Livestock

Management strategies to improve lamb weaning percentages

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Location: Minnipa Ag Centre
Rainfall
Av Annual: 324 mm
Av GSR: 241 mm
2013 Total: 334 mm
2013 GSR: 237 mm
Livestock
Enterprise type: Mixed farming
Type of stock/breed: Merino

Key messages

• Lamb survival increased by 10% from 2012 to 2013 by following a management system developed from Lifetime Ewe Management (LTEM)¹ principles.

• Pregnancy scanning is essential to understand flock potential and assists with managing ewe nutrition which is critical to lamb survival.

• An on-farm autopsy can provide valuable information to address lamb survival issues.

Why do the trial?

Benchmarking is a tool used to identify and measure areas that can be improved and should be considered an essential component of a mixed farming business. An opportunity exists in many livestock enterprises to improve reproduction. In this study this opportunity was addressed by identifying, and understanding, the timing and causes of lamb losses from pregnancy scanning through to weaning. Lamb survival issues that have been recognised can then be reduced by implementing management, genetic and/or feed and forage strategies whereby a significant economic benefit accrues to the industry.

Research into identifying the causes of lamb deaths conducted in 2012 (EPFS Summary 2012, p 120) was partly inconclusive because 49% of deaths were undiagnosed or the lambs were not found. The recommendations from the 2012 study were used as the basis for this project in 2013, which employed various flock management strategies to improve weaning percentages and closely measure and monitor flock performance.

How was it done?

A management system from joining to weaning was developed using guidelines outlined in the Lifetime Ewe Management (LTEM)¹ program in addition to recommendations from the 2012 study.

On 6 February 2013 the 350 flock ewes, which included 130 maiden ewes, were weighed, condition scored and drafted into six randomly selected single-sire mating groups of approximately 48 ewes, ensuring each had equal amount of ewe ages. Another group for artificial insemination (AI) consisted of 64 ewes that had successfully reared one or more lambs to weaning in the past two years. A February joining was chosen being close to the time of peak fertility in this environment and in attempt to match the ewe and lamb nutrition requirements with feed availability (whilst also reducing the need to supplement feed). Rams were allocated and released into their selected groups for AI later on 7 February. The AI group was laproscopically inseminated on the same day, apart from two ewes that did not meet the health requirements and five ewes which were inseminated the previous night for demonstration purposes. A back-up ram went out with the AI mob ten days after insemination. Rams were removed on 21 March for a six week joining. At this time ewes were weighed, condition scored and re-established as one mob.

Ewes were pregnancy scanned on 13 May, 13 weeks after the start of joining. Pregnancy scanning identified dry, single and multiple bearing ewes to ensure nutritional requirements could be better managed mid to late pregnancy and throughout lambing. Ewe health was monitored, and maintained through vaccination against common livestock diseases and fly, lice and worm protection.
The vaccine also contained Selenium for improved immune system performance and the vitamin B12 to assist with the ewe’s ability to cope with stress. Monitoring for predator activity via trail cameras with day and nighttime capability began in March and continued until the end of lambing. Predator monitoring also included recording of visual observations on the property. Fox lights (devices designed to randomly flash in alternating sequences to simulate the headlights of a vehicle or flashlight typical of hunting procedure with firearms) were put out at beginning of lambing in strategic locations in each paddock in an attempt to frighten foxes away from the lambing ewes. Poison baits were put out on 15 July in response to a wild cat and fox population influx, presumably as a response to lambing, until a rain event three weeks later. A trap was also put out at this time after multiple sightings of cats in a particular paddock. As a demonstration of another predator control option, two wether alpacas were run with the AI mob throughout lambing.

Six paddocks ranging from 3.4 to 6.2 ha in size were chosen for lambing based on feed availability, shelter and optimal space for individual ewes to bond with their lambs after birth. Paddocks consisted of mallee scrub, saltbush, olive trees, annual grasses, medic and broadleaf weeds. Prior to lambing, paddocks were monitored and biomasses were taken and tested to ensure that ewes would receive their nutritional requirements. Biomass was also measured on 11 and 23 July to estimate feed on offer. Ewes in paddocks with high stocking rates were allowed access to neighbouring broadacre pasture once feed reserves became low. Supplements in the form of licks and blocks were provided ad lib from the start of lambing until weaning. Oaten hay was tested for nutritional quality and provided ad lib towards the end of lambing as fresh pastures began to deteriorate.

Ewes were side-branded (for identification) and drafted into lambing groups on 27 June based on their pregnancy scan result. There were four mobs of approximately 45 ewes bearing multiple lambs, one group of 69 single-bearing ewes, the AI mob of 64 ewes and a mob of dry ewes. The AI ewes remained as one mob throughout lambing and were not drafted according to pregnancy scan result.

Lambing commenced on 4 July and the last lamb was born on 17 August. Lamb birth dates were recorded daily, lambs were individually identified (to both sire and dam) and tagged. Birth weight, birth type, rectal temperature, lamb vigour and ewe maternal temperament was also recorded, along with any other observations about ewe or lamb behaviour. In the case of lamb death prior to weaning a basic autopsy was conducted to establish the most likely cause of death. If the cause of death could not be determined laboratory analysis was used to make a diagnosis.

Lamb marking was undertaken on 22 August and included tail docking, castrating, EID ear tagging and vaccination. At weaning on 18 October lamb and ewe weights were recorded and ewes were condition scored to understand their requirements for recovery.

What happened?
From the 350 ewes joined, 534 lambs were scanned, equating to 153%. One sire group had a below average result with 29 out of 45 (56%) ewes scanning dry. After establishing that the ram had no physical injury or abnormality, it was concluded he had an unknown fertility issue.

The result for the 350 ewes included 46 dry, 89 singles, 202 twins, 11 triplets and 2 quadruplets. At birth 531 lambs were tagged, equating to 152%, including lambs that were found deceased at the birth site. The number of lambs weaned was 448, equating to 128%. In the AI group, 45 out of the 62 ewes inseminated became pregnant with 69 lambs weaned, equating to 111%.

Birth weight (measured at 2-24 hours after birth) ranged from 2.5 to 8.2 kg, averaging 5.4 kg for singles, 6.1 kg for twins, 5.3 kg for triplets and 4.8 kg for quadruplets. Rectal temperature measured on live lambs ranged from 34.5 to 40.5°C with an average of 39°C. The ewe maternal temperament and lamb vigour was measured as an objective score of 1 to 5 (with 1 being poor and 5 being excellent). Interestingly, the maternal temperament score increased with the higher number of lambs born per ewe with a score of 3.5, 3.6 and 4 for the singles, twins and triplets/quadruplets respectively. However, this can possibly be explained by the greater number of maiden and younger ewes that gave birth to single lambs as opposed to multiples (indicative of better maternal instinct in older ewes).

