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Contents

Editor:
Khama Kelman
Email: sibi@dpird.wa.gov.au

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Lamb Survival Initiative - comparing 2015 and 2016 results

Rebecca Butcher, DPIRD, Moora

Corresponding author: rebecca.butcher@dpird.wa.gov.au

This article presents a comparison of the results of the 2015 and 2016 Lamb Survival Initiatives. The results of the 2015 Lamb Survival Initiative are available in the March 2016 edition and the 2016 results are available in the September 2017 edition of the Ovine Observer.

Introduction

The Lamb Survival Initiative, through involvement with regional grower groups, aims to provide the support required for producers to achieve 100%+ lamb marking rates. The initiative provides training and support, encouraging producers to set achievable targets and benchmarking their marking rates against producers in similar regions and across the state.

The Lamb Survival Initiative is in its third year with the first initiative run in 2015. In 2015, producers from five grower groups were involved in the initiative and in 2016, producers from six grower groups participated.

The grower groups were spread throughout the southern region of Western Australia (WA) and included Facey Group (Wickepin), Southern DIRT (Kojonup), the Gillamii Centre (Cranbrook), ASHEEP (Esperance) and three independent groups, with a total of 34 participants.

In order to build producer confidence and skills to lift marking rates to 100%+ the initiative encourages producers to:

- undertake pregnancy scanning for multiples on a significant proportion of their adult ewes
- record and submit data on the reproductive rate, marking rate and weaning rate achieved in the scanned ewe flock/s so that the rates can be benchmarked against producers in similar regions
- attend at least one training course or workshop focused on reproduction
- work closely with industry professionals where reproduction rates are less than expected.

Lifetime Ewe Management accredited facilitators Ed Riggall and Jonathan England were selected by the groups to provide in depth information on reproduction. Facilitators meet either on-farm with each producer or via group meetings to provide support and training on topics such as condition scoring, feed budgeting and husbandry practices for increasing lamb survival.

Information collected by producers around the reproductive cycle included:

- ewe condition score at rams out and pregnancy scanning
- scanning rate (number of lambs scanned per 100 ewes joined)
- marking rate (number of lambs marked per 100 ewes joined)
- weaning rate (number of lambs weaned per 100 ewes joined)
- weaning weights (where facilities were available)
- Feed on Offer (FOO) at lambing and details of supplementary feeding.

Collection of this information has enabled producers to gain valuable understanding on where lambs were being lost throughout the reproductive cycle, providing them with targeted ways to improve their lambing percentage.

Analysis of results from the initiative comparing 2015 and 2016

Ewe condition score

In general, the groups showed a trend of increasing ewe condition score between the periods of removing the rams and pregnancy scanning (Figure 1). As shown in Figure 1, producers from the ASHEEP, Gillamii Centre and Southern DIRT groups maintained a high average condition score (CS) of 2.9 or above in their ewes between rams out and pregnancy scanning in both 2015 and 2016.

