BAROSSA IMPROVED GRAZING GROUP BIGG

# Maximising Pasture in a Variable Climate

mla MEAT & LIVESTOCK AUSTRALIA

## PRODUCER CASE STUDIES

2016-2018

COOPERS OF MT. PLEASANT FARM SUPPLIES

Heritageseeds

Pasture Genetics Science based seed®

Farmer Johns

# Foreword

The Barossa Improved Grazing Group (BIGG) is a community-driven network of livestock production and farming groups from the Barossa and Eastern Mount Lofty Ranges, including sheep (North Rhine Sheep Group), beef (Mt Pleasant Beef Group), dairy (Barossa Mid-North Dairy Discussion Group) and two (Angaston and Koonunga) local Ag Bureaux.

Formed in 2012, BIGG has over 300 members who share an interest in sustainable grazing systems, with the group's area of influence covering the entire Barossa and Eastern Mount Lofty Ranges region, which includes about 50,000 hectares of grazing land.

BIGGs vision is to be a trusted and valuable network supporting innovative, sustainable and resilient grazing businesses. It has an active advisory committee made up of producers, rural business representatives and industry, ensuring that all projects are delivered 'from the ground up', developing relevant and seasonal outcomes that support livestock producers. BIGG acknowledges the importance of landholders networking, supporting and learning from each other, particularly in tough times, hence the delivery of producer case studies.

The past three years have provided a huge range of challenges, particularly related to seasonal conditions, for grazing businesses, not only in the Barossa but much of southern Australia. With challenges there come opportunities and the stories within this case study demonstrate the importance of accepting the challenges, adapting to changes and rolling with the punches to find the opportunities and make the most of them. Three very different seasonal conditions provided the opportunity to test different pasture varieties providing insightful demonstrations on ways to maximise pasture and livestock production.

# Contents


Introduction 2

Key Findings 3

Major Site Koonunga 4

Major Site Keyneton 7

Major Site Eden Valley 10

## 2017

**Utilising stored soil moisture to grow high quality summer forage crops**
Toby Rosenzweig, Keyneton 12

**Moby barley provides feed and flexibility**
Matt Neldner, Marananga 14

**Early and late ryegrass varieties to extend the growing season**
Bill and Mandy Evans & Anthony Steinert, Keyneton 16

**Utilising native pastures for lambing**
Jason and Kirsty Treloar, Keyneton 18

**High stocking rate increases perennial pasture performance**
Michael Evans, Flaxmans Valley 20

**Establishing Lucerne to provide year-round feed opportunities**
Andrew and Kate Jaeschke, Eden Valley 22

**Performing perennial grass pastures**
Anthony Steinert & Warren and Barbara Fargher, Flaxmans Valley 24

## 2018

**Vineyard winter feed wedge maintains lamb growth rates**
Karl Schiller, Angaston 26

**Where there is a will there is a way**
Karl Zerner, Eudunda 27

**The benefits of introducing poly cultures to your cropping and livestock rotation**
Ian and Fiona Koch, Moculta 30

**Production of high-quality silage in a rotational grazing system**
Craig Hage, Angaston 32

**Producing quality lamb and managing pastures under organic principles**
Bruce Hancock, Flaxmans Valley 34

**A flexible pasture to fill the summer feed gap**
Tracy and Owen Bonython, Ebenezer 38

**Acknowledgements** **40**

**Glossary** **40**

# Climate change is creating challenges for grazing businesses, resulting in a later autumn break, reduced spring rain and increased summer rainfall.

Through the Meat and Livestock Australia's (MLA) Producer Demonstration Site (PDS) Project, the Barossa Improved Grazing Group (BIGG), Coopers Farm Supplies and Farmer Johns worked with producers over three years to develop a more reliable feed base responsive to changing climate that is optimised for variable rainfall patterns including late breaks, early finishes and out-of-season summer rainfall events.

Through the development of three 'major' sites located at Koonunga, Keyneton and Mt Pleasant/Eden Valley, different pasture varieties and blends were sown and measured over a three-year period to determine how they can effectively fill seasonal feed gaps.

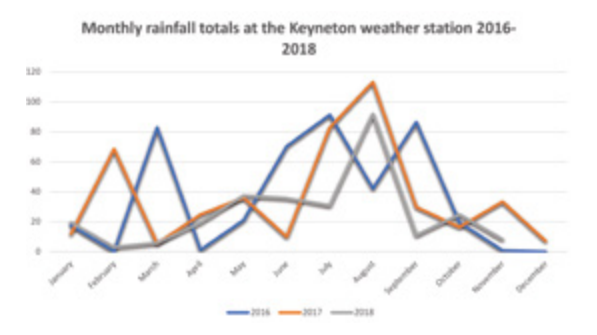
In conjunction with the major sites, 'minor' sites were developed in 2017 and 2018. Minor sites test the successful pasture blends seen in the major sites, on local producer's paddocks, allowing large scale monitoring and production measurements.

This booklet presents the results of the demonstration and monitoring sites which were established through the three years of the project. The opportunity to learn from others can be thought provoking and provide information on how producers across Southern Australia can help their pasture systems adapt to a changing climate, by reducing risk and making the most of opportunities.

## BACKGROUND

Seasonal variation plays a huge role in any agricultural production system and significantly impacts pasture production, quality and persistence.

Traditionally the Barossa Valley receives an average of 550- 600mm of rain annually, with most of the rainfall occurring in a winter dominant pattern. This average decreases to 400-500 towards the Eastern Mt Lofty Ranges and north towards Koonunga. The autumn break is generally considered to occur in May.




The main growing season occurs through late winter/spring with pastures quality and growth declining in late October. Occasionally there may be summer rainfall as a result of thunderstorm.

### 2016 - above average rainfall

The first year of the project was the fourth wettest calendar year on record with 63% above average annual rainfall. This included a March thunderstorm which dumped 83mm of rain over two days, however, the following April and May were below average rainfall and the 'break' occurred in June. Due to the cold and wet conditions through winter there was very little pasture growth. However, the wet and mild conditions continued through spring and summer which delivered above average pasture growing conditions.

### 2017- average rainfall

After a wet summer in 2017, the break came very late in June. This was followed by an average winter and slightly lower than average spring. This resulted in a short growing season, allowing significant differences to be seen between the 2016 year which delivered a long above average growing season.

### 2018 - below average rainfall

The final year of the project was an exceptionally dry year with less than half the annual average rainfall across the Barossa. There was very little summer rainfall, a dry autumn with no break, average July and August, and very little rainfall through the spring. The soil moisture levels were never at the 'full' stage throughout the year. This has been an extremely difficult year for producers, however has highlighted the pasture varieties which will perform under very poor seasonal conditions, demonstrating the small opportunities that can arise from tough times.

# Key Findings

Identify your feed gap and target varieties to fill it. For example, consider early varieties to provide winter feed, lucerne or perennial grasses for summer feed and fodder crops to utilize stored spring rainfall.

Consider blends of varieties to provide opportunities to capitalize on all rainfall events; this could include early and late ryegrasses within a mix to make the most of any late spring rainfall event, whilst still providing high quality pasture through late winter and spring. Blends of ryegrass and forage cereals could also be considered to increase feed quality and provide grazing options once the forage crop has been removed.

Consider pasture varieties which can provide grazing and fodder conservation to increase flexibility and opportunities. For example, utilising a forage cereal to fill a winter feed gap through grazing, followed by fodder conservation in the form of hay or silage to fill summer feed gaps.

Ensure you have the seeding rate correct to maximise production.

Continue to measure and monitor your soil, pastures and livestock and utilize forecasting tools to make sure you are hitting your targets and making the most of opportunities.

Look at options to increase the flexibility of the system through pasture variety selection, temporary fencing to divide paddocks and considered paddock design to facilitate ease of management.

Seek help and advice to make sure your pasture plan suits your enterprise and environment.

# Koonunga Pasture Demonstration Site

## FARMER JOHNS & PASTURE GENETICS

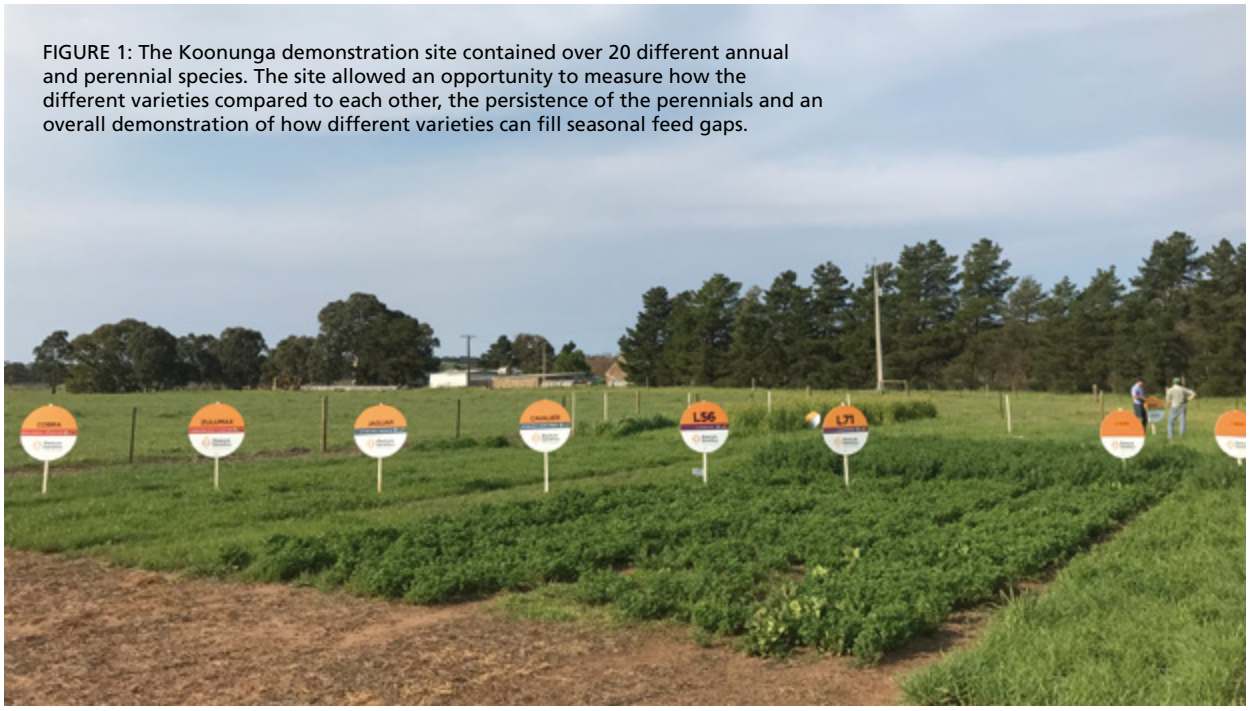


FIGURE 1: The Koonunga demonstration site contained over 20 different annual and perennial species. The site allowed an opportunity to measure how the different varieties compared to each other, the persistence of the perennials and an overall demonstration of how different varieties can fill seasonal feed gaps.