Between scanning and weaning, five ewes died from reproductive-related causes including pregnancy toxaemia, dystocia (labour difficulty) and mastitis. Between tagging at birth and weaning 83 lambs died, with 24% of carcases ‘not found’ and autopsies unable to be conducted on 10% of the deceased lambs due to secondary predation. These were labelled ‘undiagnosed’. The majority of lambs died when they were less than a week old (70%), with 32% of these dead within the first day. Of the deceased lambs, 29 were born to maiden ewes. There were more deceased multiples (83%) than singles (13%), with 4% recorded as unknown birth type. The autopsy results are displayed in Figure 1, which also shows the results from the 2012 study.
Monitoring pre-lambing suggested that predator populations were low. However, one week into lambing it became clear from autopsy data that predators had moved into the area. From March until the end of August there were thirteen sightings of cats, eight of foxes, two of dogs and two of eagles. A baiting program was implemented with baits placed at strategic locations in close proximity to the lambing ewes and water points. Over the baiting program only two out of ten baits were taken suggesting there was enough afterbirth and carcasses to scavenge during this time.

Fox lights may have worked as a deterrent for a short time after they were initially installed in the paddocks but any effect was short lived as predators became accustomed to their presence.

**What does this mean?**

Using a ‘best practice’ management system assisted the Minnipa flock to increase lamb survival percentage by 10% (Table 1).

Each individual cause of lamb death from conception to weaning was analysed separately to identify the sequence of events that occurred to both the ewe and lamb during this time. With this information, targeted responses could be implemented immediately and/or into the future.

Lamb survival is an important factor determining success in a flock and this is driven by ewe performance. The importance of understanding ewe nutrition requirements during pregnancy and throughout lambing was the major catalyst for the success. Pregnancy scanning was the initial process by which nutritional decisions needed to be made, as the use of this information and subsequent changes in management practices reduced the chance of potential losses. In particular, the information obtained from scanning for single and multiple bearing ewes increased flock productivity considerably, as multiple bearing ewes required different amounts of nutrition to single bearing ewes and dry ewes, given that a foetus can grow two thirds of its actual size in the third trimester.

In 2013, fewer deaths were associated with starvation, mismothering and exposure (referred to as the SME complex) collectively when compared to 2012. This is most likely attributed to better managed, multiple bearing ewes and a subsequent increase in lamb birth weight combined with reduced stocking rates to alleviate the likelihood of mismothering. By managing ewe nutrition according to pregnancy status, maintenance of body condition in single and twin bearing ewes could be maintained. This result is highlighted by an increase in lamb birth weight of 0.4 kg and 0.6 kg in twins and triplets/quadruplets respectively from 2012 to 2013. Associated benefits included the ewe spending more time at the birth site (allowing lambs to obtain their first essential drink containing colostrum to build their immune system), better ewe milk supply, more energy for labour and healthier lambs that were able to follow their mother during grazing and were not as susceptible to predation.

**Table 1 The reproductive performance of the Minnipa flock in 2012 and 2013**

<table>
<thead>
<tr>
<th>Year</th>
<th>Ewes joined</th>
<th>Pregnancy scanning</th>
<th>Lambing</th>
<th>Weaning</th>
<th>Lamb deaths*</th>
<th>Foetuses**</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>374</td>
<td>557 (149%)</td>
<td>563 (150%)</td>
<td>443 (118%)</td>
<td>120</td>
<td>30%</td>
</tr>
<tr>
<td>2013</td>
<td>350</td>
<td>534 (153%)</td>
<td>531 (152%)</td>
<td>448 (128%)</td>
<td>83</td>
<td>25%</td>
</tr>
</tbody>
</table>

*lambs deceased during or after birth

**per cent mortality from scanning through to weaning, including foetuses aborted
Eyre Peninsula Farming Systems 2013 Summary

More dystocia diagnoses were given in 2013 than in the 2012 study due to the implementation of a more advanced autopsy procedure that explored the complexity of the birthing process and the role that difficulties during labour can have on lamb development post-birth. Dystocia is an issue generally associated with large lambs, which can be caused by excess feeding of predominantly single-bearing ewes, particularly in the last trimester. Problematic labour can be common in maiden ewes or is caused by incorrect presentation of the lamb/s during birth. Dystocia may be more of an issue than originally believed, and can easily be misdiagnosed. Information suggests that haemorrhaging of cerebral tissue and the spinal cord can occur in lambs which have a difficult, or unusually long birth, this can damage the innate response to suckle. Basic post-mortem examination would label these lambs as death due to the SME complex, however further investigation may detect partial haemorrhaging of the brain, confirming cause of death to be a result of dystocia. Cause of death by dystocia can be minimised by correct ewe nutrition, which will better manage lamb size and will also provide ewes with sufficient energy to cope with their labour. However, poor presentation i.e. a lamb that is not correctly positioned during birth, is unavoidable.

The second year of the study found that shelter and paddock allocation go hand-in-hand with managing ewes according to their pregnancy status. Plenty of dense shelter and good quality feed needs to be provided to the multiple-bearing ewes. Single lambs tend to be larger and stronger when first born and have access to more colostrum therefore they are not as susceptible to hypothermia. Paddock design also needs to be considered to allow for bonding between the ewe and lambs.

Unfortunately, some deaths to some extent are inevitable, for example prematurity, misadventure, infection and injury. Some cases of premature deaths are caused by poor nutrition and stress, which can be rectified to prevent death in utero. At lambing time, mobs should be checked regularly (every 1-3 days) but should have minimal disturbance. Losses due to ewe physical abnormalities can be avoided by regular monitoring and treatment where appropriate. Checking udders at weaning time is important (if individuals have not been identified during lambing) in order to determine if the ewe has reared a lamb, lambed and lost, or is dry. Ewes should be culled if they have not reared a lamb for two consecutive years.

The study has found that primary predation was generally not an issue. Observations concluded that efforts should be concentrated more to minimise predator numbers to reduce secondary predation of lambs that are weak or have been mismothered. Autopsies concluded that the majority of predated carcasses were scavenged; hence predation was not the primary cause of death. However, it is essential that pest numbers are controlled in order to reduce the incidence of scavenging which builds up predator condition and can result in population increase around lambing time, and possible ‘gang’ attacks.

Determining your ewe’s reproductive potential is the first step to increase weaning percentages – you don’t know what you have lost unless you know what you started with. The most efficient way to acquire this information and subsequently better manage your ewes is through pregnancy scanning. The next step is to identify areas that can be improved to reduce the gap between the potential number of lambs and the actual number of lambs weaned.