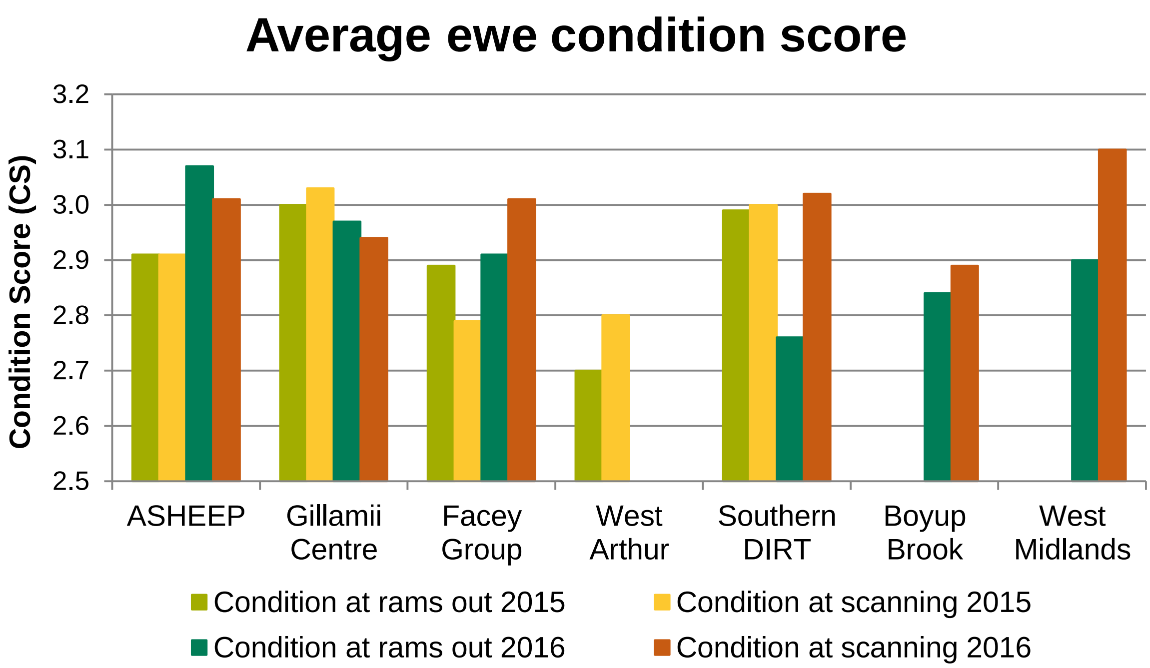


Figure 1 Difference in average condition score (CS) of ewes in the different grower groups between rams out and pregnancy scanning in 2015 and 2016

The average ewe condition scores were higher in 2016 than 2015 for the ASHEEP and Facey Group groups, which reflects the significant increase in FOO available at each of these sites in 2016 compared to 2015. While FOO increased between years at all sites that were measured in both 2015 and 2016, the difference in FOO was greatest at these two sites.

In 2016, producers from the Southern DIRT and West Midlands groups saw a moderate increase in average ewe condition scores of 10%, while producers from the Facey Group and Boyup Brook groups saw a slight increase between rams out and pregnancy scanning.

There was a reduction in the average ewe condition scores in the ASHEEP and Gillamii Centre groups in 2016, however the change was negligible (<2%) and was not reflected in the 2015 condition scores.

Feed availability

Figure 2 displays the available amount of feed on offer and supplementary feeding across both 2015 and 2016 for all groups. FOO increased between 2015 and 2016 for all groups measured in both years.

In 2016, average FOO at lambing was high for all groups, with the difference between years most notable for ASHEEP and Facey Group producers, reaching almost one tonne difference for ASHEEP and exceeding one tonne for Facey Group.

The lowest average FOO in 2016 was 1200 kilograms per hectare (kg/ha) (Southern DIRT), which was actually greater than the highest average FOO in 2015 being 1060kg/ha (ASHEEP). This may be in part due to the areas in which the groups resided experiencing decile 1 rainfall during the growing season in 2015.

