Benchmarking sheep enterprises using Breeding Value technology

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EXTENSION

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Location:
Minnipa Ag Centre
Rainfall
Av. Annual: 325 mm
Av. GSR: 241 mm
2014 Total: 407 mm
2014 GSR: 290 mm
Livestock
Enterprise type: Commercial sheep flocks
Social/Practice
Time (hrs): Additional time required for additional measurements and data entry
Clash with other farming operations: Standard practice
Labour requirements: Some additional labour may be required depending on the type of measurements taken
Econimics
Infrastructure/ operating inputs: Computer software and some data collection equipment is required
Cost of adoption risk: Low

Key message

- **Breeding Values can increase productivity and profitability of a livestock business through long term improvement to genetics of the flock by benchmarking performance, continually setting higher targets and monitoring actual progress. The technology can also be used in conjunction with other sheep husbandry activities to increase labour efficiency. To be effective, the use of technology needs to be closely aligned with visual selection and the setting of stretch productivity targets in each individual flock in order to see significant improvement.**

Why do the trial?

The Eyre Peninsula has the proven capacity to produce productive and profitable sheep as a valuable component of the mixed farming system. Current market forces, a longer term consideration of climate change and the likely adaptations to whole farm systems provide a real opportunity for sheep to reinvigorate farming businesses in the area. Merinos have suffered from limited uptake of new technology in recent decades, but there is now good demand for medium wool, meat and restockers. For these reasons, a four year study was undertaken at the Minnipa Agricultural Centre to investigate new sheep breeding technology and management options. The project at Minnipa promoted ways to overcome barriers to new technology and aimed to show how Breeding Values could be used as a benchmarking tool to help set targets and monitor change towards achieving goals in breeding programs.

How was it done?

The project used the Merino sheep flock at Minnipa to demonstrate the genetic benchmarking system that is known as MERINOSELECT created by “Sheep Genetics” (a joint MLA and AWI project).The three main topics covered in the project were; use of the Minnipa demonstration flock to engage with ram buyers and breeders, technology transfer to ram buyers, and, technology transfer to ram breeders.

Over the four years of the study the key activities important for the Minnipa flock to create Breeding Values were demonstrated to breeders. These included mothering-up at birth, measuring body weights, wrinkle scores, wool weights and fat and eye-muscle depths, visual classing, side sampling for fleece quality measurements, ram inspection, ewe allocation and pregnancy scanning. How to efficiently collect and handle the sheep data using new technologies such as electronic ear tags, use of an auto-drafter, electronic scales, barcode reader and printer, stick reader, computer indicator and livestock management software were also demonstrated.

Measurements were submitted to MERINOSELECT for the 2010, 2011, 2012 and 2013 drops at yearling (Y) age (10-13 months). This process subsequently generated Australian Sheep Breeding Values (ASBVs), which are figures that aim to take the environmental effects (such as feed, birth type, seasonal conditions etc.) out of the actual measured trait and thus better reflect the actual genetic merit and potential of an animal. These Breeding Values are valuable productivity benchmarks but must also be complemented with the longstanding traditional visual assessment in order to stay “on track”.

What happened?

The Minnipa flock breeding objective was aimed to specifically increase growth rate (Ywt) (body weight at yearling age), fleece weight (Ycfw) and eye muscle depth (Yemd), reduce breech wrinkle (EBWR) and maintain micron (Yfd) and fat (Yfat). However every flock in the system has the ability to choose their own goals and relative emphasis between traits.

Table 1 Average Australian Sheep Breeding Values (ASBVs) of the 2010-2013 yearlings in the Minnipa flock

Drop Year	Ywt (kg)	Yfd (μm)	Ycfw (%)	Yemd (mm)	Yfat (mm)	EBWR (visual)	DP+*	No. head**
2010	2.0	-0.9	12.5	-0.1	-0.2	-0.3	134.4	361
2011	2.9	-0.5	13.8	-0.3	-0.3	-0.4	134.3	414
2012	3.9	-0.4	14.1	0.2	-0.1	-0.6	137.5	546
2013	5.1	-0.4	16.6	0.1	-0.2	-0.6	142	523
Change	*+3.1*	*+0.5*	*+4.1*	*+0.2*	*0*	*-0.3*	*+7.6*	*NA*

**The Dual Purpose (DP+) index ranks animals on their ability to produce merinos for a dual purpose operation. An index combines the values of several ASBVs into one figure.*

***Number of head represents all animals, including deceased, born in each drop year and submitted to MERINOSELECT*

ASBV results varied throughout the four years of data collection, "bouncing around" especially in the initial years of the project, as the Minnipa flock did not have good early linkage (use of sires with large numbers of progeny) in the MERINOSELECT data base or good internal flock linkage between years.

Over the 4 years this was gradually resolved by increasing the number of well-linked sires. The early data and flock structure at Minnipa was in a similar state to many breeders considering adoption of Breeding Value technology.

A summary of the ASBVs using July 2014 data are represented in Table 1. It shows that the change in ASBVs were in line with the Minnipa breeding objective.

Comparative results for the raw data collected from these years are displayed in Table 2, which shows a differing trend to the ASBV results and the environmental impacts (season, age, birth type, feed etc.) on actual production. A comparison of the results between Table 1 and Table 2 shows the benefits of Breeding Values over raw data for setting benchmarks and monitoring progress. Note the differences in the "Change" data in both tables.

