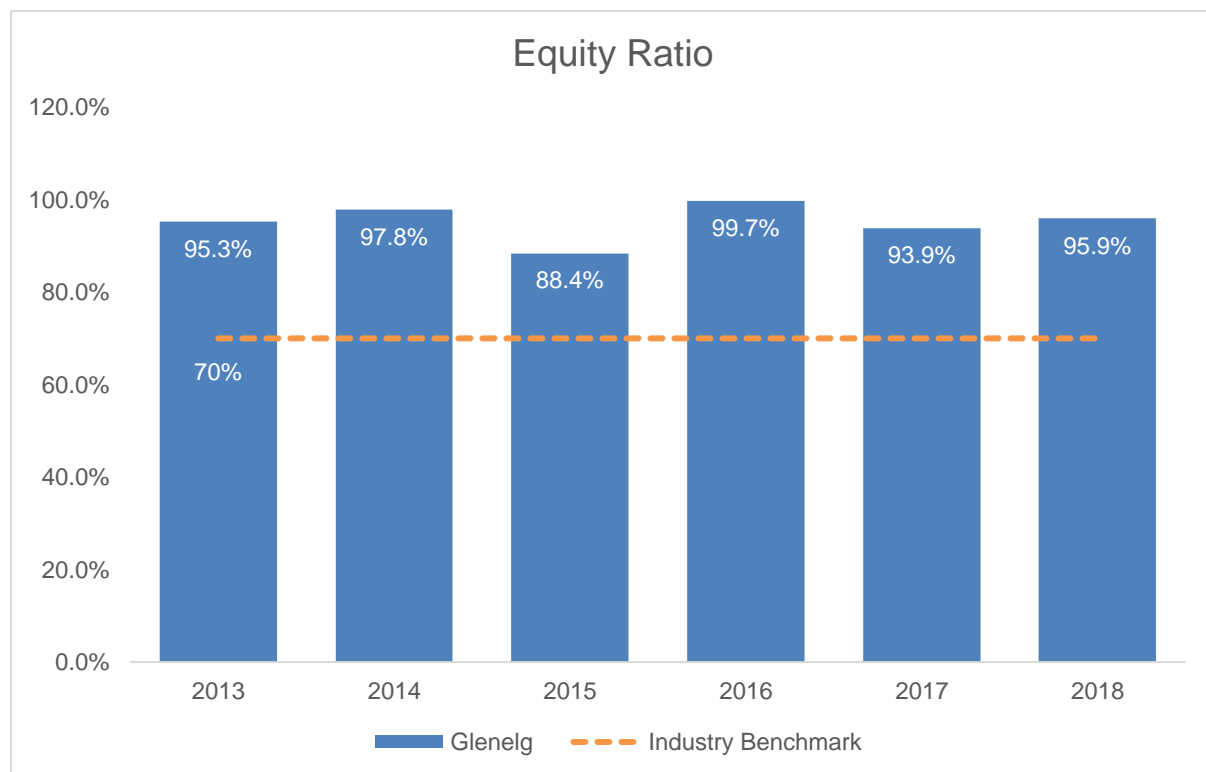


Figure 9 Equity Ratio

### Data Insights:

- The equity ratio fell in 2015 resulting from the addition of a small loan taken out that year. The loan was repaid by the end of the 2016 financial year.
- The Chambers took out a chattel mortgage for a work vehicle in 2017. As such there is a slight reduction in the equity ratio for 2017 and 2018.
- In 2013, 2014, 2015 and 2016, the Chambers used small loans to purchase motor vehicles.

A key point to take from this analysis of Glenelg's balance sheet is that the Chambers incur little to no debt when funding assets and operations. For most years included in our analysis, the Chambers had no current liabilities and minimal non-current liabilities. The way the Chambers have managed Glenelg allowed them to make large improvements without incurring much debt. Improvements include regrowth control and the pest exclusion fence.

## Interest Expenses

As they have little reliance on debt, the Chambers experience very small interest expenses each year. Figure 12 illustrates Glenelg's minimal interest expenses as compared to the Average Farm.