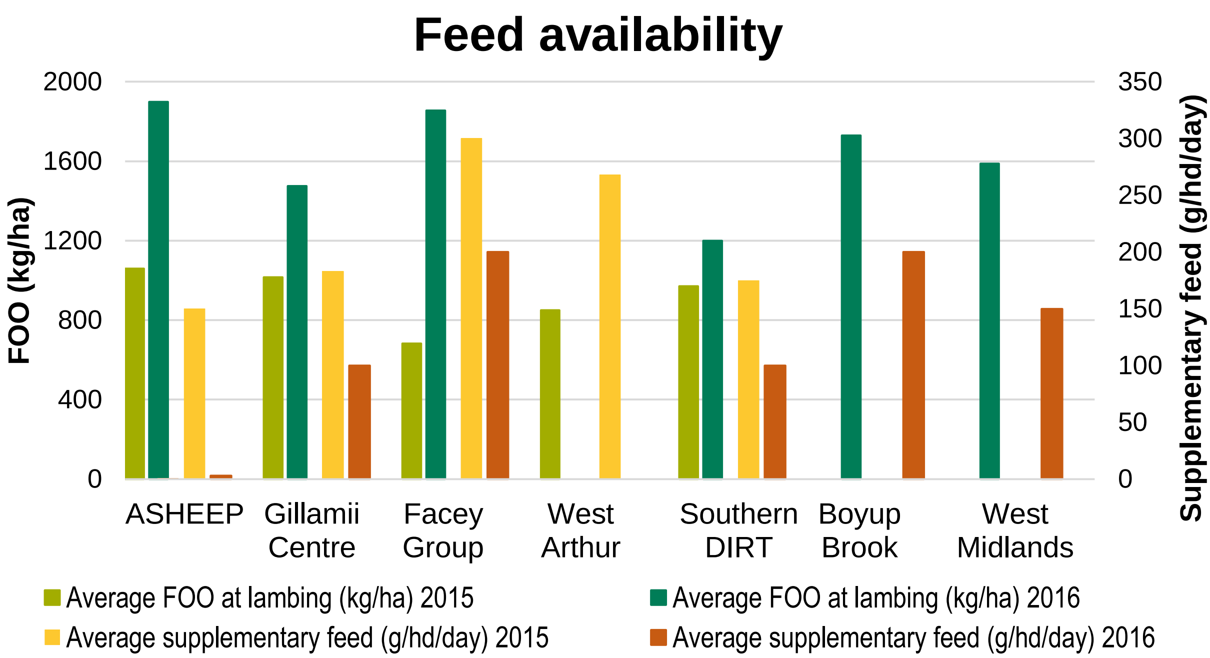


Figure 2 Feed on offer (FOO) and supplementary feeding amounts in the different grower groups in 2015 and 2016. Key: kilograms per hectare (kg/ha); grams per head per day (g/hd/day)

Most groups continued to provide supplementary feed to ewes even when FOO was high in both years (Figure 2). A variety of supplementary feeds were used including hay, wheat seconds, oats, barley, an oat-barley mix and/or lupins. The majority of the supplementary feed recorded was used for feeding twin bearing ewes.

Reproductive rates

In Figure 3 reproductive rates are recorded and include the number of lambs scanned, marked and weaned per 100 ewes joined in 2015 and 2016. As in 2015, the greatest lamb loss in 2016 for each group occurred between pregnancy scanning (dark blue – 2015, light blue – 2016) and lamb marking (dark green – 2015, light green – 2016). This mortality may be either in-utero, during the birthing process or in the first 72 hours of life, when 80% of lamb mortality occurs.

Producers in the ASHEEP group had large losses during this period in both 2015 and 2016. Producers in the Southern DIRT, Boyup Brook and West Midlands also suffered large losses during 2016, which is interesting given the reasonable condition score and FOO for each of these groups. Comparatively, the losses during this period were smaller in the Facey Group and West Arthur groups.

Surprisingly the number of lambs weaned (2015 – orange, 2016 – yellow) increased from the number of lambs marked (2015 – dark green, 2016 – light green) in several groups, occurring in the West Arthur group in 2015 and the Gillamii Centre and Facey Group groups in 2016. The increases were relatively small and are likely to reflect some out-of-season lambing and/or ewes and lambs that were not present at marking.