## Maximising pasture production

Red-brown sandy loam soil, adequate pH (6.4 Cacl2) and marginal phosphorus (35ppm Cowell).

Annual rainfall: 450mm

2016: 500mm

2017: 445mm

2018: 250mm

The perennial grasses and lucernes were planted in 2016 and monitored through until 2018. Different annual varieties in the form of ryegrasses, clovers, medics and forage cereals were sown throughout the three years. Some varieties such as the clovers and medics were left to evaluate their seed regeneration potential.

Varieties included:

- Lucerne- two varieties plus three mixes (Moby barley, Ambassador cocksfoot, Balance chicory)
- Perennial grasses (phalaris, cocksfoot, perennial ryegrass, fescue) and blends
- Clover and medic- five varieties
- Annual varieties- brassicas, radish, forage cereals and annual ryegrasses

This site allowed an opportunity to measure how the different varieties compared to each other, the persistence of the perennials and an overall demonstration of how different varieties can fill seasonal feed gaps (Figure 1).

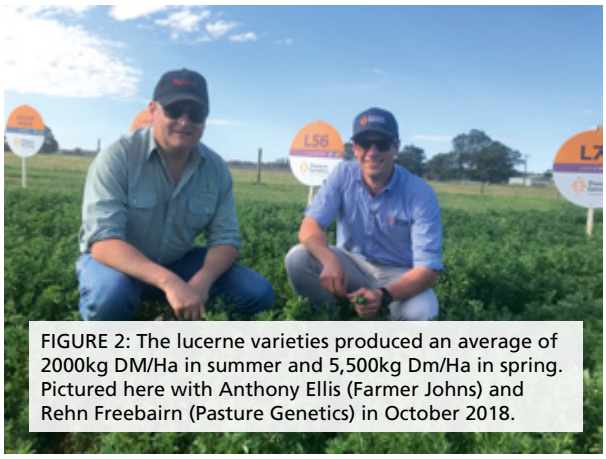



FIGURE 2: The lucerne varieties produced an average of 2000kg DM/Ha in summer and 5,500kg Dm/Ha in spring. Pictured here with Anthony Ellis (Farmer Johns) and Rehn Freebairn (Pasture Genetics) in October 2018.

### Summer, winter and spring potential of lucerne:

Lucerne produced high quantities of dry matter through all three years of monitoring.

- Summer production averaged 2,000 kg of dry matter per hectare across the three drier than average summers. This is a result of their deep root system which can draw up moisture from up to 2 metres below the soil. This would increase the annual average stocking rate by 5 DSE/Ha.
- Both lucerne varieties (L71 and L56) planted in 2016, produced an average of 5,500 kg of dry matter per hectare in spring over the three years of monitoring (Figure 2). This results in a 60 kilograms of dry matter per day spring growth rate or increase the annual average stocking rate by 15DSE/Ha.
- The majority of the growth of Lucerne occurred in late spring and summer, this is when annual varieties die and lose quality. Lucerne maintained high quality of 19% protein, high metabolisable energy (ME) of 10 MJ and 25% dry matter in November 2016. This high-quality pasture would provide an opportunity to finish lambs as a follow on from the productive ryegrasses and forage cereals available through winter and early spring.
- The addition of summer active Balance Chicory to Lucerne 71 produced the highest total dry matter across the three Lucerne plots. In February 2017, this plot produced an additional 1800kg of Dry Matter per hectare compared with the straight lucerne (L71) plot. In addition to the increased dry matter, chicory helps to prevent bloat and provides additional vitamins and minerals for grazing livestock. The chicory was allowed to seed each year thus allowing it to persist in 2018, in the third year after sowing.

### Annual varieties provide flexibility for early and late grazing opportunities:

- Early forage cereals, such as Moby barley, can be utilised to provide feed through the early winter months, when many other traditional annual and perennial varieties are building up production for spring. In August 2017, Moby barley produced 1500 Kg of Dry Matter per Ha more than the other annual varieties (Figure 3), however had gone to head by September. This would result in an increased 4 Dry Sheep Equivalent (DSE)/Ha annual stocking rate.
- In comparison, in 2017, Outback oats, a slightly later variety, produced lower levels of production in winter than Moby barley, but then increased production though spring. This demonstrates the importance of choosing the right variety to suit your enterprise. If you need early winter feed Moby barley would fill this gap, however Outback oats will extend the number of grazing days through the spring (Figure 2).
- The Moby barley and Outback oat forage cereals are valuable because they utilise available winter and spring soil moisture to provide grazing opportunities and they convert the moisture into grazing opportunities for the summer months in the form of hay, harvesting the grain or grazing as a standing crop. This will increase grazing days through the conservation of fodder, particularly if moisture is limited through the spring months.

### Making the most of the good years

Taking advantage of an extended spring soil moisture, such as in 2016, when there is unlimited feed availability, locking pastures up to allow annuals to flower and set seed will provide a cheap and high-quality pasture in the following year.

- Outback oats and Tetrone ryegrass ran to head in 2016. This seed set resulted in high quantity of pasture the following year with the Outback oats producing over 4500 kg of dry matter per hectare and the Tetrone over 6000 kg of dry matter per hectare. When added to the 2016 production this results in a total of over 10,000 kg of dry matter per hectare for the Outback Oats and over 8000 kg of Dry Matter for the Tetrone.
- Allowing clovers and medics to regenerate also provides a cheap alternative to re-sowing high protein pasture components. Cavalier and Jaguar medic, regenerate from a hard seed which will remain in the soil over many years. In 2017, these species regenerated at a rate of 10 plants per $m^2$, providing winter feed opportunities.
- Zulumax, a later arrow-leaf clover variety produced over 6000 kg of dry matter per hectare in 2016. The following year, as a result of the previous years seed production, in November 2017 it was producing 4,000kg dry matter per hectare at over 80 plants per $m^2$. In addition, the Zulumax variety has a very hard seed, which ensures there will be viable seed in the ground for the coming years to maximise on later spring rainfall.

### Perennial grass blends increase grazing days

Perennial grasses increase grazing days by utilising summer rainfall events to produce dry matter, in addition they provide dry matter production through late winter, spring and early summer.

- A mix of perennial grasses and clovers, Farmer Johns

FIGURE 3: Early Moby Barley (left) and two self-sown from 2016 tetrone ryegrass (middle) and Outback Forage Oats (right) in August 2017.

550mm rainfall mix (FJ550) and Farmer Johns 450mm rainfall mix (FJ450) produced over 700 kg of dry matter per ha above the average of the straight perennial grass plots through spring 2017. This equates to increased 1.9DSE/Ha annual stocking rate.

- As the soil moisture decreased in 2018, the FJ 450 continued to produce through early summer, demonstrating the importance of choosing varieties which are developed for local rainfall conditions.
- In the low rainfall 2018 year, the FJ450 mix produced 3400 kg of dry matter per hectare or 1160kg of dry matter/ 100mm rainfall in spring with a growth rate of 43 kilograms/day. In comparison, the FJ550 mix, which produced over 4,000kg of dry matter per hectare in the average rainfall year of 2017, only produced 1,200kg of dry matter in 2018, or 280mm/ 100mm rainfall and 12 kilograms per day.
- In addition, all perennial varieties maintained over 75% ground cover throughout the year, which significantly reduces the risk of soil erosion.

## Varieties to increase annual grazing days

A combination of different pasture varieties across a grazing system is important to provide grazing opportunities and extend annual grazing days.

- The 2017 results at Koonunga (Figure 4) demonstrated the opportunities for early feed varieties Moby barley and Outback oats which not only provide grazing opportunities early in the season but also the potential to store fodder in the form of hay or grain which can be fed out later in the season.
- Later annual varieties, such as Zulumax arrow leaf clover, provides later feeding opportunities of high-quality feed, especially if there is moisture present. Utilising perennials such as FJ 450 and lucerne provides year-round feed opportunities, particularly later in the season when the annuals have reduced production.
- If there is plant available water, summer fodder opportunities such as sorghum can also help to increase grazing days.

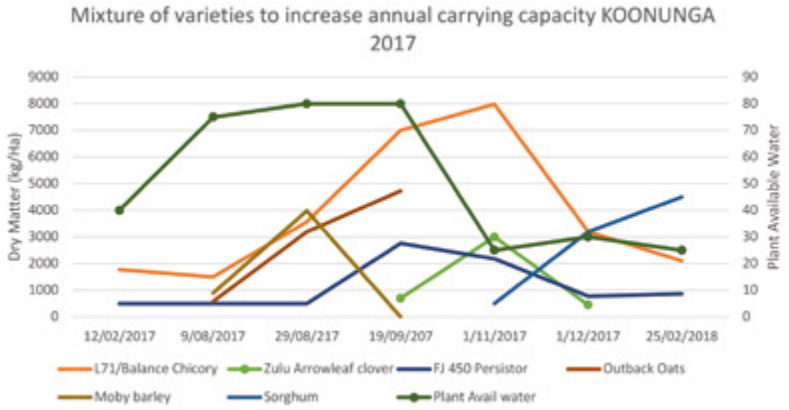



FIGURE 4: A combination of different varieties can provide extended opportunities for feed availability through the year.

# Keyneton Annual Pasture Demonstration Site -2016 and 2017

## COOPERS FARM SUPPLIES & HERITAGE SEEDS

Annual varieties were chosen on a basis of grazing and feed quality potential, and the opportunity to value add in the form of hay or silage.

Comparisons against newer and the older, more traditional varieties used in the local areas, were also included.

Varieties included:

- Cereals (oats, triticale, wheat and barley)
- Ryegrasses (annual ryegrass, Italian ryegrass)
- Vetch and peas
- Cereal and ryegrass mix (oats, triticale and barley)
- Coopers hay and silage mix- sown at four different seeding rates
- Subclovers and annual clovers were sown in 2016, however not in 2017 as they were sown at the Eden Valley site.