1Lifetime Ewe Management (LTEM) is a nationally accredited course developed from the LTW2 project, which developed management guidelines for improved understanding of the impact of ewe nutrition on the performance of the ewe and her progeny over their lifetime.

Acknowledgements

We gratefully acknowledge the funding by the South Australia Sheep Advisory Group (SASAG) through the Sheep Industry Fund (SIF) in addition to in-kind support from the South Australian Research and Development Institute (SARDI), Eyre Peninsula Grain and Graze 2 and an Australian Wool Innovation (AWI) project conducted in conjunction with this project. We would also like to thank Minnipa Agricultural Centre staff Mark Klante, Trent Brace and Brett McEvoy for their livestock management support and Emily Litzow (Primary Industries and Regions South Australia) for her technical expertise.
Key messages

• Grazing a vetch crop, compared to a standing barley forage crop, increased merino weaner growth rates from 41 to 190 g/head/day.
• Data to compare daily methane production per animal is currently being collated and analysed.
• The increased growth rates provided the opportunity to sell weaners earlier per unit of production.

Why do the trial?

Direct emissions from agriculture currently accounts for approximately 15 per cent of Australia’s total greenhouse gas emissions of which approximately 65 per cent is methane resulting from sheep and cattle. The emission level is associated with the quality and digestibility of the animal feed; the higher the digestibility and the less feed required to maintain production (higher quality), the lower the amount of methane produced per unit of product (e.g. per kg body weight produced). This trial aims to evaluate forage opportunities which may increase sheep production and reduce methane emissions through improved feed quality in late spring, autumn and early winter in southern Australian livestock production systems. It will contribute new data on methane production with different forage systems under commercial grazing conditions.

How was it done?
The trial commenced on 8 November 2013 with 200 mixed-sex Merino weaners (July 2013 drop) at an average live weight of 28 kg split equally into 2 groups of 100 animals. Group 1 was placed on a 15 ha unharvested vetch stubble; oats were supplied in a lick feeder. Group 2 were placed, with another 242 weaners, onto 35 ha of standing dry sown unharvested barley stubble with an annual medic pasture residue understory; a grain mixture of barley and field pea were available in a lick feeder. The weaners were weighed on 8 November following an overnight fasting and prior to being placed on their respective paddocks.

The 2 groups were retained on their treatments until 3 December when methane production measurements commenced. Each group had 50 animals allocated as replicate 1 and the second 50 as replicate 2, with methane measurements completed over 4 days with 30 animals from each replicate within each group being measured at the same time each day. Sheep were removed from grazing respective fields at 7:30 a.m., drafted into identified group and placed in a “polytunnel” from 8:30 a.m. for 3 hours (Group 1, Rep1 on 3 December, Group 2, Rep1 on 4 December, etc.). A polytunnel is a large inflatable tent into which the group of sheep is temporarily placed, with air containing all gases produced by the sheep extracted through a duct. Methane is analysed in real-time with a sensor, and data logged to a computer every 10 minutes for later analysis. CSIRO staff from Perth completed the measurements and are currently analysing the data. Sheep were returned to respective fields until they were removed on 8 December, and weighed after an overnight fast at 9:00 a.m. on 9 December.

Data which is being reported are the weaner live weights from the commencement and completion of the trial with the comparative forage availability, utilisation and quality. The pre- and post-grazing samples, 0.1 m² quadrants, were collected from the same 10 randomly selected points within each paddock and sorted into their specific components. Quality of the different forage components was estimated through a FEEDTEST analysis.

What happened?
The group 1 weaners gained a total of 5.5 kg/head live weight, the group 2 weaners an average 1.2 kg/head live weight gain over the 29 day trial.
Table 1 Forage biomass (tDM/ha, 8 November – 8 December) disappearance (kg/head/day) crude protein (CP) (% of DM), digestibility (% of DM) and estimated mega joules of energy (MJ/kg of DM) of a legume and cereal based crop residue

<table>
<thead>
<tr>
<th>Forages</th>
<th>Biomass (tDM/ha)</th>
<th>Disappearance (kg/head/day)</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CP (%)</td>
</tr>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vetch Pods/Grain</td>
<td>0.3 - 0.1</td>
<td>1.2</td>
<td>28.9</td>
</tr>
<tr>
<td>Residue</td>
<td>1.9 - 1.6</td>
<td>1.5</td>
<td>12.9</td>
</tr>
<tr>
<td>Oats</td>
<td>0.25</td>
<td></td>
<td>15.3</td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley Heads/Grain</td>
<td>0.6 - 0.3</td>
<td>1.3</td>
<td>12.8</td>
</tr>
<tr>
<td>Residue</td>
<td>1.9 - 1.5</td>
<td>1.3</td>
<td>8.7</td>
</tr>
<tr>
<td>Pasture Medic pods</td>
<td>0.5 - 0.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Residue</td>
<td>0.9 - 0.7</td>
<td>0.9</td>
<td>8.7</td>
</tr>
<tr>
<td>Field pea</td>
<td>0.06</td>
<td></td>
<td>26.2</td>
</tr>
<tr>
<td>Barley</td>
<td>0.02</td>
<td></td>
<td>11.3</td>
</tr>
</tbody>
</table>

*As the feed intake capacity of a 28+ kg weaner is <1 kgDM/day some grain and most residue losses are attributed to stock traffic

What does this mean?
The increase from 50 grams/head/day to more than 190 grams/head/day from the flock grazing the vetch residue as compared to the flock grazing the barley/pasture residue reflects the higher nutritional quality of the vetch stubble compared the barley stubble, particularly the protein content. A higher supply of protein can improve the utilisation of the high-fibre components of stubble. Referring to the NSW DPI Primefacts No 347 weight gains of 190 grams/day from Merino weaners requires more than 0.8 kg of forage at 15%+ CP and a minimum 13 megajoules of metabolisable energy (MJ/kg DM).

The group 1 weight gain of 190 grams/day indicated that the diet was 0.8 kg vetch grain augmented by 0.2 kg of oats to provide the required CP and ME intake levels, 26% CP and 13 MJ/kg of DM. The group 2 weight gain result, 41 grams/head/day indicates a much lower protein intake from a barley grain heads diet 12.8% CP and 12.6 MJ/kg of DM, augmented with lower quality crop and pasture residue.

We await the methane production results, however, irrespective of the results the potential to achieve the increased weight gains measured in the study provides the opportunity to sell young sheep at an earlier age and thereby reduce methane emissions intensity (methane produced per unit of weight gain).