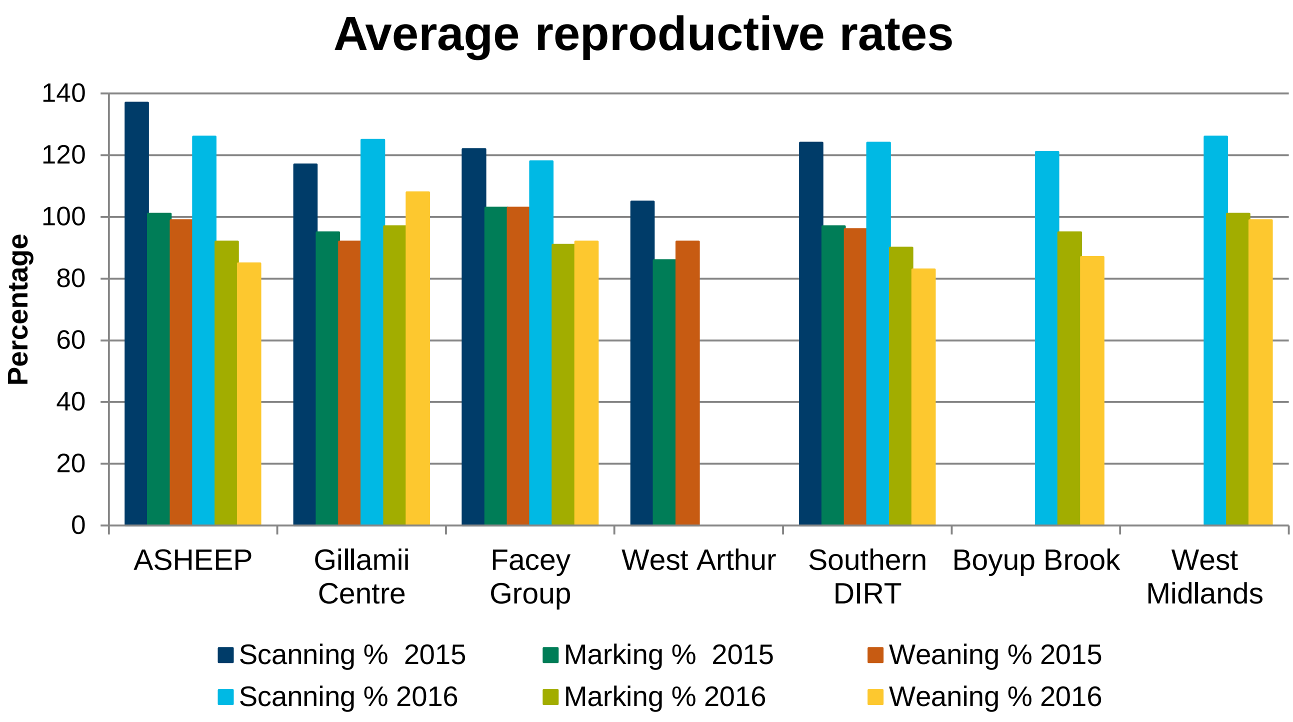


Figure 3 Change in reproductive rates in the different grower groups between scanning, lamb marking and weaning in 2015 and 2016

There are many practices that can be put in place to increase lamb survival. These have been long understood and were reiterated through the Lamb Survival Initiative group participation.

The practices include the importance of monitoring the condition score of ewes, scanning for multiples, preferentially feeding twin bearing ewes, as well as providing shelter and limiting mob size at lambing especially for those ewes with multiples.

Weaning weight

While not all producers involved in the project recorded lamb weights at weaning, the average weaning weights are shown in Figure 4. It's no surprise that average weaning weights were higher in 2016 which is most likely due to the better seasonal conditions favouring higher FOO and higher liveweight growth.

Weaning weight can have an important effect on post weaning survival and growth rate. Making More from Sheep states that "a 14kg weaner has a 34% lower mortality risk than a 12kg weaner, whereas a 20kg weaner has a 22% lower mortality risk than an 18kg weaner".

The average weaning weights for each of the groups was greater than 20kg, and sometimes more than double this, reflecting the reduced mortality seen in the groups.