### Maximising pasture production

Sandy Loam Soil- low pH (4.3 CaCl2)

Average Annual Rainfall - 500mm

2016 Rainfall - 434mm

2017 - 439mm

FIGURE 1: Early Establishment of the cereals at the Keyneton Site August 2017

FIGURE 2: The Keyneton demonstration site

### Responding to a late break

In years where a late break occurs, such as 2016 and 2017, winter feed is critical:

- Sowing in mid-June, after the break, resulted in extensive bird damage in the cereal plots in 2016. Consider dry sowing of cereal varieties where possible. Sowing in early July prevented bird damage, however resulted in slow establishment of the plants from the cold and damp conditions.
- Utilising faster growing more productive cereal varieties such as Mammoth forage oats, Dictator 2 barley, and in combination with annual ryegrass sown at a higher seeding rate, will produce more dry matter when established under cold and wet conditions from the consequence of a late break (Figure 1). In 2016, these varieties produced an additional 300kg of dry matter per hectare of extra winter feed, compared with the mid and later varieties. This would equate to or an extra 0.82DSE/ha increase in annual stocking rate.
- In a late sowing situation, annual balansa and persian clover varieties have small seeds so provided an alternative to the larger seeds of vetch and subclovers, which take longer to germinate. In 2016, after the late break, these annual clovers produced the highest kilograms of dry matter per hectare with 4800kg of dry matter per hectare, compared with the sub clover varieties which only produced 2000 kg of dry matter per hectare.

### Making the most of extended springs

Careful sowing selections can set up pastures to respond to any late spring rainfall or stored soil moisture.

- Utilising varieties which have a later maturity will extend the number of grazing days. In November 2016, with available soil moisture, ryegrass varieties such as Arnie and Vortex, both later maturing varieties, produced an extra 1000kg of dry matter per hectare above the average. This would amount a stocking rate increase of 2.7DSE/Ha annual stocking rate.

### Increasing production and quality using cereal and ryegrass blends

The addition of ryegrass which contains early and late varieties (Coopers Hay and Silage Mix, CHS) to forage cereals increased the winter and spring dry matter production and improves the quality (Figure 3).

- In 2016, compared with the straight varieties, the addition of annual ryegrasses increased production by 400 kg of dry matter per hectare in winter, and by 600kg of dry matter per hectare in spring in the Mammoth and Genie Forage Oat plots (Figure 3). This would equate to an annual stocking rate increase of 1.6 DSE/Ha.
- With the wet spring in 2016, the ryegrass continued to produce an extra 6,000kg of dry matter per hectare through the late spring and into early summer. This would provide an opportunity for additional grazing days after the forage cereal is removed for hay or silage, compared with the straight forage cereal which would have very little regrowth potential.

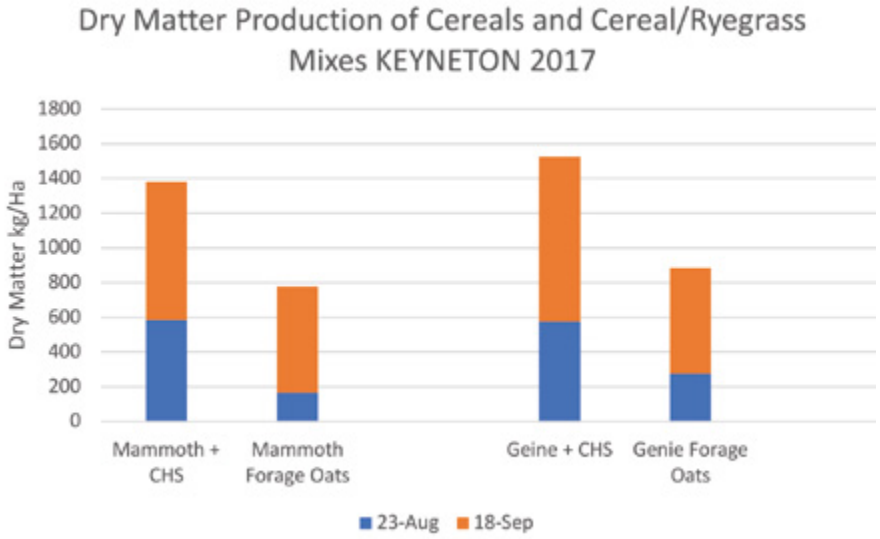



FIGURE 3: The Dry Matter production of Ryegrass and Forage Oats is over 600kg/ha more than the straight Forage Oat varieties.

## Getting the Sowing Rate of Annual Ryegrasses is important

A comparison of four different seeding rates of Coopers Hay and Silage Mix, which is a mix of early and late maturing ryegrasses, demonstrated the importance of a correct seeding rate in 2017 (Figure 4).

- As expected, due to the low number of seeds, seeding at a low rate (10 kg/Ha) reduced the total dry matter production and growth rate by 400 kg of dry matter per hectare. In addition, seeding at a high rate (40kg/Ha) reduced the dry matter production by 350 kg Dry Matter per hectare as a result of the increased competition.
- Sowing ryegrasses at 30 kg/Ha produced 923 kg of dry matter per hectare in spring. It produced over 500kg of dry matter more than the sowing rates of both 10kg/ha and 40kg/ha. This equates to an extra 1.3 DSE per hectare annual stocking rate.

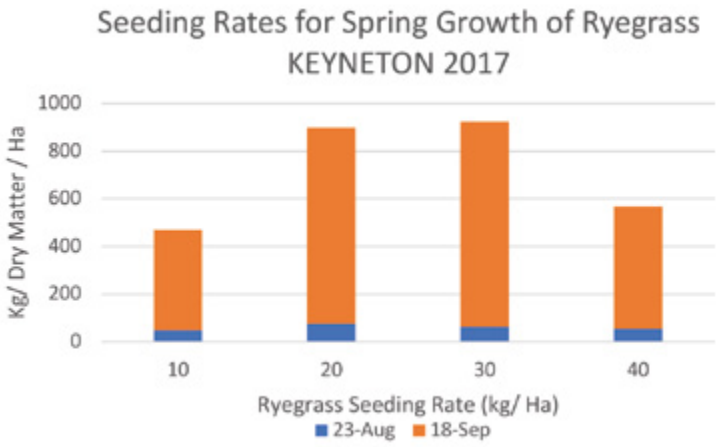



FIGURE 4: Seeding rate is critical for ensuring high growth rates and production of dry matter in annual ryegrass.

# Eden Valley Pasture Demonstration Site - 2016 and 2017

**COOPERS FARM SUPPLIES, HERITAGE SEEDS AND PASTURE GENETICS**

FIGURE 1: The Eden Valley site demonstrated how choosing early and late clovers can be used to increase grazing days.

# Maximising pasture production

Sandy loam- good pH (5.1 in CaCl2), however low phosphorus (18ppm Cowell), low organic matter (1.4%) and very low cation exchange capacity (2.96 meq/100g).

Average annual rainfall: 750mm

2016: 756mm

2017: 486mm

This site proved extremely difficult to establish pasture varieties. This was a result of late spring and summer weed competition in the form of toad rush and wireweed which outcompeted the varieties. This site ran for two years before being moved to a new site in Mt Pleasant.

The only significant results came from the clovers in 2016:

- Subclover- 16 varieties
- Annual clover (arrow leaf, Persian, balansa) - 8 varieties
- White clover - 2 varieties

### Annual clovers respond in a late break

Annual clovers have a small seed which allows them to respond quickly to rainfall events compared with sub clover seeds which are larger and take longer.

The late sowing conditions, which occurred as a result of the late break in 2016, demonstrated the ability of the annual clovers to establish quickly, producing over 2000kg of dry matter per hectare more than the sub clovers. This equates to an increased annual stocking rate by 5DSE/Ha.

### Later variety clovers will extend number of spring grazing days

Above average spring rain and mild conditions highlighted the ability of the later maturing varieties to continue providing feed through the spring and into summer (Figure 1 and 2).

- Later maturing, arrow leaf annual clover variety, Zulu II and Arrowtas, in late November 2016, measured 6,800 kg of dry matter per hectare and 4,800 kg dry matter per hectare respectively, compared to the other annual clover varieties which has already set seed and died. This would extend the number of grazing days to 200 days, or an increased 18 DSE/Ha annual stocking rate.
- These later varieties did not produce high levels of feed earlier in the season, compared with balansa clover varieties. This highlights the importance of selecting varieties to fit individual livestock production systems.

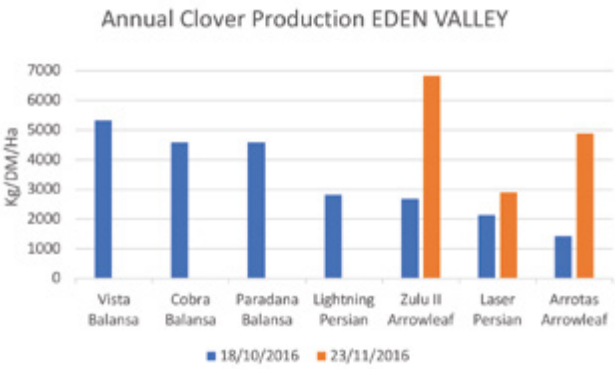



FIGURE 2: Choose the variety which fills your feed gap, balansa clovers for early spring production or Arrowleaf clovers for later spring production.

FIGURE 1: The high-quality brassica provided grazing for 500 ewe hoggets for 43 days through summer.

# Utilising stored soil moisture to grow high quality summer forage crops

**TOBY ROSENZWEIG, KEYNETON**

With wet conditions in spring 2016 Toby Rosenzweig, located at Keyneton, sowed a Leafmore brassica forage crop with an aim to provide green summer feed to ewe hoggets.

The brassicas were sown into a 30Ha paddock, on the 5th of September at 3kg/ha with barley added to increase the bulk of feed (Figure 1). Due to the wet, cold conditions they had poor establishment so were re-sown on the 12th October.

In December, the pasture was measured at 3500kg of dry matter (DM) per hectare (Ha), resulting in a 54 kg DM per Ha growth rate through late spring. Toby divided the paddock into three cells using the Rappa temporary electric fence system. On the 21st December, 10 weeks after sowing, he drafted off 500 of his lightest merino ewe hoggets and allowed them to graze the first cell. These ewes remained on the brassica paddock, being rotated through the cells twice, for a total of 43 days at an average stocking pressure of 75 DSE/Ha per cell. With a total utilisation of 1,090 kg of dry matter over the 43 days, the cost of establishment and seed costs per kg of dry matter utilised was $3.10.

Compared with the dry grass in the neighbouring paddocks this feed wedge provided significantly higher quality pasture (Figure 2) with 11MJ metabolisable energy (ME), 75% digestibility, 20% protein and a low Neutral Detergent Fibre (NDF) of 30-40%. The lower quality late summer grass quality in the surrounding paddocks was 7-8MJ ME, 55-60% digestibility, 6-8% protein and above 60% NDF.