Acknowledgements
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Flexibility in grazing cereals: the yin-yang effect
Jessica Crettenden
SARDI, Minnipa Agricultural Centre

Try this yourself now

Location: Lock
Gus Glover
Rainfall
Av. Annual: 345 mm
Av. GSR: 266 mm
2013 Total: 385 mm
2013 GSR: 270 mm
Paddock History
2012: Mace wheat
2011: Medic pasture
2010: Yitpi wheat
Soil Type
Grey sandy loam
Plot Size
60 ha (electric fence splitting northern 35 ha and southern 25 ha)
Yield Limiting Factors
Early finish
Livestock
Type of stock/breed: First cross Dohne x White Suffolk

Key messages
- Opportunities in grazing cereals should not be limited by deciding on the final outcome of the crop at the beginning of the season – it should be a flexible decision.
- Priorities need to be set according to farming system concerns (livestock production, feed availability, crop yield, weed control etc).
- Seasonal variability plays a major role in the successes of decisions made within mixed farming systems and outcomes can vary depending on in-season choices.
- Although grain yield was compromised by pasture topping in this demonstration, the dry matter remained unaffected and provided a valuable standing forage source.

Why do the demonstration?
The common mixed farming practice of grazing cereals could be described as a physical manifestation of the yin-yang concept, whereby livestock can help, hinder or neutralize the success of a cereal crop, depending on the desired outcome. Crops and livestock can be thought of as complementary (rather than opposing) forces interacting to form a dynamic system in which the whole is greater than the parts. Of course this leads to a more complex system, which requires priorities to be made, and can often result in completely different outcomes, according to the rank of priorities and seasonal variability.

The opportunity to graze a cereal crop provides a number of options for in-season and end-use outcomes. A one year demonstration was conducted on a mixed farm at Lock on the Eyre Peninsula to show an example of the flexibility available in mixed farming systems and the interconnections that occur within a livestock and cropping enterprise relationship.

How was it done?
A 60 ha paddock was chosen east of Lock that was in the break phase of its rotation and was subsequently sown with Flagship barley @ 55 kg/ha with 40 kg/ha of DAP (18:20:0:0) on 29 April 2013. The paddock received 1.2 L/ha of Treflan, 1 L/ha glyphosate and 100 ml of Striker pre-seeding. The original intention was to use the paddock as an in-season feed source, removing livestock after a period of grazing and possibly harvesting the crop at the end of the season, however controlling grass seed set by pasture topping was required, which compromised this option.

Pre-grazing biomass cuts were taken three times with a 0.1 m² quadrant on 6 June at 12 sampling points in the paddock to calculate feed on offer (FOO). Collected samples were sent away for a feed test analysis. Twelve exclusion cages measuring 1 m² were placed at each sampling point.

On 7 June, 310 first cross Dohne x White Suffolk ewes and 360 April/May drop lambs were put in the paddock. Eleven days later an electric fence was erected to split the paddock in two with 35 ha in the northern section and 25 ha in the southern section and sheep were moved into the northern section the same day. A small fence was also built around an exposed sand hill to prevent further erosion.

On 25 July sheep were moved from the north to the south side of the paddock and biomass cuts were taken to determine feed utilisation. Three cuts x 0.1 m² were taken at each of the six sampling points on the northern side and a biomass cut of 0.1 m² was taken from inside of each exclusion cage.

On 4 August, 200 lambs were drafted off the ewes and sold averaging $130/head. The electric fence was taken down at the same time to allow sheep to graze the entire paddock. On 20 September the remaining 160 lambs were sold averaging $110/head and the ewes were removed from the paddock. The entire paddock was then spray-topped with 500 ml/ha of glyphosate 450.

On 11 December harvest index and grain samples were taken from 1 m of row inside each exclusion cage and from 2 x 1 m rows in the paddock at each sampling point on the northern side of the exclusion cage.
Table 1 Dry matter (DM) and yield results (t/ha) from paddock and exclusion cage pre-grazing, post-grazing and harvest measurements in the northern area of the 2013 Lock demonstration paddock

<table>
<thead>
<tr>
<th>Date</th>
<th>Sample</th>
<th>Pre-grazing DM</th>
<th>Post-grazing DM</th>
<th>Harvest DM</th>
<th>Grain yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area</td>
<td>t/ha</td>
<td>t/ha</td>
<td>t/ha</td>
<td>t/ha</td>
</tr>
<tr>
<td>6 June</td>
<td>all</td>
<td>0.5</td>
<td>1.3</td>
<td>3.7</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>paddock</td>
<td></td>
<td></td>
<td></td>
<td>6.9</td>
</tr>
<tr>
<td></td>
<td>exclusion</td>
<td></td>
<td></td>
<td></td>
<td>0.9</td>
</tr>
<tr>
<td>30 July</td>
<td>paddock</td>
<td></td>
<td></td>
<td></td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>exclusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 December</td>
<td>paddock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>exclusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What happened?
The cereal was well established when grazing began, therefore it took a substantial amount of time to graze the whole paddock evenly and this was better achieved using the electric fence to increase stocking pressure. Post-grazing biomass and harvest measurements were taken only from the northern side due to negligible biomass remaining after grazing in the southern area. Sheep tended to camp near the sand hills on the southern area when distributed over the whole paddock, resulting in poor crop recovery and some erosion, hence there was a shorter grazing period in this section.

The paddock was grazed for a total of 107 days, with sheep allowed to graze the entire paddock for 59 of these days. Grazing was rotated from the northern to the southern side according to cereal height (targeted approximately 10 cm), with the aim to achieve an even grazing whist preventing erosion on the sand hills. The northern side of the paddock had a bigger area and sand hills were less prevalent, therefore this area was grazed for a longer period of 38 days compared to 10 days in the southern side.

The pre-grazing feed test reported above adequate levels of crude protein of 34.8% (16% required) and metabolisable energy of 11.9 MJ/kg DM (11 MJ/kg DM required) for lambs and lactating ewes and acceptable levels of neutral detergent fibre, dry matter and digestibility (DOMD) with test results of 39%, 18.9% and 73.5% respectively.

At the commencement of grazing 1126 DSE were allocated to the entire paddock, calculating a stocking rate of 18.8 DSE/ha with an initial allocation of approximately 0.5 t/ha of DM (Table 1).

In Table 1, biomass samples taken from the northern area show a feed utilisation of 2.3 t/ha between 6 June and 30 July with this area having a higher stocking rate of 32.2 DSE/ha for 38 days of grazing and a lower stocking rate of 18.8 DSE/ha for 11 days over this period.

Results showed 18.5% more dry matter in the exclusion area at harvest and 31% more yield than measurements taken from the grazed area of the paddock. However, this portrays that the impact of grazing was minimal, considering the feed utilisation and other advantages (such as resting other pastures) of using this paddock for grazing throughout this period. The low harvest index in both the paddock and exclusion cages can be explained by the effect of pasture topping.