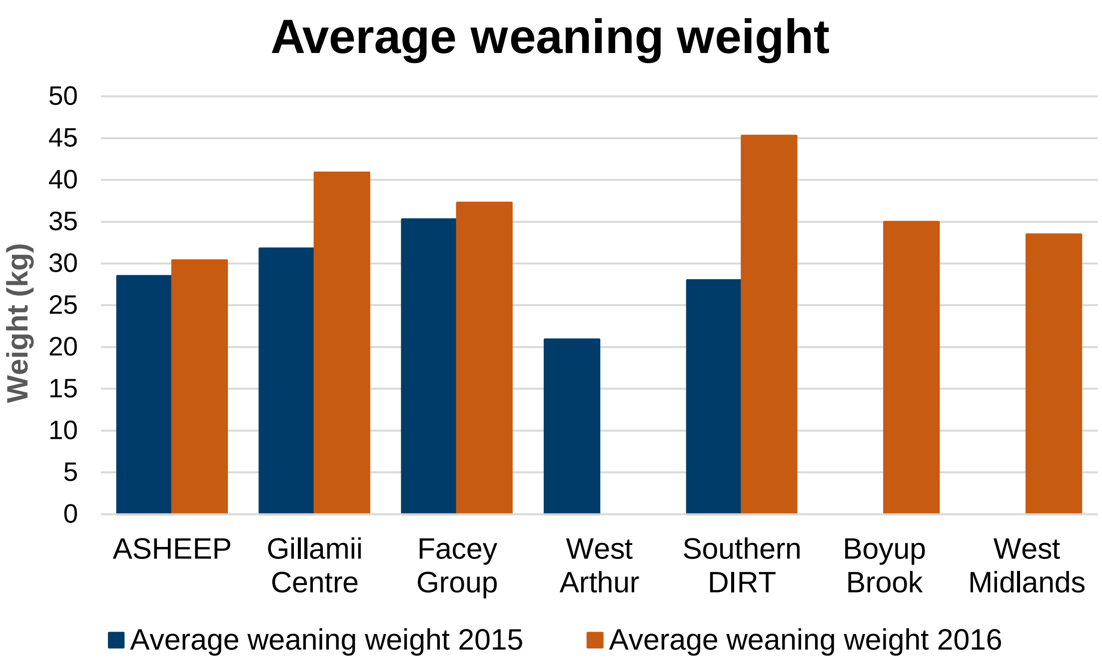


Figure 4 Average weaning weight of lambs in the different grower groups in 2015 and 2016

Producers involved in the initiative over the last couple of years stated their reason for joining being the desire to improve lamb survival (especially in twin born lambs), to improve their management skills and to improve lambing percentage. Overall feedback from producers involved indicated that they found the Lamb Survival Initiative to be highly valuable to their business.

Some of the key take home messages listed included ensuring that the right sheep were selected for your enterprise, feeding sheep to their requirements was important, that condition score at joining was paramount and managing multiples in smaller mobs increased lamb survival.

Further information on increasing lamb survival can be found in the September 2015 edition of Ovine Observer, or on the DPIRD website.

If you would like to become involved in the 2018 season of the Lamb Survival Initiative, please contact Rebecca Butcher, Sheep Industry Development Officer, Moora on +61 (0)8 9651 0540 or rebecca.butcher@dpird.wa.gov.au.

Value or supply chain – pedantry or practice

The chain

In basic terms, the meat business involves growing animals to produce meat to be eaten by consumers. This requires a number of individuals and businesses to work together, as generally no one person or business undertakes the entire process alone. The events that link the farm to the consumer is often called a chain.

Figure 5 Events linking the producer to the consumer

That is a pretty simple concept but with the addition of extra words, such as value and supply, the situation becomes more confusing. The process as a whole then becomes described as either a supply chain or a value chain. So the question you might ask is: what is the difference, if any, between a supply and a value chain? Does this difference mean anything in a real and practical way and is one better than the other? Or do the words just add a bit of spin?

Supply chain

Supply starts with the sheep that becomes a carcase, then a cut, and then a meal. Supply starts at the farm and ends with the consumer. The direction of the movement of supply is therefore from the paddock to the plate.