# Maximising pasture production

Utilising stored soil moisture after a wet spring with a high-quality spring sown pasture helps to fill summer feed gaps, in this case gaining an extra 43 days of grazing.

In addition, the higher quality pasture results in improved livestock production which adds value to the business.

FIGURE 2: A forage brassica crop was sown in spring 2016 to take advantage of the available soil moisture to fill a summer feed gap.

When compared with the remainder of the mob, this 'lighter' brassica mob were 0.5kg heavier and cut 300 grams more wool which resulted in 152kg extra wool cut, or almost one extra bale of wool.

Toby found that it was critical to supply good quality hay while the ewes were grazing the brassica, to ensure they have adequate fibre. He also had to crutch the mob and 'click' them to prevent fly strike while they were grazing the pasture. It is also important to note that sheep should be vaccinated 14 days prior to a change in diet and should not be introduced to the brassicas while they are hungry to prevent animal health problems.

The brassicas continued to grow through winter with some residual ryegrass, providing feed for over 900 ewes with lambs at foot through late July and 1000 ewes in October, prior to the pasture being sprayed out ready for the following years cereal hay crop.

SUMMER UTILISATION: 1090 kg dry matter per hectare-118mm rain (September to January)

925 kg dry matter per hectare per 100mm rain

# Moby Barley Provides Feed and Flexibility

**MATT NELDNER, MARANANGA**

Matt Neldner of Marananga made the most of the high soil moisture levels and 40mm of rain in April 2017 to sow a Moby barley crop to provide winter feed for a lambing ewe mob. Matt lambs in late April, with an aim get his lambs up to weight and off the property in early spring, when he gets busy in the vineyards. Therefore, he aims to achieve a lamb growth rate of 300 gram per head per day growth. To achieve this growing high quality, early winter feed is important.

Matt sowed the barley at a rate of 65kg/ha one week after the rainfall event in to a 4.7ha paddock. Moby barley is an early maturing forage variety which has a fast establishment and winter growth to a minimum rainfall of 350mm. In early July, it measured 3000Kg of dry matter, which resulted in a 48kg dry matter (DM) per hectare (Ha) a day growth rate, which is high for mid-winter when the cold conditions tend to slow pasture growth rate down. In addition, a late break resulted in low soil moisture which further slowed the rate down in neighboring pasture paddocks.

FIGURE 1: Through winter the barley was growing at 48kg dry matter per hectare per day allowing 250 ewes with lambs at foot to graze the pasture in July.

Matt grazed the barley with a mob of 250 ewes with lambs at foot for 14 days in early July (Figure 1). This resulted in a stocking pressure of 165 DSE per hectare and a stocking rate of 6.3 DSE per hectare. Green Moby barley is estimated to be 12MJ of Metabolisable Energy (ME), 25% protein and 35% Neutral Detergent Fibre (NDF), this supported the lamb growth rate which Matt measured to be 400 grams per day for the tops and 200 grams per day for the bottoms, resulting in an average of 350 grams per day for a first cross lamb (Figure 2).

Due to the drier than average season, the pasture was not grazed again but rested to allow a hay cut. Cutting occurred on the first of October, when the barley was measured at 5500 kg of DM per Ha, resulting in a 75kg Dry Matter per hectare per day growth rate. This resulted in 45 bales weighing around 420kg, giving a yield of 6.75 tonnes per hectare.

The hay quality was excellent with an ME of 9.7MJ, protein of 12% which is well above average for cereal hay, and NDF of 55% which is average. This is a result of the grazing which prevented the hay from becoming bulky and fibrous, holding its quality.

The surplus feed conserved, could maintain 250 dry ewes for 97 days. At a cost of $64 per tonne (not including cartage, feeding out or growing costs) for the hay, this results in a cost of 8.3 cents per day to maintain these ewes at the bailing cost price.

TOTAL: 2388 Kg dry matter per hectare/ 100mm rain

## Maximising pasture production

Utilising an early variety with fast early growth rates, makes the most of any autumn and winter rainfall to fill a winter feed gap, and ensures lamb growth of above 300grams per head per day rates are achieved.

The pasture filled a winter feed gap providing 14 days of grazing in July. Grazing helps maintain feed quality, which is particularly important for forage cereals which can become bulky and fibrous at hay cutting.

In addition, Moby barley has utilised winter and spring rainfall to produce hay which will maintain the ewes through all of summer at a low supplementary feeding cost.

FIGURE 2: After grazing the barley the lambs were weighed and measured a 400 grams per head per day growth rate for the top portion and 200 grams per head per day for the bottom portion.

FIGURE 1: The pasture was able to be grazed in twice in August and September for a total of 13 days with 1270Kg of dry matter per hectare utilised.

# Early and late ryegrass varieties to extend the growing season

**BILL AND MANDY EVANS & ANTHONY STEINERT, KEYNETON**

Utilising a mix of early and late variety ryegrasses provides opportunity to produce a large amount of high-quality pasture through the spring which can be utilised for silage and extend the growing season by capitalising on late spring rainfall.

Bill and Mandy Evans lamb in mid-June so require high quality pastures through spring to maximise lamb growth rates. Because they are slightly later lambing, they also need to make the most of any late spring rain which falls to ensure lambs can be weaned onto high quality feed.

In early June 2017, just after the break in the season, Anthony Steinert sowed their 6 hectare pasture into a mix of annual ryegrasses, balansa cover and medics. Annual ryegrasses are utilised for their high quality and fast spring growth. Arnie and Vortex are annual ryegrass varieties which establish quality and provide an early first grazing, however due to their later maturing nature will remain vegetative for an extended period. This helps to extend the

FIGURE 2: The pasture was cut for silage in late October with a total of 52 bales, which could maintain 195 dry ewes through summer for 62 days.

grazing period, by maintaining high quality pasture which can respond to any later spring rainfall. The balansa clover and medics helped to ensure high protein levels improving the quality of the pasture, with the medics providing winter growth and the balansa the later spring growth.

On the 1st August, the pasture measured 2000kg dry matter per hectare (Figure 1) and was grazed with 195 ewes with lambs at foot for 9 days at a stocking pressure of 98 DSE/ hectare. The pasture was rested for four weeks and then grazed again for four days in September which resulted in a total of 13 days grazing and 1270Kg green dry matter of the pasture utilised.

The pasture was then rested until it was cut and baled for silage in late October (Figure 2). During this time, it grew at a rate of 50kg of dry matter per day which resulted in a total of 2.3 tonnes of dry matter per hectare and a total of 52 rolls of silage. These silage bales tested at 33% dry matter which allows efficient fermentation, very high metabolisabe energy (ME) at 9.7MJ and reasonable protein at 9%. The Neutral Detergent Fibre (NDF) was high for silage at 59.6%, which is likely to be a result of being cut late. The excess maturity can affect compaction which can exclude oxygen for fermentation. Ideally the NDF needs to be below 55%.

The total amount of silage at 9.7ME could maintain the 195 dry ewes for 62 days. The cost to produce the silage was $55 per tonne (not including cartage, feeding out and growing cost), which resulted in a 19 cents per day cost to maintain the ewes at the cost of baling through at least two of the summer months when there is less pasture feed available.

After baling, the pasture received a further 10mm rainfall which allowed the later variety ryegrasses to produce another 1700 kg dry matter per hectare which was grazed with 200 weaners in early November for six days.

Total pasture utilised = 5310 – total growing season rainfall: 344

Total of 1543kg dry matter per 100mm rain.

## Maximising pasture production

Ryegrasses produce high quality feed providing 23 days of late winter and spring grazing prior to being cut for silage.

The later varieties responded to the high plant available water through spring, providing a further six days grazing after silage had been removed.

The use of higher protein clovers and medics ensured the quality of the pasture and resulting silage remained high.

In addition, the pasture provided the opportunity to preserve surplus feed in the form of silage to allow ewes to be maintained for 2 months through summer.

FIGURE 1: The native grass pasture was rested over the summer months, ensuring a feed wedge was available for the ewes at lambing time through winter and spring.

# Utilising native pastures for lambing

JASON AND KIRSTY TRELOAR, KEYNETON

In the Eastern Mt Lofty Ranges, native grass pastures are a critical component of grazing systems. Understanding and utilising their potential can provide production gains and ensure longevity of these important areas.

Jason and Kirsty Treloar utilise native grass pastures for lambing their merino ewes. In 2017, they lambed 630 merino ewes, mated to merino rams, onto a 650ha paddock between May and June. Although this is a low stocking rate of 0.9 DSE/Ha, the ewes were able to remain on the pastures for the winter and spring months. This allows flexibility across the rest of Jason and Kirsty's property ensuring they can save high quality paddocks for weaning.

The paddock contains a huge variety of native and annual grass plants. These different varieties provide opportunities for flexibility within a grazing system. Previous testing in 2015, at the site demonstrated an average of 19 Wallaby grass plants per metre growing in winter which then decline over the summer months. This is replaced with the summer active C4 plants such as Brush Wire grass and Spear grass which are dominant at 4 plants per metre square.

Prior to grazing, the pasture was rested through the summer months, allowing it to recover. With the very late break in 2017, which occurred in June, this recovery of the pastures was critical. It allowed the summer active grasses, which grew with the above average summer rainfall, to produce feed which was then utilised in the lambing period, when the winter grasses had not responded due to lack of moisture. The summer recovery process also ensured the winter active grasses could recover from last year's grazing (Figure 1) when the break did come in June, they could respond and grow, providing feed through late winter and spring.

Monitoring through the winter and spring showed ground cover remained above 90% which was a result of the lower stocking rate (Figure 2). These levels reduce the risk of soil erosion and improve organic matter. The total pasture produced was 1000kg of dry matter per hectare.

The benefits to the production system were measured when they marked 722 lambs, resulting in a lamb marking percentage of 115%. In October, just after weaning, the lambs weighed 35 kilograms. This resulted in an average weight gain of approximately 250 grams per head per day or a 63 cent per head per day gain when lambs are valued at 600 c/Kg. Considering there are no pasture establishment costs this is very valuable.

FIGURE 2: The low stocking rate ensured ground cover remained above 90% across the paddock reducing the risk of soil erosion.

At weaning the lambs were moved to the higher quality improved pastures to maintain their growth rates. The ewes remain on the native grass pastures until early summer when they were removed to allow the pastures to rest over the summer months.