The decision to leave the northern side for hay or harvest versus leaving the crop standing for a feed source to finish lambs over summer came down to getting the most benefit from the remaining crop. In this instance the 0.9 t/ha of barley grain and 5.8 t/ha of DM was more valuable as a standing crop for lambs during a time of feed shortage.

Although using the cereal as a forage crop and to control grass seed set by pasture topping has reduced yield, the feed value over this time needs to be recognised as a profitable outcome. Grazing with livestock also provides additional advantages including delaying grass growth and the on-set of seed set, offering the opportunity to spray-top later in the season. Furthermore, this end use will provide a valuable and substantial feed source for livestock over the summer and will also prevent other stubbles from being over-grazed, thus benefits of this practice need to be understood from a whole mixed farming system perspective.

What does this mean?
This demonstration portrays the yin-yang effect of how one paddock can produce two completely separate results according to the decisions made when combining livestock and cropping enterprises. Grazing a cereal crop created a flexible farming system, however results show the importance of understanding how grazing management practices can affect the crop in both the short and long term. In order to undertake the practice of grazing crops, farming system priorities first need to be decided on (e.g. feed requirement, grass control, hay cut, crop yield etc.). With these priorities in mind a flexible approach is required during the season to produce the desired outcome.

Over-grazing can easily become an issue that is not often apparent until later in the season. Keeping track of crop recovery will determine if erosion is a concern and if it poses a threat to crop persistence. In the event of over-grazing livestock should be taken out to let plants recover and stabilize before grazing again. In this demonstration the southern side of the paddock, which was a lighter soil type, was negatively impacted by the presence of livestock in conjunction with a dry spring to the point that plant recovery was compromised.
It is also essential to be aware of groundcover over the summer period and the importance of stubble retention. Utilising electric fences to increase stocking pressure and being mindful of watering, feeding and shelter points and how this effects grazing movement can assist in achieving a more even grazing across the paddock.

Conversely, seasonal variability is the most significant and unfortunately unpredictable factor, that will contribute to the success or failure of decisions made throughout the season for grazing cereals within low rainfall mixed farming systems. The interrelation of livestock and cropping should be looked upon as a favourable opportunity to improve productivity and profitability in farming enterprises, however the key to success in this complex system is that practice makes perfect.

**Acknowledgements**
I would sincerely like to thank Gus Glover and his family for the opportunity to use their property to conduct the demonstration on. I also gratefully acknowledge the help of Naomi Scholz, Trent Brace and Ian Richter for their technical assistance and site management. The Eyre Peninsula Grain and Graze 2 project is funded by GRDC and Caring for Our Country (UA00117).

Treflan – registered trademark of Dow Agrowsciences, Striker – registered trademark of Nufarm Technologies.
Enriching upper EP forage options

Jessica Crettenden
SARDI, Minnipa Agricultural Centre

Searching for answers

Location:
Minnipa Ag Centre

Rainfall
Av. Annual: 324 mm
Av. GSR: 241 mm
2013 Total: 334 mm
2013 GSR: 237 mm

Soil Type
Red sandy loam

Environmental Impacts

Soil Health
Soil structure: Stable
Compaction risk: Nil
Ground cover or plants/m²: Forage shrubs
Perennial or annual plants: Perennial

Water Use
Runoff potential: Low

Resource Efficiency
Energy/fuel use: Standard
Greenhouse gas emissions (CO₂, NOx, methane): Minimal

Social/Practice
Time (hrs): Site establishment time
Clash with other farming operations: Standard practice
Labour requirements: Minimal

Economic
Infrastructure/operating inputs:
Establishment costs
Cost of adoption risk: Low-medium, depending on establishment success

Key messages

- Perennial shrub-based systems can be a productive addition to conventional feed sources particularly to address feed shortages and complement other forages such as stubbles.
- Increased plant diversity is important for feed utilisation, nutrition and animal performance.
- Direct seeding is an option for establishing perennial shrubs, however further study needs to be done in order to understand time of sowing, site preparation and design and the best options for weed management.

Why do the trial?

Forage shrubs are an ideal option for producers wanting to develop a beneficial and profitable use for their unproductive cropping land, particularly due to the perennial nature of these shrubs to offer out-of-season feed. A shrub-based system provides the opportunity for a valuable forage source not only in the summer-autumn period, but also at other stages of the year when pasture is not a viable option, making this an efficient alternative to manage seasonal variability in low rainfall mixed farming regions.

The research aimed to investigate alternative shrub based grazing systems using perennial native shrubs and to evaluate the use of these shrubs as a feed base for multiple benefits in farming systems, including improved livestock production and health, environmental resource management and sustainability of farming landscapes for the future.

How was it done?

The *Enrich* project at Minnipa, Piednippie and Elbow Hill sites on Eyre Peninsula (EP) established a sound foundation to introduce perennial forage shrubs to EP farming systems (EPFS Summary 2010, p 138-139, EPFS Summary 2011, p 135-138 and EPFS Summary 2012, p 143-145). The trial allowed species performance to be evaluated under three key environments in the region, which has generated key outcomes to furthering perennial shrub research in the area. A crucial result from the research was determining species ‘best-bets’ through analysing establishment, growth, edible biomass, palatability, recovery and persistence of the shrubs. This work linked to the national *Enrich* project, which conducted further research into species adaptation, nutritive value, grazing management strategies and the overall contribution of forage shrubs to the whole farm.

Following this evaluation, the project generated sufficient interest to continue work to test a more efficient establishment option for forage shrubs in mixed farming systems on the EP. Direct seeding of the ‘best-bets’ species from the *Enrich* project was trialled at Minnipa from 2011 to 2013.

What happened?

*Enrich* Minnipa: This site was grazed for the last time for 18 days in March 2012. A dry spring resulted in poor shrub recovery with significantly low survival measurements recorded in November. Lack of summer rainfall over 2012/13 decreased the number of shrubs surviving even further when measured in autumn 2013 and subsequently a deficiency of biomass lead to no grazing occurring in 2013. Survival measurements will be taken in autumn 2014 to determine future opportunities for this *Enrich* site.