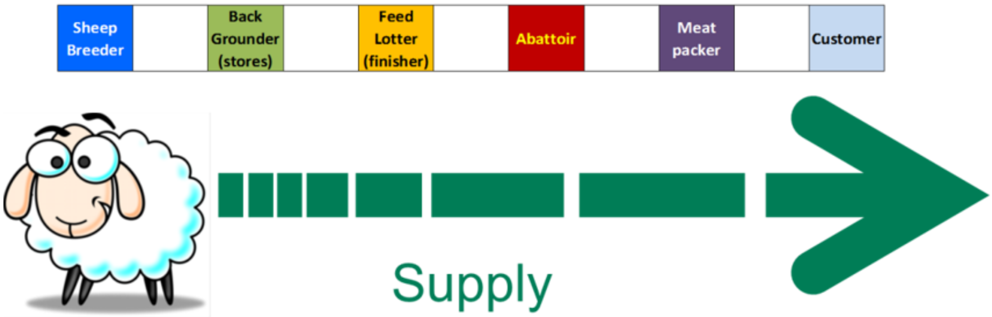


Figure 6 Supply chain between paddock and plate

Value chain

Value is money and all the money comes from the consumer. The value chain starts at the consumer and goes all the way to the farmer. The direction of the flow of value is therefore from the plate to the paddock.

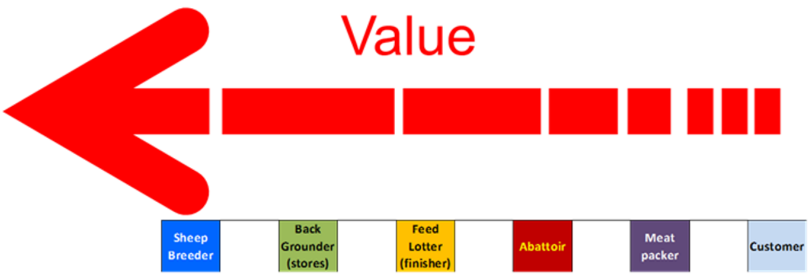
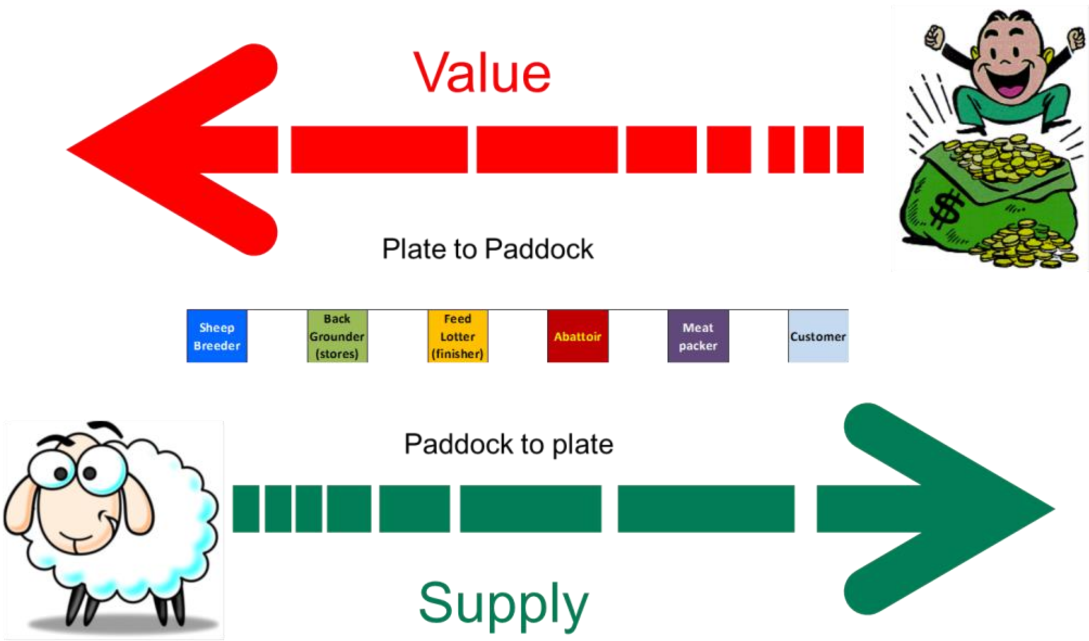


Figure 7 Value chain between plate and paddock

Supply/value chain

All chains have both a supply and value side and a chain generally can't be just one and not the other. So if that is the case, then why make any distinction. Is it all still just spin?