Total pasture produced = 1000 kg dry matter/Ha: total rainfall 300mm

Total: 333Kg dry matter per hectare/ 100mm

## Maximising pasture production

Allowing pastures to rest over the summer ensures a good recovery period for the plants and provides a feed wedge for ewes coming into the paddock for lambing.

Ensuring ground cover remains above 80% prevents the risk of erosion.

Utilising native pastures for lambing allows pastures on other areas of the property to grow ensuring lambs can be weaned onto higher quality pastures.

# High stocking rate increases perennial pasture performance

**MICHAEL EVANS, FLAXMANS VALLEY**

Michael runs a mixed enterprise of sheep and cattle. In the high rainfall, 620mm annual average of Flaxmans Valley, he utilises a range of sown annual, established perennial and native pastures within the rotational grazing enterprise with an aim to provide year-round feed without requiring supplementation.

Michael aims to graze at a high stocking rate for a short amount of time. This allows an 'even graze' across the pasture and provides adequate rest and recovery for the perennial plants. He aims to graze the perennial grasses once they get to 3.5 to 4 leaf stage or approximately 3000 kg of dry matter per hectare. This is when the plant is at a nutritional high point, ensuring good growth rates for livestock, and it is also at the point when the plant growth begins to decline.

FIGURE 1: in 2017 Michael got a total of 63 grazing days from a 4 Ha paddock running at an average stocking rate of 94 DSE/ Ha.

In 2016, he sowed a perennial pasture mix of phalaris, cocksfoot, perennial ryegrass, sub clovers and a small percentage of lucerne. This was sown with 50kg Nitrogen. The 4-hectare paddock is used within a rotation of four 4 to 5ha paddock with a central watering point in a half wagon-wheel type design. The small paddock size allows Michael to get high stocking pressure and a high stocking rate which helps with the pasture management. The paddock is located next to the cattle yards and is surrounded with electric fencing.

Michael regulates his rotational grazing to ensure he has 3000kg of dry matter per hectare coming into March when he weans the calves. This is achieved by utilising summer active perennial grasses and setting the rotational grazing to meet this figure.

After the above average rainfall year of 2016, and with careful grazing management, the pasture established well. In March 2017, he weaned 129 calves into the 4-ha paddock at a stocking pressure of 258 DSE/Ha where they remained for 8 days utilising 8000kg of dry matter per hectare.

Throughout the remainder of the autumn, winter and spring 52 cows with calves rotated through the pasture at a stocking pressure of 234DSE per hectare for five days per grazing. Michael set the rotation length on ensuring the cattle entered the pasture at 3000 kg of dry matter per hectare, this was dependent on available soil moisture, temperature and the post residual grazing pasture levels.

The target post residual grazing levels (pasture dry matter per hectare when the animals are removed from the paddock) remained at 1200kg of dry matter per hectare through autumn and winter, extending to 1500kg of dry matter per hectare as the pasture growth rate increased in spring. The total grazing days through this period was 15 days.

The pasture was then grazed through summer providing an additional 40 days grazing for cattle at a stocking pressure of 34DSE/ha. A feed sample taken in January demonstrated the pasture provided 14% protein, 8 MJ of ME, and 32% dry matter, which is higher quality compared with non-improved annual pastures at this time.

The total number of grazing days throughout the year was 61 days, with a total annual stocking rate of 25.5DSE/Ha and a total of 9,300kg of dry matter utilised.

**Total utilised pasture 9,300 with total annual rainfall 465mm**

**Total of 2000kg of dry matter per hectare per 100mm rainfall**

## Maximising pasture production

Grazing at a high stocking rate allows the pasture to be grazed evenly, with little wastage, and help keep pastures vegetative for longer periods of time, resulting in further grazing days in the future.

Perennial grasses fill summer feed gaps providing additional high-quality grazing opportunities, in this case 8 days grazing for weaned calves in 2017 and another 40 days for heifers in 2018.

Careful planning of grazing rotations ensures pastures are grazed at the optimum time providing high quality and persistent pastures.

# Establishing Lucerne to provide year-round feed opportunities

**ANDREW AND KATE JAESCHKE AND FAMILY**

Keyneton cattle producers Andrew and Kate Jaeschke planted a stand of L70 Lucerne in 2014, which is utilised for weaning and finishing steers, heifers and bull calves. The lucerne plays an important role in the Jaeschke's Santa Gertrudis cattle grazing system due to its high protein and metabolizable energy ensuring their stock maintain and improve condition (Figure 1). With two calving periods during the year, they aim to sow semi-winter active varieties, which will provide year-round grazing opportunities, ensuring they reach target growth rates throughout the year.

In June 2017, just after the late break to the season, Andrew sowed a 14.2 Ha paddock to lucerne. He chose older varieties, Flairdale and Sardi Grazier which are 250mm annual average rainfall varieties, to ensure they establish and grow even in the below average years. Lucene has a large tap root that extends up to 2 metres under the soil. This allows it to draw up nutrients and water from deep below ensuring it continues to provide feed in low rainfall environments.

These varieties also exhibit a more prostate growth habit and have a larger crown which Andrew believes increases their persistence as they can handle grazing better.

Prior to sowing, the paddock was spray-topped the previous year, to reduce potential weed problems at establishment. The paddock was also sprayed 8 weeks prior to sowing with glyphosate. For pest control, Andrew

FIGURE 1: The lucerne plays an important role in the Jaeschke's Santa Gertrudis cattle grazing system due to its high protein and metabolizable energy ensuring their stock maintain and improve condition.

## Maximising pasture production

Ensure the paddock is prepared prior to the establishment of lucerne to eliminate weed competition

The deep rooted lucerne plant provides year-round production, even in low rainfall years

In times of feed surplus, lucerne can be utilised for hay to provide feed in times of low feed availability.

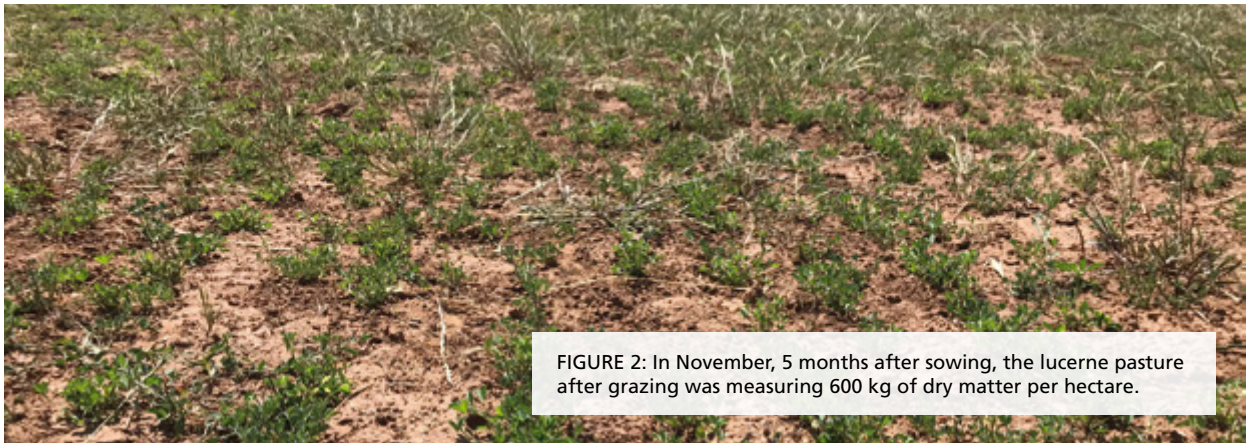


FIGURE 2: In November, 5 months after sowing, the lucerne pasture after grazing was measuring 600 kg of dry matter per hectare.

included Pyrnex into the mix and sprayed again 8 weeks post sowing. In addition to the Pyrinex, Andrew ensures the seed is coated with a seed treatment which aids germination and establishment.

Lucerne has a staggered germination, which helps to reduce the risk in establishment. Andrew noticed that his Lucerne germinated in three stages, in response to sporadic rainfall events over a 5 week period. This sporadic germination meant Andrew had to be selective in his chemical use and had to hold off spraying with selective grass herbicide until 8 weeks post germination, until the youngest plants were at the correct leaf stage.

Andrew grazed the pasture with heifers in October, just after weaning. This paddock is located next to the cattle yards, with the high protein and metabolizable energy in the lucerne, this makes a perfect weaning pasture.

By early November, the plants had established an average of 80 plants per $m^2$ and was producing 600kg of dry matter per hectare. A feed test taken demonstrated a high protein of 19% and energy of 9.6 MJ of metabolizable energy, considering the time of year in late spring, after an early finish, these figures are much higher than other annual and native pastures on the property. The high quality of the lucerne provides opportunities for finishing and growing out steers or heifers.

With the following dry summer, the pasture was lightly stocked. Lucerne hay harvested from other paddocks on the property was used to maintain the cattle.

The pasture provided feed for a total of 40 grazing days at an average stocking pressure of 32 DSE/Ha or an increased annual stocking rate of 3.5 DSE/Ha.

# Maximising pasture production

A one-off pasture establishment cost has allowed the 2.75Ha to be utilised to grow good quality hay on an annual cycle.

The summer active perennials provide additional grazing opportunities after the hay crop has been removed.

The use of perennial varieties within the paddock have increased the pasture quality and ensured greater than 95% ground cover year-round.

FIGURE 1: To provide extra bulk to the pasture for added hay production, it was over sown with perennial grasses and sub clovers in June 2017.

# Performing perennial grass pastures

**ANTHONY STEINERT & WARREN AND BARBARA FARGHER**

A well-established perennial pasture can provide huge flexibility to a livestock enterprise. Anthony Steinert, at Flaxmans Valley, share farms the 2.75Ha paddock 'China' with owners Warren and Barbara Fargher. In mid-June 2017, the paddock was over-sown to the Coopers (Farm Supplies) perennial mix. This mix contains Holdfast GT Phalaris, Cocksfoot, Kidman ryegrass and sub clovers.

With careful management, these pastures established well with over 100% ground cover, 50% perennial grasses and 50% clovers.

In August 2017, after the late break to the season, the pasture measured 1500kg of dry matter per hectare (Figure 1). With plenty of available spring feed, the decision was made to lock the pasture up and cut it for hay. After average spring rains, the pasture measured over 5,000kg of dry matter per hectare in early November which resulted in 1,500 kg of dry matter produced per 100mm of rainfall and 40kg dry matter growth rate per hectare per day.

A feed test was taken in November with results indicating 23% dry matter, 10.3% protein and 9.5Mj of metabolizable energy. In comparison, an unimproved area of the paddock demonstrated the difference in pasture quality with a higher dry matter percentage of 33, lower protein at 6% and lower metabolizable energy at 9 MJ (Figure 2).