*Enrich* Piednippie: This site was grazed for the last time over two weeks in April 2012. This graze was only a partial graze as sheep were allowed to leave the *Enrich* site to graze the surrounding paddock. This resulted in shrubs thriving on winter and early spring rainfall in 2012 and significant overgrowth was observed during the last survival measurements in October 2012. Some maintenance will need to be carried out on the site to graze or slash the shrubs down to a more manageable level in autumn 2014 when survival measurements will be taken. The farmer will use this site as a livestock feed base, particularly in the autumn/winter feed gap, in the future.
Eyre Peninsula Farming Systems 2013 Summary

**Hay yard:** The hay yard forage shrub direct seeding site was sown in June 2011. All of the perennial shrubs established well after some good rain in August and September after sowing, however the germination of spring weeds over many plots caused some shrubs to be out-competed by weeds. The most successful species included ruby saltbush (*Enchylaena tomentosa*), creeping saltbush (*Atriplex semibaccata*) and mallee saltbush (*Rhagodia preissii*) which established well and have grown significantly since sowing. Sandhill wattle (*Acacia ligulata*) also established well but subsequent survival has been poor. Higher seeding rates and/or better seed quality are required for old man saltbush (*Atriplex nummularia*) and river saltbush (*Atriplex amnicola*) with only a small number of plants emerging. Survival measurements have been taken each year in spring and autumn since sowing and biomass measurements were taken in spring 2013. The site will be grazed over the autumn/summer period and recovery and shrub survival after grazing will be measured to determine the future of the site.

**North 1 (A):** This site was sown in August 2012 to put into practice some of the lessons from the hay yard site. Unfortunately rainfall totals were significantly low from sowing until autumn in 2013 and subsequently the site had poor establishment and was abandoned.

**North 1 (B):** Another direct seeding forage shrub site was sown next to the North 1 (A) site in June 2013 as a mixed stand of the successful species from the hay yard site, with an increased seeding rate to improve shrub establishment and weed competition. Good rains after sowing have resulted in successful establishment of some species; however shrub resilience will be determined after the 2013/14 summer period. This site will be monitored and shrub survival recorded to determine the trial success. Grazing will be undertaken if shrubs survive in the future.

**What does this mean?**

The Enrich sites provided excellent information to assist with shrub selection and management, however establishing shrubs from seed appears one of the major hurdles in the further adoption of forage shrubs and more research is required. These sites were used as a ‘trial and error’ opportunity to understand what the major hurdles for shrub establishment on the EP are. An important conclusion from the demonstration sites was that more work needs to be done on more workable direct seeding practices before promoting it as a cost and production efficient option to growers, especially on time of sowing, site preparation and design, and weed management.

There has already been excellent research undertaken in establishing perennial shrubs resulting in some good information available about important management strategies that should not be overlooked. The following essential points should be considered in applying shrub systems on farm:

- **Site design:** Much work has been done in the areas of shrub-based system designs, however ultimately the design of a feedbase is determined by species choice, site size and location, machinery, labour availability and personal choice. Layout (block, alley or belt), shelter, purpose and shrub structure, size, and variety are important factors that need to be considered for shrub success. Layouts that comprise opportunities for cropping and grazing in the same area will maximise the return on investment for shrub-based systems as the complementary feedbase will provide benefits that will promote production.

- **Site preparation:** Considerations include weed control (critical pre and post sowing in the establishment year), pest control and seed bed preparation. Information regarding species tolerance to herbicides is quite limited and therefore other options including cultivation, scalping (removing top layer of soil from sowing row to reduce weed competition in increase water catchment) and most importantly forward planning need to be used.

- **Time of sowing:** In this region, research specifies that sowing should occur soon after the break of the season, allowing plants time to establish before the warmer and drier conditions over summer with the disadvantages of frost risk, weed competition and possible slower plant growth over winter.

- **Sowing method:** Success of direct seeding is extremely variable under all methods of sowing. Depth control is the most important factor in the sowing operation and establishment will decline if the seed is buried at depths greater than 5 mm. Seed source, viability, pre-treatment and mixture are also noteworthy influences that need to be considered as part of the seeding operation.
• **Grazing management:** The aim for these grazing systems is for livestock to incorporate the forage shrubs into their daily diet. They will take time to adjust to a new feed source when first introduced to the shrubs and may focus on other feed sources before they become accustomed to the shrubs. However, it is more ideal for livestock to balance their diet and include different feed sources for optimal animal nutrition and production. Increasing grazing pressure, rotating animals through smaller paddocks (providing a fresh allocation of feed), using animals with different levels of experience and using watering points and/or feed supplements to control livestock movement are options for managing grazing behaviour and achieving dietary mixing.

• **Plant and site maintenance:** Plant size (grazing or slashing) and health (avoiding under or overgrazing shrubs, especially during particular periods of the year) are two other factors that need to be maintained for optimal productivity. The role of forage shrubs can be to provide shelter, ground cover and/or a component of the livestock diet.

Perennial forage shrubs are well adapted to EP and can contribute to the farm feedbase and livestock productivity. Experimenting still needs to be undertaken in order for shrub-based systems to become established via direct seeding as a potential broadacre option in this region. The successful establishment of perennial forage shrubs through direct seeding is currently very dependent on seasonal variability, and until better practices are determined and the issues that have been encountered in this study can be overcome, more research needs to be done in order to achieve success.

**Acknowledgements**

I gratefully acknowledge the advice and information provided to us by Jason Emms (Senior Research Officer for the Enrich project, SARDI). I would like to also thank Ian Richter, Wade Shepperd, Mark Klante and Brett McEvoy for their technical assistance and site management.
Benchmarking EP sheep enterprises

Daniel Schuppan\(^1\), Mary Crawford\(^2\) and Naomi Scholz\(^3\)

\(^1\)Landmark, Jamestown; \(^2\)Rural Solutions SA, Port Lincoln; \(^3\)SARDI, Minnipa Agricultural Centre

Key messages

- There are 3 main steps to improving your sheep enterprise:
  - Assess your current situation,
  - Set targets for key performance indicators (KPIs) and where you would like to be in the short, medium and long term,
  - Make plans to achieve targets.
- Benchmarking can assist in knowing your current situation and enables monitoring of changes over time.

Why do the work?

The sheep and wool industry has a poor reputation for productivity gains and has lost significant ground to competing industries such as broad acre cropping. Utilising tools such as benchmarking enables producers to properly evaluate the current state of the enterprise and identify profit drivers, which highlight any opportunities where changes can occur to the business.

How was it done?

Five sheep groups, established with funding from the Eyre Peninsula Grain and Graze 2 Project and Sheep Connect SA have focused on benchmarking their sheep enterprises. Thirty eight businesses completed benchmarking for the 2012/13 season, with one group completing benchmarking for the past three years, two groups for two years and two new groups completing it for the first time in 2013. Benchmarking periods for the sheep groups run from 1 April to 31 March.

To maintain confidentiality and anonymity, the groups will be named Group A, Group B, Group C, Group D and Group E.

What happened?