Whole of chain approach

The reason for making a distinction between value and supply becomes more obvious when a 'whole of the chain' approach is taken and ways to manage each component considered. Things like production inputs (fertiliser, drench, etc.), logistics (transport), storage and inventory are examples of factors that can be managed to improve the supply side of the equation. Consumer analysis (products they want, willingness to pay, provenance, and convenience), product development and waste reduction are examples of factors that can be managed on the value side. The value and supply chains have a bearing on each other so how can they work together?

An integrated chain is one in which one company owns more than one link of the chain. In the WA sheep meat industry there are few examples of this, so bringing supply and value together can be a challenge. When the chain is not integrated, improved communication of information between the value and supply parts of the chain is one way of doing this.

As the new measurement systems and associated data systems come into commercial practice, the movement of timely information between different links of the chain will become more achievable. This should help the value to get from the consumer to the producer and the supply to get from the producer to the consumer, in the way that each wants.

DNA flock profile gives commercial breeders ASBV confidence

Tom Granleese, Sheep CRC, University of New England, New South Wales (NSW)

Corresponding author: tgranle2@une.edu.au

Introduction

Commercial sheep producers often have little pedigree or performance information on individual sheep within their flocks. This lack of information makes management decisions such as ram selection to achieve genetic gain difficult. However, since the creation of the Information Nucleus Flock in Australia, prediction of Australian Sheep Breeding Values (ASBVs) from genomic information is possible.

A useful tool for commercial sheep producers could be to genotype a proportion of their flock and be given a flock mean breeding value based on genomic information (genomic breeding value - GBV). This would enable commercial sheep producers to make more informed decisions when buying rams with ASBVs or as a marketing tool when selling sheep via saleyards or AuctionsPlus. The flock profile project was set up to test the feasibility of this idea.

Can we generate individual genomic breeding values and flock genomic breeding values?

130 Merino flocks have been sampled using low-density 15k single nucleotide polymorphism SNP tests to measure flock genomics. Flocks varied from highly related to MerinoSelect flocks, through to closed breeding flocks with no known links to MerinoSelect. GBVs have been successfully calculated for all individuals from all flocks. However, GBVs and ASBVs are measured on different scales and the ability to compare them on a relevant scale is important for commercial producers so they can make meaningful management decisions with the results.

GBVs and ASBVs can be compared using a regression equation to relate each trait, such as adult weight, using industry data from the Sheep Genetics population. An example of a regression equation ($y = 1.1145x + 3.4783$) can be seen in Figure 8 where the x axis is on the horizontal and the y axis is on the vertical.

The R^2 is also shown and a value of 1 would indicate a perfect correlation between the flock GBV and ASBV. An R^2 of 0.71 indicates a good association between the GBV flock mean and the ASBV flock mean. Each data point in Figure 8 represents a flock that has genomic tested at least 20 sheep from their stud each year (with all wool types represented).