The pasture was cut for hay in late November with a total of 14 bales averaging 380kg each. A feed test of this hay indicated the hay was reasonable quality with 83% dry matter, 9.4 MJ of metabolizable energy, and protein of 9.9%. The perennial pasture also ensured over 95% groundcover across the property compared with the non-improved areas which dropped to below 70%. This increases the risk of soil erosion.

**FIGURE 2: The improved perennial pasture (right) was higher quality compared with the unimproved area with a higher dry matter, lower protein and energy in November 2017.**

At a baling cost of $71 per tonne (and not including feeding out or cartage costs), this would sustain a mob of 200 dry ewes for 22 days at 9 cents per head per day or a mob of 20 dry cows for 12 days at $1.60 per head per day.

The pasture was then grazed with dairy heifers in mid-January, providing summer feeding opportunities.

330mm growing season rainfall 2017 (April-October)

284mm growing season rainfall 2018 (April- October)

# Vineyard winter feed wedge maintains lamb growth rates

**KARL SCHILLER, ANGASTON**

Karl Schiller of Angaston is keen to make his vineyard as productive as possible by fitting it into his rotational grazing program. Karl only grazes the vineyards in winter, once the leaves have dropped from the vines and prior to bud burst in September.

The pasture consists of perennial grasses with perennial ryegrass and fescue established in alternating mid rows. There is also 10% remnant clover across the paddock.

Grazing the vineyards not only helps Karl to defer grazing and grow a feed wedge in his other grazing paddocks, but also helps with weed control in the vineyard. This helps to reduce the use of herbicides, reduce compaction and provides fertiliser in the form of urea and manure.

Karl plans his joining period to coincide with available feed in the vineyard, so joins for an eight-week period beginning in mid-December. He utilises a longer joining period to ensure he gets as many lambs on the ground as possible and aims for all lambs to be sold by October when the vineyard management gets busier.

Karl only puts his ewes into the vineyards once they have finished lambing and after lamb marking, to reduce lamb loss attributed to mismothering which can occur with the presence of vines. Karl also ensures pruning is completed prior to the mob entering the vineyard. At pruning Karl leaves the canes on the ground mid-row and mulches them, which acts as ground cover and mulch for the soil. However, if sheep were to be introduced prior to mulching, the sheep would spread canes across the vineyard making this process very difficult.

Karl monitors lamb growth rates to assess whether they are reaching his targets. Assuming that the larger lambs were born first, and the smaller ones last, ten of the heaviest lambs and ten of the lightest lambs were weighed before going into Karl's 13ha vineyard. The "heavies" and "lights" were an average of 22kg live weight per head and 11kg live weight per head, respectively.

On the 2nd of July following marking and weighing, 155 merino ewes and 145 first cross lambs went into the vineyard after marking with around 3000kg dry matter (DM)/ hectare (ha) Food On Offer (FOO). On the 16th of August following 45 days grazing at a density of 35 Dry Sheep Equivalents (DSE)/ha, there was approximately 1200kg DM/ha remaining.

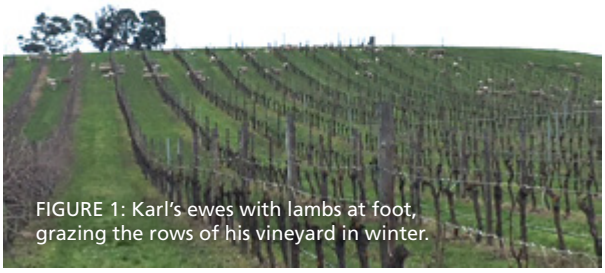


FIGURE 1: Karl's ewes with lambs at foot, grazing the rows of his vineyard in winter.

After the 45 days of grazing, the same lambs were again weighed at weaning resulting in an average daily live weight gain of 290g/head/day across the 20 lambs that were recorded. The "heavies" grew at 310g/head/day and the "lights" grew at 270g/head/day.

Karl totalled 1,530 DSE/ha grazing days and with an average live weight gain of 290g/head/day, this is an increase of $36 per head (assuming a conservative yield of 46% and 600c/kg carcass weight value). Over the 45 days spent grazing the vineyards, this results in a $401 increase per hectare, which is additional gross income to the grape crop that is harvested. By grazing his vineyards, Karl was able to acquire this increase in gross income whilst meeting his goal of having all lambs sold from the property by the end of October at a targeted weight range of 40 to 50kgs.

## Maximising pasture production

Utilising pastures in vineyard to fill a winter feed gap- maintained lamb growth rates of 290 grams/head/day.

Grazing provides benefits to the vineyards by reducing compaction, herbicide use and the addition of manures.

Grazing the vineyards helps to create a spring feed wedge across grazing paddocks on the property.

FIGURE 1: After receiving only 43mm of autumn rainfall, Karl created partnerships with other producers to clean hay offal, the hay remaining at the bottom of the hay shed, from sheds to provide livestock feed.

# Where there's a will there's a way

**KARL ZERNER, EUDUNDA**

Karl Zerner, a producer from Ellimatta near Eudunda sowed a demonstration paddock with an early maturity Fleet barley at 75 kg/ha on the 18th of June with the aim of a light grazing during the season before ceasing grazing and eventually harvesting. However, in early June Karl decided to reconsider his strategy in maximising production off the paddock, as at that stage they had only received approximately 43mm of rainfall in a 350mm average rainfall area.

Utilising a number of long-term weather forecasting applications including; The Long View, AV Weather, Walkers Weather, Inigo Jones – National Archives of Australia, Ken Ring – Predict Weather, Australian CliMate and of course the wisdom of the older generations, led Karl to believe that they were in for a long and tough season. As a result, Karl begun to offload stock from the property to reduce the grazing pressure. At first, the crossbred lambs went and then following a "tits, toes and teeth" check, another 100 older ewes left the property.

Come late July/ early August, Karl's hay stores were disappearing fast and he needed to organise more in order to maintain his core breeding merino ewes. However, this was no easy task. Due to the extremely dry weather being experienced by the majority of QLD and NSW, paired with subsidised freight, meant that finding local fodder was extremely difficult.

In mid-August, Karl did manage to secure two semi loads of straw and two semi loads of hay.

To increase the palatability of the straw and thus reduce the quantity of wastage, Karl poured vegetable oil over the straw. Karl was also feeding Molafos at 100g/head/day in 20L chemical drums that had been cleaned and cut in half prior to use. Sourced from local distributer Bruce Schutz from Pt. Pass via Eudunda, Molafos is a supplementation of energy, protein and minerals. It increases rumen bacterial function which encourage stock to forage further and less selectively. It also increases dry matter intake and therefore can result in improved growth rates. The Molafos feed analysis shows energy and dry matter content at 10Mj ME/ kg DM and 68% respectively.

With the straw and hay stocks again running low, Karl was forced to think outside of the box, as fodder was becoming increasingly sparse and expensive. At the beginning of

FIGURE 2: Karl removed a total of 130 tonnes of hay offal from hay sheds around the district to provide livestock feed.

September, Karl had organised the hiring of a tele-handler and a semi whilst JT Johnson's scouted hay sheds with adequate amounts of hay offal. Hay offal is the hay remaining on the shed floor after the main bales have been removed. It is often removed from the sheds and simply burnt, however this time Karl had plans to load it into the semi to then feed out onto the ground to his valuable breeding stock.

Karl and his team managed to clean out seven sheds in total from Kapunda, Riverton, Marrabel and Manoora. A total of 130 tonnes of hay offal was captured and fed to stock requiring 29 semi loads (4.5T/ semi).

Karl's innovative solution to an unavoidable tough season bought them around 6-8 weeks' worth of feed at a fraction of the cost of buying hay. Using an average freight cost of $440/ semi load and $80/hr for tele-handler hiring, the total cost equated to around $125/T of hay offal excluding labour, almost a quarter less than cereal hay per tonne. Eight of the 29 semi loads went to neighbouring properties to help, where Karl was extremely kind and generous in charging a minimum of $20/hr for the loads. One local was very humbled by Karl's generosity as the loads of fodder allowed him to keep his sheep close and occupied whilst he focused on shearing.

It wasn't all sunshine and roses though. The hay offal contained small amounts of black plastic used to line the floor of the hay shed. However, this was quite easy to spot and thus a majority was picked out and discarded. What wasn't as easy to spot and remove though were bale tags and inch-long bale string, which frequently got caught up on the bellies of a few sheep. This was removed at crutching.

## Maximising pasture production

Utilise climate forecasting to help with decision making.

Offload low priority stock early to ensure the core breeding stock can be retained.

Remain positive, there are always alternative solutions.

Everyone is in the same boat, unite and work together to find solutions to local problems.

Aside from keeping his stock maintained, Karl said it was the conversations he had and the relationships he built that was the most fulfilling part of the experience. Cleaning the sheds out was one less job the shed owners had to do and therefore there were good cooperative relationships to be made.

Karl's Fleet barley crop was grazed for 27 days through October from 180 merino ewes and 130 crossbred lambs. Having only received around 136mm of rainfall at the end of September, the crop has now progressed to head. Although quite sparse, Karl still plans to harvest the paddock where he hopes to get 10-20T together to store in a field bin and/or feed out to sheep.

In the end 2018 was a tough, unavoidable season endured by all. However, thinking outside of the box, combined with quality team work, helped to keep Karl's spirits high and his core breeding mob maintained.

FIGURE 3: Karl was able to provide feed for 6-8 weeks to maintain his core breeding ewe mob through spring

# The benefits of introducing poly cultures to your cropping and livestock rotation

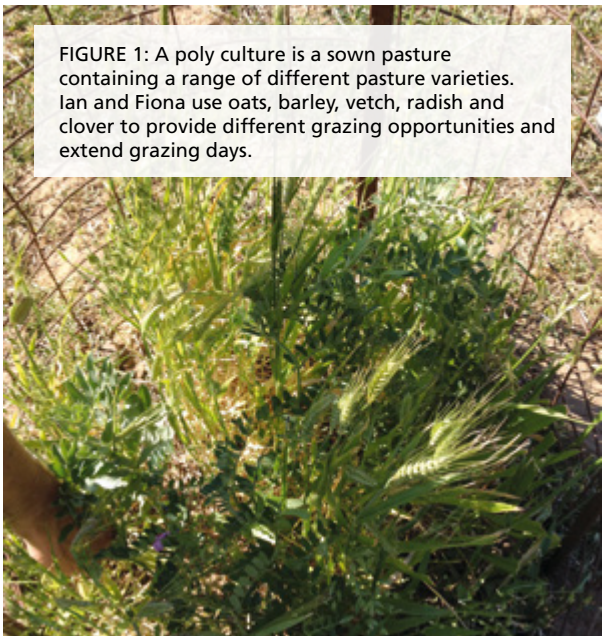


FIGURE 1: A poly culture is a sown pasture containing a range of different pasture varieties. Ian and Fiona use oats, barley, vetch, radish and clover to provide different grazing opportunities and extend grazing days.