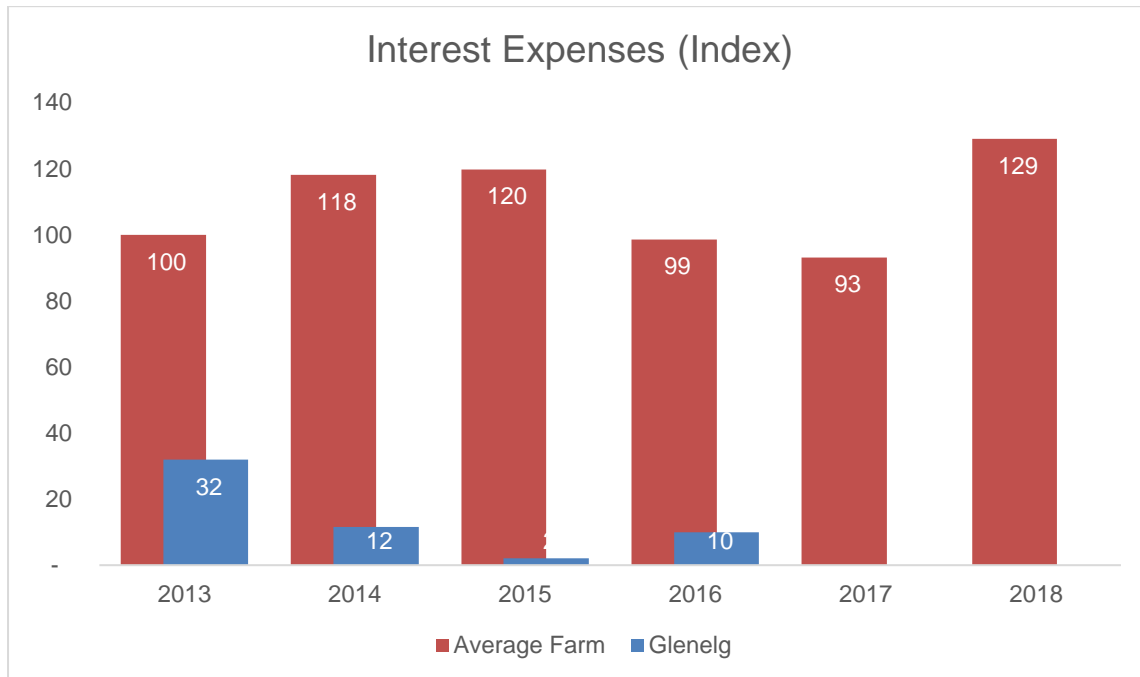


Figure 10 Equity Ratio Data Insights:

The Chambers' business model allows them to fund and manage their enterprise with little need for debt financing. Even in periods of drought, such as 2013, there is little to no reliance on loans to continue farm operations. This is due to both the farm management practices and conservative stocking rates, as well as the regenerative measures implemented to maintain quality pastures and soil health.

2019

## GLENELG CASE STUDY SOCIAL REPORT

Prepared by Terry Harkness

### Risk and Reward

The original allotment that was Glenelg consisted of densely wooded vegetation, minimal grass cover, significant erosion scalds and lots of weeds. Not an ideal start to a grazing enterprise, however, where one sees a challenge, another sees an opportunity. If this landscape was to be returned to health it had to be productive, profitable and more in keeping with its pre-European vegetation structure.

When Harry Chambers purchased this property in 1970 much of the landscape looked similar to neighbouring properties today. It's a remarkable story of resilience, determination and landscape interpretation. Soils for Life is proud to reflect on pioneers of generations past and their contribution to Australian agriculture, Harry Chambers and his innovative yet risky approach to landscape management could well be another chapter in the Australian story. Whilst Harry may have passed the enterprise onto Graham and Jan Chambers his legacy and the ongoing developments appear set to serve the test of time, come rain, hail or drought.