The sheep flocks benchmarked were dominated by ewes with most producers having around 60-70% of their flock as breeding ewes and 25-35% as replacement ewes (Table 2). Generally, all prime lambs and merino wether lambs are sold by one year of age. There were a range of enterprise structures but the main two were self-replacing merino flocks and or terminal sire over merino ewes. There was one producer who had a self-replacing dorper enterprise. There were also three producers who operated a stud as well as their commercial flock. The studs were merino, white suffolk and poll dorset. Approximately 10% of the producers purchase lambs to utilise stubbles in most years. This however could be as high as 50% of producers, when the ideal trading opportunity presents itself with feed and prices.

There were no notable changes in the physical sheep production figures over the 3 years. There were some general trends across all groups, these included:

- Sheep losses decreased.
- Lambing percentage decreased in the 2012/13 season. Although all groups had difficult conditions for lambing due to a poor spring and limited feed reserves, Group B had a 20% decrease in lambing percentage. This may be improved with in future with planning, management and monitoring, that is, condition scoring ewes and providing the correct nutrition required at lambing.
- The stocking rates remained similar although there were variations according to the season. With a poorer season the stocking rate decreased as less area was cropped and the sheep had more winter grazed hectares.
- Although the stocking rates varied, the producers who had the highest stocking rate in a good season also had the highest stocking rate in a poorer season.
- The size of the sheep enterprises remained constant, although the sheep numbers and winter grazed hectares for group A slightly increased over the 3 years benchmarked.
- The enterprise mix in groups A, D and E were very similar with approximately 65-70% of the farm cropped and 30% for winter grazing due to majority of their farm being all arable (Table 1). Group B cropped around 45% due to more un-arable country. Group C was in a higher rainfall location and the farms in this benchmarking group had a large hill area that was un-arable and used for grazing, therefore only 50% of their farm was cropped.

The financial results are shown in Table 3. The gross margin per DSE and per hectare in 2012/13 was on average less than the previous two years, although there was a large variation within a group and between groups. The sheep and wool prices had a low period in the second half of 2012 compared to the previous 2 years. Producers with a good strategic and tactical management plan for their sheep enterprise were still able to achieve above $30/ DSE, which was a good result in 2012/13.

Due to the poor spring in 2012 any producers who had stocking rates set to the extreme and/or no exit strategies did crash the system, resulting in low gross margins (per hectare and DSE). This was generally around 20% of the producers.
### Table 1 Soil type, average rainfall, average percentage of farm cropped and numbers of businesses participating in benchmarking from sheep groups across Eyre Peninsula in 2013

<table>
<thead>
<tr>
<th>Group</th>
<th>District soil type</th>
<th>Number of businesses participating in 2013</th>
<th>Av annual rainfall (mm)</th>
<th>Av growing season rainfall (mm)</th>
<th>Average % of farm cropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Red sandy loams to sandy clay loams</td>
<td>9</td>
<td>310</td>
<td>212</td>
<td>65</td>
</tr>
<tr>
<td>Group B</td>
<td>Grey calcareous sandy loams</td>
<td>5</td>
<td>324</td>
<td>245</td>
<td>42</td>
</tr>
<tr>
<td>Group C</td>
<td>Red brown earth</td>
<td>6</td>
<td>425</td>
<td>344</td>
<td>51</td>
</tr>
<tr>
<td>Group D</td>
<td>Red sandy loams to sandy clay loams</td>
<td>11</td>
<td>342</td>
<td>248</td>
<td>66</td>
</tr>
<tr>
<td>Group E</td>
<td>Calcareous sandy loams</td>
<td>7</td>
<td>350</td>
<td>260</td>
<td>67</td>
</tr>
</tbody>
</table>

### Table 2 Physical and production traits for all participants surveyed in the 2010/11, 2011/12 and 2012/13 seasons

<table>
<thead>
<tr>
<th>Sheep</th>
<th>2010/11</th>
<th>Range Low-High</th>
<th>2011/12</th>
<th>Range Low-High</th>
<th>2012/13</th>
<th>Range Low-High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dry sheep equivalent (DSE)</td>
<td>1780 (1110 - 3940)</td>
<td>1520 (1300 - 5570)</td>
<td>2340 (625 - 5982)</td>
<td>1192 (166 - 6800)</td>
<td>65 (33 - 99)</td>
<td></td>
</tr>
<tr>
<td>Ewes (%)</td>
<td>70 (42 - 99)</td>
<td>72 (40 - 81)</td>
<td>65 (33 - 99)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ewe Hoggets (%)</td>
<td>24 (0 - 46)</td>
<td>27 (9 - 37)</td>
<td>28 (0 - 55)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losses (%)</td>
<td>5 (0 - 13)</td>
<td>3 (1 - 6)</td>
<td>3 (0.6 - 6.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stocking Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter Grazed (WG) hectares</td>
<td>810 (240 - 2100)</td>
<td>790 (320 - 1550)</td>
<td>1119 (166 - 6800)</td>
<td>65 (33 - 99)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSE/WG ha</td>
<td>2.9 (1.3 - 6.4)</td>
<td>2.1 (1.0 - 4.8)</td>
<td>3 (0.5 - 8.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSE/WG ha/100 mm rainfall</td>
<td>1.0 (0.6 - 2.8)</td>
<td>0.9 (0.5 - 1.8)</td>
<td>3 (0.6 - 6.4)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheep Trading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marking (%)</td>
<td>92 (78 - 103)</td>
<td>96 (73 - 120)</td>
<td>92 (65 - 150)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lambs/ha (No/ha)</td>
<td>1.5 (0.4 - 2.3)</td>
<td>1.1 (0.3 - 2.0)</td>
<td>1 (0.2 - 4.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale price (av $/hd)</td>
<td>122 (101 - 155)</td>
<td>112 (92 - 165)</td>
<td>85 (42 - 156)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wool Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wool price (av $/kg)</td>
<td>6.23 (5.16 - 8.44)</td>
<td>7.61 (6.71 - 8.66)</td>
<td>6.00 (4.22 - 8.51)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total kg*</td>
<td>9540 (4020 - 26080)</td>
<td>6780 (4900 - 23940)</td>
<td>8743 (4012 - 23400)</td>
<td>4012 (23400)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kg wool/DSE*</td>
<td>5.1 (3.6 - 6.6)</td>
<td>4.5 (3.2 - 5.5)</td>
<td>4 (2.2 - 6.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kg wool/WG ha*</td>
<td>14.8 (5.7 - 32.1)</td>
<td>9.4 (5.1 - 26.7)</td>
<td>13 (1.3 - 31.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*note, Dorper enterprise not included in wool production figures

The low gross margins could be attributed to an over-supply in the meat market that forced prices down, when producers had no alternative but to sell. Properties in the higher rainfall environments were affected the greatest as they had higher stocking rates, no spring feed and less stubbles available.