**IAN AND FIONA KOCH, MOCULTA**

Local Moculta producers, Ian and Fiona Koch, rely heavily on a number of different management strategies to remain as productive as possible in a variable climate. In between the cropping cycle, they establish poly cultures (pastures containing a mix of many different pasture varieties) to fill feed gaps for their stud ewe and ram flock.

In addition to the available pasture, Ian and Fiona believe there are several other benefits to poly cultures which supports the soil, and in return their cropping program. These benefits include the additional nitrogen fixation from legumes, reducing inputs such as pesticides and herbicides and, as a result of the increased number of growing days that living roots are within the soil, increased soil biology. Compared with traditional cropping enterprises which aim for reduced plant growth through summer to conserve soil moisture, the poly culture aims to provide living roots within the soil which are beneficial for soil biology, helping to increase soil organic matter, increase available nutrients and improve water infiltration to name a few.

On the 8th of May, Fiona sowed a poly culture pasture which included Wimmera Ryegrass, Oats, Barley, Vetch, Lunch Radish and Clover (Balansa and Arrow Leaf), with 40kg/ha Pro S 10 from Hi-Tech Ag Solutions, into their 56ha paddock (Figure 1). Ian and Fiona choose varieties that are easily sourced and inexpensive. Ian says it can be quite difficult at times to source 'older' varieties when seed companies are focused on promoting the latest innovative varieties. Prior to sowing, the paddock had been treated with grape marc to improve soil health.

On the 8th of June, 117 14-month-old merino rams were weighed with an average of 70.7kg live weight before going into the poly culture paddock. The rams had approximately 1500kg of dry matter (DM)/hectare (ha) Food On Offer (FOO) with a grazing pressure of six Dry Sheep Equivalents (DSE)/ha. The rams grazed the paddock for 30 days and during this period, also had access to lick feeders which contained 60% barley and 40% oats. Ian noticed that whilst initially the rams fed regularly from the lick feeders, towards the end of the grazing period the rams preferred to graze the paddock feed.

During this grazing period, a feed sample was taken to assess the quality of the paddock feed. The sample results indicated the pasture was very high quality with values for crude protein (CP), metabolisable energy (ME) and neutral detergent fibre (NDF) of 18.9%, 11.8MjME/kgDM and 40.8% respectively.

On the 10th of July the rams were removed from the paddock and weighed again. An average live weight of 85.4kg was obtained resulting in an average live weight gain of 455g/head/day. Following the grazing period, it was estimated that there was approximately 1900 kg DM/ha remaining, suggesting that the pasture growth rates were significantly greater than the rate of consumption. Assuming the rams were consuming 2 kg DM/head/day, it is estimated that the pasture growth rates were approximately 20kg/ha/day.

Whilst the paddock was being rested following its first grazing, Ian took the opportunity to apply a range of liquid fertiliser products also from Hi-Tech Ag Solutions on the 16th of July. These included; Hi-Mag at 1lt/ha, Hi-Balance at 1.5ltr/ha and BLU-Trace at 9ltr/ha.

FIGURE 2: Ian stocked the poly culture paddock with over 400 merino weaners to total 116 grazing days for the 2018 winter and spring.

Approximately one month later, on the 15th of August, 472 merino weaners came straight off shears and into the paddock at around 13 DSE/ha for 31 days. The season was tough with only 217mm cumulative rainfall by the beginning September. As a result, on the 20th of September, Ian removed the weaners from the paddock to draft and cull 70 of the original 472 weaners to reduce the grazing pressure on the paddock. The remaining weaners went straight back into the paddock.

On the 25th of September, Ian split the 56ha into two smaller sections, one at 42ha and the other at 14ha using a permanent fence. This gave Ian and Fiona the ability to graze the poly culture pasture with all their weaners whilst remaining within their respective sex class. 220 ewe weaners went into the 14ha portion with a grazing pressure of 24 DSE/ha and 182 ram weaners went into a 42ha portion at 7 DSE/ha (Figure 2).

On the 23rd of October, Ian added their late drop lambs to their respective sides of the paddock bringing the ewe weaners grazing pressure up to 26 DSE/ha and the ram weaners up to 8 DSE/ha. Ian acknowledged that the ewe weaners were stocked relatively high and so on the 20th of November he removed them to rest the poly culture and grow a feed wedge.

Ian and Fiona have totalled approximately 2,426 DSE/ha grazing days so far throughout the season with only 255mm cumulative rainfall to date in an annual rainfall zone of 500mm. The total number of DSE/ha grazing day will continue to rise as the ram weaners remain grazing their 42ha portion as they become next year's sale rams and as ewes utilise the feed wedge grown later in the season.

## Maximising pasture production

Poly cultures contain a range of varieties which all mature at different stages of the year, for this reason they can provide impressive livestock growth rates and increased number of grazing days, in this case 116 days of grazing through winter and spring.

Poly cultures can reduce the need for inputs such as herbicides and pesticides when grown in three-year rotation with cropping

Poly cultures stimulates healthy soil biology through N fixation which may be utilised in cropping rotation

As for the fate of the poly culture paddock; Ian and Fiona will again sow a poly culture in the same 56ha paddock which will be its third year in a row. They purposely implement a three-year rotation as they believe that three years is the maximum you can push the system before brome grass starts to proliferate and requires spray topping to control. Once the paddock has been spray-topped, it will be sown to a cereal to make use of the additional N that was fixed in the soil by the legume content of the poly culture.

FIGURE 1: Red Legged Earth Mite altering the appearance and quality of Clover.


FIGURE 2: Craig's silage baler and wrapper.

# Production of high-quality silage in a rotational grazing system

**CRAIG HAGE, ANGASTON**

Craig Hage, based in Angaston, sowed his 20ha FigTree paddock to a mixture of ryegrass and clover in autumn 2018. His aim was to provide grazing forage for cows with calves and ewes with lambs before being rested and eventually cut for silage.

The pasture was dry sown on the 17th of April with a twin disc seeder with press wheels at a rate of 25kg/ha (20kg of ryegrass and 5kg of clover). The ryegrass portion consisted of a blend of Vortex, Arnie and Tetila Seedcare Annual Ryegrass species from the "Coopers (Farm Supplies) Hay Silage Annual Ryegrass (ARG) Blend" and the clover portion included Lightning Persian, Vista Balansa and Zulu II Arrowleaf Clover AgriCote from the "Coopers Annual Clover Blend". This mix includes a range of early and late maturing varieties which provide grazing opportunities throughout autumn, winter and spring.

Despite the dry conditions, having received only 81mm cumulative rainfall at the beginning of May, the pasture established well receiving its first grazing by cows and calves on the 16th of May with a grazing pressure of 88 Dry Sheep Equivalent (DSE)/hectare (ha). The cows and calves initially had 1200kg Dry Matter (DM)/ha Food On Offer (FOO) and following two weeks of grazing there was approximately 700kg DM/ha remaining.

At the beginning of June, Craig noticed that in isolated areas the clover had begun to change colour from lush green to variegated. Upon closer inspection Craig found significant populations of red legged earth mite (RLEM) (Figure 1). RLEM use adapted mouthparts to lacerate the leaf tissue of plants and suck up the discharged sap. The resulting cell and cuticle damage promotes desiccation, retards photosynthesis and produces the characteristic "silvering" that is often mistaken for frost damage. Subsequently, Craig sprayed FigTree with Le-mat at a rate of 25ml/ha to reduce the burden RLEM were placing on the pasture.

Controlling pests, along with the addition of 120kg/ha of pasture prime (N/P/K) fertiliser on the 20th of June, saw the pasture bounce back well from the first grazing. Subsequently, on the 2nd of July FigTree received its second grazing again by cows with calves at a grazing pressure of 88 DSE/ha. The cows and calves initially had 1800kg DM/ha FOO and following two weeks grazing there was approximately 1200kg DM/ha remaining.

With only 207mm cumulative rainfall by the beginning of August, the pasture was still progressing well with a third and final grazing on the 13th of August from 200 ewes and 250 lambs with a grazing pressure of 33 DSE/ha. Initially there was 1800kg DM/ha FOO and following two weeks grazing there was approximately 1400kg DM/ha FOO remaining. Following this final grazing, Craig applied hay booster and rested the paddock ready to cut for silage in late September.

On the 24th of September Craig mowed FigTree. He made this decision based on the high leaf area of the grass within the pasture and the maturity of the clover. High leaf area is favourable as it provides adequate sugar quantity which aids in the anaerobic fermentation and improves silage quality, whilst the clover is just harder to pick up off the ground with the mower as it begins to wilt and fall over.

Following mowing, the rows of pasture are raked from two into one. This is done immediately prior to the row being picked up by Craig's unique silage baler and wrapper. As the pasture row is picked up off the ground an inoculant is added. Craig uses Silage King as an inoculant which activates enisling bacteria already present on the pasture and inhibits those that decompose it. Craig has found that it also significantly reduces the presence of mould. The inoculant is applied at a variable rate and is dependent on how much pasture is being fed into the baler but is generally around 100-120ml/ wet tonne of forage. At times the pasture is chopped before being wrapped up as it increases the utilisation by stock. However, this season Craig decided not to chop as the pasture was already quite short and if it were to be further chopped there would be an increase in wastage when feeding out. Craig's silage baler and wrapper (Figure 2) is unique as it is capable of wrapping the previous silage roll formed and off-load it whilst Craig is still progressing through the row picking up pasture to form the silage roll.

There are several variables contributing to the quality of silage, however two of the most important things that Craig takes into consideration is the Neutral Detergent Fibre % (NDF), which relates to plant maturity, and the Dry Matter % (DM). The effects of these two variables can be seen in the "Silage Quality Matrix" (Figure 3). As shown, values under 55% for both NDF and DM are considered high quality, with 40% being optimal for both parameters.

160 bales of silage were produced from FigTree with an average weight of 700kg. A feed analysis returned values for NDF and DM at 39.8% and 46.7% respectively, confirming that Craig has indeed produced 160 bales of high-quality silage. The metabolisable energy (ME) and crude protein contents were 11.9 MJ/kgDM and 19.1% respectively.