### The Vision

The original landscape around Mungallala was lightly timbered open country, with deep watering holes and springs renewed by underground aquifers. Flora and fauna was more abundant and of greater diversity. Erosion was not a concern because ground cover was bountiful, binding the soil and capturing water in the landscape. In order to return this land to a functioning landscape, tree density had to change. But it wasn't without risk. Removal of trees is known to raise water tables and leave salt scalds on the landscape.

Tree removal commenced not long after purchasing Glenelg, initially by ringbarking, then followed tree pulling, chemical application (Tordon), blade ploughing and finally stickraking. Gradually as the trees were pulled, Buffel grass took hold and the land started to repair itself. Ground cover improved out competing weeds like Galvanised burr (*Sclerolaene birchii*), Bathurst Burr (*Xanthium spinosum*) and *Pimelea* sp.

As grass and ground cover species took hold biodiversity increased. Now there was habitat and protection for ground dwelling species, water was being captured where it fell, deep rooted perennials were accessing the water table and life was returning. The water table had risen and Glenelg had permanent watering holes not seen on neighbouring properties for years.



The response was positive, landscape function was returning with the water cycle and vegetation responding to the changes. Productivity increased, stock had access to clean drinking water, the enterprise was independent and resilient.

One thing leads to another and with this came kangaroos. The conservative stocking regime encouraged roos to graze and compete with livestock for pasture. It seemed Glenelg was a beacon of light for all sorts of species! In 2014 an exclusion / predator fence was commenced, over the course of the next two years the Chambers constructed the fence themselves minimising costs as they go. Once the fence was sealed a program of kangaroo culling saw improvements in total grazing pressure. Wild dogs inside the fence were trapped. There was a noticeable response from livestock, a general calmness descended upon the herd, not to mention the landholders!

A can do attitude has served the Chambers well, by taking control of their circumstances through construction of the exclusion / predator fence, contracting shearers', undertaking their own mechanical repairs and attention to woody regrowth, Glenelg is now a low input, debt free, productive enterprise.



## Water Holes

Glenelg has a functioning hydrological system, good ground cover capture's water where it falls, springs have started flowing again, deep rooted perennials access the water table, water holes are permanent and the biodiversity that lives in and around these watering holes has returned.

Native fish abound, Blue claw yabbies, Swans, Jabiru's, frogs, reptiles and mammals are all attracted by the permanent water supply. As too are the locals to catch a feed of fish or yabbies and relax in this idyllic of past times. Interestingly the introduced Carp species are less frequent at Glenelg than elsewhere in the district. Possibly because the ecosystem has been restored and the natural balance that exists keeps all species in check.



## Community

When a landscape is resilient not only does the outlook appear more positive and the livestock more content but the land manager has more time, enabling a balanced lifestyle. A nice mix between working on the land, working with your hands and your mind to working with and for others. No better example of that than Jan Chambers, Deputy Mayor Maranoa regional council. In this role Jan not only represents constituents in relation to roads, rates and rubbish but chair's the Finance sub-committee, as well as numerous other sub committee's including Community Engagement and Major Projects. Furthermore, Jan is Secretary to the Maranoa Diggers' Race club. Clearly a busy person, her

unrelenting drive to represent the local community, to advocate and provide for the Maranoa region all whilst co-managing an enterprise that has endured an extended drought lasting six years to date.

## The Future

The regrowth maintenance program, conservative stocking regime and strong family support will see the stewardship of this land and the property it supports carry on into the foreseeable future. Both Jan and Graham are active, healthy people leading full lives. They get plenty of physical exercise and balance their extensive commitments to the farm and community through hard work, planning and dedication. Sons Sidney and Matthew are actively involved with Glenelg and it's likely that one of them will take it on when the time is right.

The Chambers approach to regenerative agriculture hasn't been conventional, but an unconventional approach isn't necessarily bad. To swim against the tide takes courage and the results can be most rewarding. We'll leave the final words to the Chambers “...most satisfying, treating country right and leaving it for the next generation” and to see the quality of the wool provides them with a sense of job well done.