Scanning and lamb marking results for the Minnipa flock have improved over the duration of the project (Table 3). These advances are due to better attention to sheep husbandry rather than genetic improvement. Dam ASBV for Number of Lambs Weaned (NLW) remained constant at 0.

The average ASBVs of the sires and dams used over the duration of the project reflects the Minnipa flock breeding goals and rate of gain in the flock (Table 4 and 5). The gains in their progeny are shown in Table 1. Note that the changes in ASBVs are recorded in Table 4 and 5 twice to reflect change during the project (2010-2013) and change after the project (2014-2015).

Table 5 shows the ASBVs for the dams. As many of the ewes in the early years did not have any recorded data, much of the current data comes from progeny testing (known sire and offspring performance). The rate of gain in the ewes was assisted by the high lambing results and thus high ewe culling that could take place across all ages.

Table 2 Average raw data values of the 2010-2013 yearlings in the Minnipa flock

Drop Year	Ywt (kg)	Yfd (μm)	Ygfw (kg)	Yemd (mm)	Yfat	EBWR (visual)	Y age (av. days)	No. head (Y age)*
2010	50.1	18.1	3.4	30.8	2.9	2.6	318	321
2011	47.1	18.6	3.7	34.7	3.7	2.2	327	394
2012	51.2	17.4	3.6	30.9	2.6	2.9	333	429
2013	46.3	17.5	3.2	27.7	3.0	3.8	312	434
Change	*-3.8*	*-0.6*	*-0.2*	*-3.1*	*+0.1*	*+1.2*	*NA*	*NA*

**Number of head represents only all alive animals born in each drop year and measured at yearling age*

Table 3 Fertility data of the 2010-2013 drop years in the Minnipa flock

			Animal numbers at yearling age					
Drop Year	Dam preg. scanning (%)	Lamb marking (%)	Age (av. days)	No. head	Singles	Multiples	Unknown birth type	Annual rainfall (mm)
2010	126	99	318	321	150	169	2	410
2011	126	121	327	394	96*	178*	120*	404
2012	160	130	333	429	66	344	19	253
2013	153	128	312	434	77	349	8	334

**The 2011 drop year pedigree was measured only through a DNA test; hence the number of unknown birth types due to some animals being sold off before the tests were taken*

Table 4 Average Australian Sheep Breeding Values (ASBVs) of the 2010-2015 sires used in the Minnipa flock

Year	Ywt	Yfd	Ycfw%	Yemd	Yfat	EBWR	DP+	No. head
2010	3.6	-0.9	13.8	-0.3	-0.4	-0.3	139.9	8
2011	5.2	-0.3	16.5	-0.6	-0.5	-0.4	142.3	7
2012	7.1	-0.1	16.1	0.4	0	-0.5	145.3	7
2013	8.2	-0.2	18.7	0.4	0	-0.6	148.9	8
Change	*+4.6*	*+0.7*	*+4.9*	*+0.7*	*+0.4*	*-0.3*	*+9.0*	*NA*
2014	7.8	-0.4	18.9	0.6	-0.1	-0.4	153.1	7
2015*	8.3	-0.3	22.9	0.5	-0.1	-0.4	164.1	8
Change	*+4.7*	*+0.6*	*+9.1*	*+0.8*	*+0.3*	*-0.1*	*+24.2*	*NA*

**shows the ASBVs of the 2015 sires to be used*

Table 5 Average Australian Sheep Breeding Values (ASBVs) of the 2010-2014 dams used in the Minnipa Flock

Year	Ywt	Yfd	Ycfw%	Yemd	Yfat	EBWR	DP+	No. head
2010	0.5	-0.7	11.6	0	-0.1	-0.2	127.6	246
2011	0.5	-0.7	11.7	0	-0.1	-0.2	128	182
2012	1.5	-0.6	12.5	-0.1	-0.2	-0.3	132.8	296
2013	1.7	-0.6	12.7	-0.1	-0.2	-0.3	133.3	296
Change	*+1.2*	*+0.1*	*+1.1*	*-0.1*	*-0.1*	*-0.1*	*+5.6*	*NA*
2014	2.4	-0.5	13.3	0	-0.1	-0.3	135	253
Change	*+1.9*	*+0.2*	*+1.7*	*0*	*0*	*-0.1*	*+7.4*	*NA*

What does this mean?

The Minnipa flock represents a flock similar to many Merino breeders on the verge of joining or those that have just joined MERINOSELECT. It offered an opportunity to demonstrate to local studs some of the vagaries that can occur in the initial years of benchmarking. Despite these challenges, over only three years considerable genetic gains were achieved in increased live weight, eye muscle depth, fleece weight, and reduced breech wrinkle in the Minnipa flock. The project also showed how MERINOSELECT can provide ram buyers with a system to benchmark their flock whilst assisting with ram purchasing decisions. Although the project aimed mainly to demonstrate MERINOSELECT as a genetic benchmarking system and what is involved in its implementation rather than simply validating the use of Breeding Values, the positive genetic changes in the Minnipa flock were an encouraging outcome.

Breeding Values have the potential to increase productivity by more accurately benchmarking performance, encouraging the setting of new targets and monitoring improvements. Much of the technology can also be used to increase labour efficiency. However, for effective use of the technology, it needs to be closely aligned with visual selection and breeding objectives to achieve long term success.

Most of the assessments were taken at young ages and the comparison of the young and older age assessments were not possible in this project. The project demonstrated how the protocols can be adopted into ram breeding businesses and showed the technology has the potential to benchmark with reasonable clarity and progress towards the chosen breeding objective.

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