Craig prefers silage over hay for several reasons including; silage can be produced in as little as one to two days in comparison with two to three weeks with hay, therefore you can predict and manage your duties around the weather more effectively, the wrapping of silage also quickly conserves the fodder at its highest quality and lastly, livestock are able to return to the paddock far sooner to graze. Valued at around $40-50/T for mowing, inoculating, baling and wrapping, silage may be a better option than hay depending on your location.

As of November 2018, Craig had totalled 2,926 DSE/ha grazing days and captured approximately 2,600 kgDM/ha stored in silage rolls and plans to either graze the paddock again with his first cross weaners or cut it again for hay.

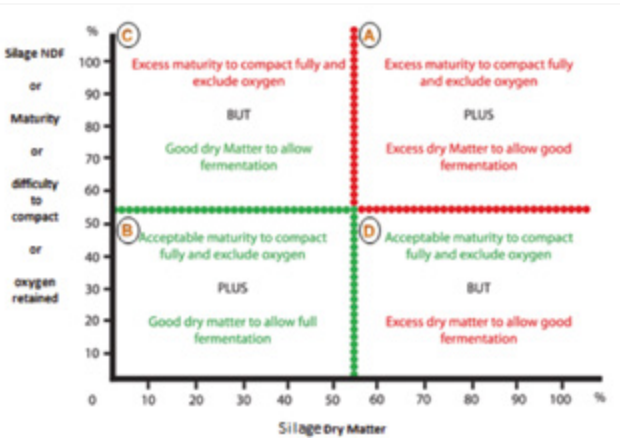



FIGURE 3: Silage Quality Matrix (Adapted from Ian Sawyer – Hay Guard Nutritionist).

## Maximising pasture production

Sowing early ensures the pastures establish while the soil temperature is still high, allowing winter grazing opportunities prior to spring silage.

Targeted management including pest control, the addition of fertiliser post grazing and early sowing can be highly productive, even in a dry season.

There are a number of variables in silage production, pay attention to them by monitoring your pastures and be rewarded.

Silage allows you to 'lock' in the pasture at it's highest quality, providing the opportunity to fill the summer feed gap with this high quality feed.

FIGURE 1: Bruce Hancock and Jackson Adams measuring the pasture. Bruce's main goal was to produce high quality fodder during late autumn and winter and produce high quality silage.

# Producing quality lamb and managing pastures under organic principles

BRUCE HANCOCK, EDEN VALLEY

Bruce Hancock leases the grazing country from organic grape growers, Ben & Gill Radford of Eden Valley. The vineyard, pastures and livestock are all run under organic principles.

The area of interest comprised of three individual paddocks managed as one, with a total area of 8ha. On the 20th of April after 16mm of rainfall, Bruce used a twin disc seeder with press wheels to sow an annual forage crop mixture of Oretet ryegrass, Narrikup sub clover and Zulu Arrowleaf clover at a rate of 30kg/ha (Figure 3). This annual forage crop mixture was sown into a background of phalaris and a mixture of sub clover species. Bruce specifically chose to include the Narrikup species of clover as it has Red Legged Earth Mite tolerance and with limited insecticide options to control as a result of the organic status, the new pasture warranted trialling.

BioAg Phosphate fertiliser was also added on the 30th of April at 250kg/ha. Soil amelioration through the application of lime has increased soil pH from 4.7 in 2012 to 6.2 in 2017, and with annual production of silage and biennial application of organic fertilisers, the soil P (Olsen) has remained at 7ppm.

Bruce's main goals were to produce high quality fodder during late autumn and early winter for his ewes and lambs at foot, or later lambing ewe lambs to ensure they maintain high growth rates (Figure 2). Bruce also planned to cut the pasture for silage to provide feed in times of low feed availability. Bruce's aim was to bale at least 10 silage rolls to the hectare. Mowing the paddock and producing silage also helps to provide a fire barrier around the homestead as well as control the seed set of broadleaf weeds and annual grasses. Following pasture regrowth in November and December, this feed wedge provides good quality, seed-free grazing.

On the 30th of June, 65 dorper ewes with 80 lambs at foot began to graze the annual pasture mix with an approximate 2500 kgDM/ha Food On Offer (FOO). Assuming 3.2 Dry Sheep Equivalent's (DSE's) per ewe and lamb unit, this is a grazing pressure of 26 DSE/ha/day. The ewes and lambs grazed the paddocks for 51 days until the 20th of August totalling 1,326 DSE/ha grazing days. Following the grazing period it there was an estimated 1500 kgDM/ha remaining.

Bruce would have normally grazed the paddocks for an extra two weeks, providing the pasture with only six weeks rest before the forecasted ensiling date. However this season, having only received approximately 273mm of cumulative rainfall by the end of August in a 600mm annual average rainfall zone, knowing the plant available

FIGURE 2: The paddock produced a total of 18.7 tonnes of dry matter through grazing and conservation of fodder, which provided feed for Bruce's dorper ewes

# Maximising pasture production

Maintaining soil fertility is achievable on organic properties and ensures pastures remain productive.

The later maturing perennial grass varieties, with the addition of ryegrass, utilises late spring rainfall, when the soil temperature and day length has increased, to create enough bulk pasture to conserve 2,700 kgDM/ha in the form of silage.

In addition to the silage, the pasture provided 1,326 DSE/ha grazing days.

moisture levels indicated by the local Barossa Improved Grazing Group's (BIGG) soil moisture probes and the information provided by several climate forecasting tools led Bruce to rest his paddocks for four weeks longer than normal. After receiving 15mm in September and 25mm in October this proved to be an effective management decision. Allowing the pasture an extra four weeks of rest created sufficient biomass to justify silage contractor, Regari Contracting, to come and capture the high quality pasture.

On the 30th of October the pasture was cut, raked and baled into silage. 55 silage rolls were produced in total with an average weight of 750kg. With an estimated 45% dry matter this equates to approximately 2,700kgDM/ha being stored as silage. Paired with a total of 1,326 DSE/ha grazing days, Bruce is very happy with the result considering the tough and dry season.

Total of 1016kg dry matter per 100mm rainfall

FIGURE 3: An annual forage crop was sown in April 2018 using annual ryegrass and clovers.

FIGURE 1: The pasture was cut for hay in October, resulting in six bales of high-quality hay

# A flexible pasture to fill the summer feed gap

**TRACY AND OWEN BONYTHON, EBENEZER**

Tracy and Owen Bonython, at Ebenezer worked one on one with Pasture Genetics' Rehn Freebairn to develop a customised pasture mix which is flexible and can help fill the summer feed gap to help meet growth weight targets of 40 to 50kg for weaner goats.

The mix included GTL60 Lucerne, and summer active perennial grasses Australis Phalaris, Convoy Cocksfoot and Valley Diploid perennial ryegrass. It also included a small percentage of Balance Chicory which Tracy had heard was a favourite variety for goats. Although summer active, these varieties will also respond in winter and spring to produce high quality feed.

The pasture was sown on the 28th May into a 2.8 Ha area at a rate of 25Kg/Ha. Given the dry winter and spring conditions with only 203mm received in the growing season, it established well and was measuring over 3,000 Kg of dry matter at the end of September. This equates to 1,477 kg of dry matter per 100mm rainfall.

In October, Tracy decided that she had enough spring feed available so split the paddock in half and baled 1 ha of the paddock for hay. Considering the season, she decided the fodder conservation would be valuable for filling a feed gap later in the season. The hay was baled on the 24th October with six bales made totalling 1.5 tonnes of hay. Six days after baling, the pasture was measuring 2,400 kg per hectare of dry matter, with a large percentage of chicory which was short enough to be missed by the mower at cutting (Figure 1).

This high-quality hay will provide an extra 15 days supplementary feed for 75 weaner goats through the summer, helping to ensure they continue to reach their growth rates.

The remaining 1.7Ha of the paddock was split into two sections and strategically grazed. Tracy used temporary electric fencing with two lines to split the paddock. The goats respected the fence, however due to a lack of water infrastructure, the trough had to be filled up daily. The goats were slowly introduced with a couple of half day grazing's on the pasture to ease them into the new pasture varieties before they were left to eat the pasture down.

Seventy-five goats remained in the first 0.7 hectares at a stocking pressure of 107 DSE/Ha for 11 days, utilising 2,475 kg of dry matter, with a residual of 1000 kg of dry matter per hectare. This high stocking pressure ensured the goats ate the pasture evenly and quickly, resulting in less overgrazing of the new establishing pasture (Figure 2).

FIGURE 2: Tracy divided the grazing area into two sections to ensure a high stocking pressure to allow even grazing of the pastures.

The second section was grazed for 12 days. Tracy noticed that the goats did not preferentially graze any particular variety, however when moved through the freshly cut hay section, they went straight for the chicory, which she thought they may preferentially graze within the pasture.

The pastures were then rested to allow the perennial grasses, lucerne and chicory to recover and set seed prior to further grazing in the summer months.

## Maximising pasture production

The use of temporary electric fencing improves the flexibility of the pastures to be divided in to hay and grazing opportunities.

High stocking pressure ensures a quick and even graze to allow the pasture to recover

The flexibility of 2.8ha system allowed 22 days spring grazing for 75 weaner goats and an additional 15 days summer feed in the form of hay.

# Acknowledgements

The Barossa Improved Grazing Group (BIGG) would like to thank the producers who have contributed to this publication who have taken the time to trial, demonstrate and most importantly share their stories.

These case studies could not have occurred without the grant funding and the support of the following stakeholders:

- Meat and Livestock Australia
- Farmer Johns
- Coopers Farm Supplies
- Pasture Genetics
- Heritage Seeds
- Natural Resources Adelaide and Mt Lofty Ranges
- Natural Resources SA Murray Darling Basin

The collection and compilation of these case studies formed part of the professional and technology development of two young enthusiastic "Graduates" and BIGG hopes we have helped them on their life long careers in agriculture, hopefully in livestock and grazing systems:

- Jackson Adams, Meat & Livestock Australia - Livestock Consultant Intern, University of Adelaide, Roseworthy
- Kate McCarthy, Graduate Consultant, Rural Solutions SA:PIRSA, Nuriootpa.

And BIGG thanks both the producers who invested their time, energy and knowledge in these young professionals, and their employers for their in-kind support.

# Considerations

This booklet has taken the following assumptions in determining pasture and grazing measurements:

- All figures relating to the increase of annual average stocking rate (DSE/Ha) is determined on a 1kg of green dry matter utilised per DSE
- A 60kg dry ewe requires 9.96ME per day for maintenance

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