Sheep trading income has been the major source of sheep enterprise income for all producers in the groups over the past two seasons. For example the sheep trading income for Group A in 2010/11 represented 60% of the income, in 2011/12 54% and in 2012/13 54% (data not shown). Wool still plays an important part of the sheep enterprise income and the average across all groups ranged from 37% up to 52%. The variation in sheep and wool prices in 2012/13 resulted in producers achieving mixed gross margins per DSE and per hectare depending on timing of sales. Lower operating expenditure did not necessarily relate to a higher gross margin, and in some cases the highest expenditure on pasture, animal health inputs and feed still achieved the highest gross margin per DSE. This is due to less deaths, higher reproduction rate and, greater wool and meat production resulting in more kilograms to sell. Most producers had their costs under control with very good cost efficiencies. Due to the increased cost of supplementary feeding and reduced income for sheep and wool in 2012/13 the cost efficiency decreased and did not reach the returns of the previous two seasons. The cost efficiency (dollar of cost to generate dollar of income) is calculated by total variable cost divided by total income. The average cost efficiencies for the groups in 2012/13 were Group A $0.30, Group B $0.66, Group C $0.53, Group D $0.41 and Group E $0.47. A good cost efficiency range to be in for the 2012/13 season was $0.30 to $0.40. Many of the producers do their own crutching and shed hand work which was not included in their figures making their cost efficiencies very good.

**What does this mean?**

Many producers in the groups commented that it was good to improve their understanding of their sheep enterprise and get a handle on their returns on a dollar per DSE and dollar per hectare basis.
The local information from the groups allows producers to focus on targets that are being achieved in their own district and gives them confidence to implement change as they have the support of the local group members and advisors.

The returns that sheep producers achieved in the 2010/11 and 2011/12 were exceptional due to a combination of good seasons and high commodity prices for both meat and wool. Returns were lower in 2012/13 than the previous two years of benchmarking, due to a poor spring, and sheep and wool prices fluctuating. The benchmarking has highlighted that there is a large variation between the returns producers are receiving within the same rainfall environment. However, there was no stand-out sheep enterprise, and it was generally the case of ‘do what you do and do it well’.

This variation provides some opportunities for producers to be more productive and profitable. Over the 3 years of benchmarking the stand-out area in which improvements could be made was in the reduction of sheep losses and the increasing of lamb marking percentage. This could be progressed through closer monitoring of stock numbers, meeting nutritional requirements and managing animal health e.g. vaccinations and fly control.

As expected gross margin per hectare was influenced greatly by the stocking rate, which in turn impacted the number of lambs per hectare and the wool production per hectare. The producers paying attention to detail are achieving higher production with greater financial rewards.

Risk management is also important, and this will be determined by the management capabilities and the amount of risk that a producer is willing to take. The higher the stocking rate, the higher the risk and the more management required. Some producers have low stocking rates as it makes it easier to get through the ‘poor season’. Many producers have an idea in their minds of what they will do in the “poor season” but there is no written strategy to implement a number of back door or ‘exit’ strategies.

The livestock system is critical to get right first; therefore time and effort should be made for planning. As seen by the benchmarking, sheep losses are easy to control but areas such as stocking rate and lambing percentage, which are influenced by a number of factors are harder to change within 2-3 years.

The high performing enterprises in each group based on highest gross margin per hectare had:
- Higher stocking rates
- Lower death rates
- Higher reproduction
- Higher growth rates of meat and wool

Some of the other attributes of the high performing enterprises are:
- Have a simple system
- Timeliness - get operations done on time
- Good pasture and grazing management. For example defer graze and sow some feed for winter grazing
- Pay attention to breeding and genetic improvement
- Have a marketing plan and targets
- Have stable sheep numbers
- Pay attention to detail.

Acknowledgments
This project was supported and funded by EP Grain and Gaze 2 (GRDC UA00117), Eyre Peninsula Natural Resources Board and Australian Wool Innovations. The authors would like to thank all sheep producers involved in the project.

Reference

**Table 3 Financial results for all participants surveyed for 2010/11, 2011/12 and 2012/13 seasons**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Range Low-High</th>
<th>Mean</th>
<th>Range Low-High</th>
<th>Mean</th>
<th>Range Low-High</th>
</tr>
</thead>
<tbody>
<tr>
<td>$/DSE - Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wool Proceeds*</td>
<td>32</td>
<td>18 - 48</td>
<td>34</td>
<td>28 - 42</td>
<td>24</td>
<td>9 - 39</td>
</tr>
<tr>
<td>Sheep Trading Profit</td>
<td>48</td>
<td>23 - 81</td>
<td>38</td>
<td>29 - 53</td>
<td>28</td>
<td>1 - 53</td>
</tr>
<tr>
<td>Total Sheep Income</td>
<td>80</td>
<td>42 - 109</td>
<td>72</td>
<td>54 - 89</td>
<td>52</td>
<td>24 - 89</td>
</tr>
<tr>
<td>$/DSE - Expenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Variable Costs</td>
<td>13.2</td>
<td>5.6 - 19.9</td>
<td>11.4</td>
<td>7.6 - 19.5</td>
<td>22.9</td>
<td>8.8 - 38.0</td>
</tr>
<tr>
<td>Gross margin/DSE</td>
<td>67</td>
<td>36 - 97</td>
<td>61</td>
<td>46 - 79</td>
<td>29</td>
<td>-2 - 68</td>
</tr>
<tr>
<td>$/WG ha - Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Wool Proceeds*</td>
<td>92</td>
<td>29 - 199</td>
<td>71</td>
<td>34 - 207</td>
<td>94</td>
<td>9 - 225</td>
</tr>
<tr>
<td>Sheep Trading Profit</td>
<td>142</td>
<td>37 - 328</td>
<td>79</td>
<td>31 - 215</td>
<td>93</td>
<td>2 - 208</td>
</tr>
<tr>
<td>Total Sheep Income</td>
<td>234</td>
<td>66 - 527</td>
<td>150</td>
<td>66 - 410</td>
<td>174</td>
<td>13 - 393</td>
</tr>
<tr>
<td>$/WG ha - Expenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total Variable Costs</td>
<td>37</td>
<td>9 - 66</td>
<td>22</td>
<td>8 - 82</td>
<td>78</td>
<td>10 - 232</td>
</tr>
<tr>
<td>Gross margin/WG ha</td>
<td>198</td>
<td>58 - 445</td>
<td>128</td>
<td>57 - 328</td>
<td>96</td>
<td>-2 - 221</td>
</tr>
</tbody>
</table>

*note, Dorper enterprise not included in wool production figures*