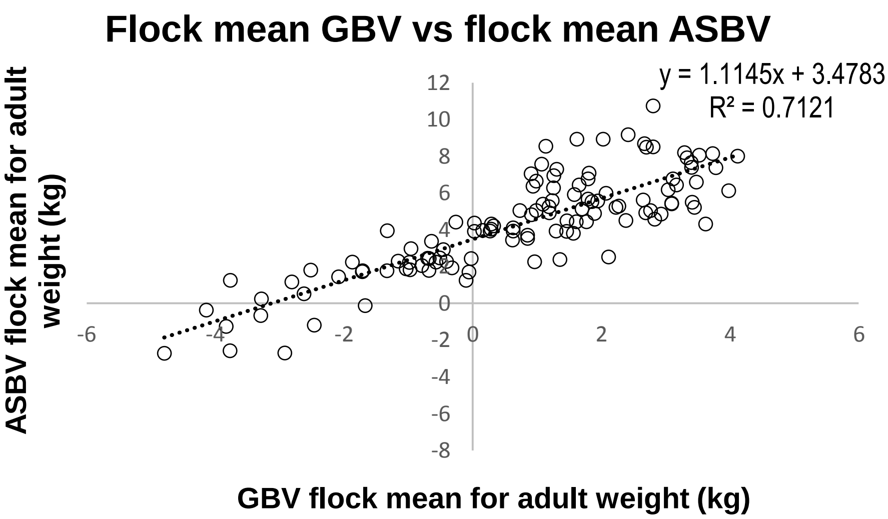


Figure 8 Flock mean genomic breeding value (GBV) versus flock mean Australian Sheep Breeding Value (ASBV) for adult weight (in kg). Circles indicate cohorts with a minimum of 20 sheep

Can we trust the methods and how can we validate them?

Both internal cross-validation and external validation methods were used to make sure the results returned were relevant to commercial producers.

Internal cross-validation

When using regression equations to scale GBVs to ASBV level, an internal cross-validation analysis was performed. The validation process used 60% of the dataset, randomly sorted, and transformed into regression equations. The regression equations for different traits were then applied to the remaining 40% of data and compared to their actual flock mean ASBV.

This process was repeated 30 times to calculate the mean slope of the relationship, intercept and R^2 value. An ideal outcome would be a mean slope of 1, intercept of zero (meaning for each one unit increase in flock profile there was a one unit increase in ASBV cohort mean) and a high R^2 value (meaning less deviation from the trendline). Figure 9 represents the results of one repetition of internal cross-validation for the yearling fibre diameter trait. Table 1 demonstrates the mean values from the internal cross-validation over 30 repetitions for wool, growth and carcase traits.

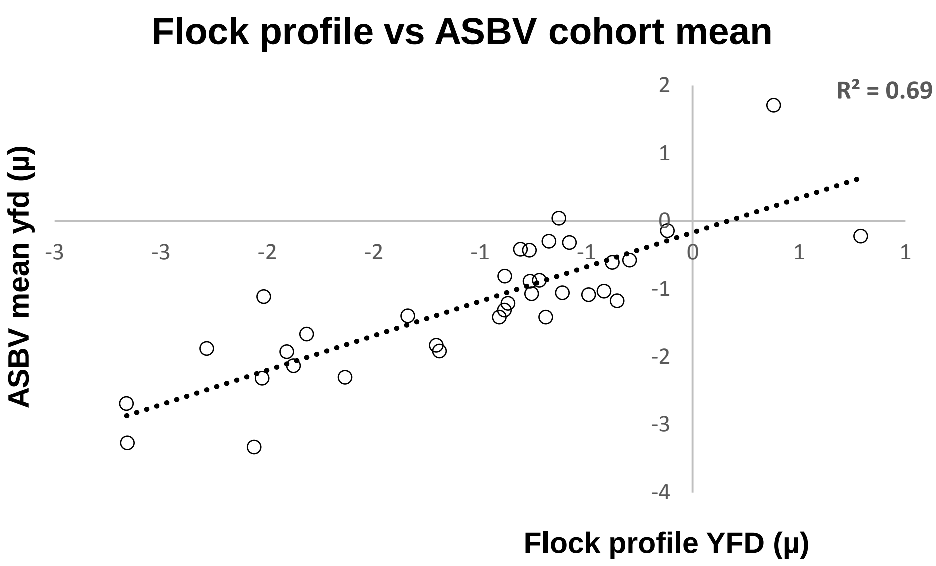


Figure 9 Internal cross-validation for the yearling fibre diameter (YFD) trait in microns (μ): flock profile versus Australian Sheep Breeding Value (ASBV) flock mean. Circles indicate cohorts with a minimum of 20 sheep

Table 1 Internal cross-validation of flock profiles (FP) using regression equations vs flock mean ASBVs from 30 repetitions for various traits: yearling weight (YWT), yearling clean fleece weight (YCFW), yearling fibre diameter (YFD), post weaning weight (PWT), yearling staple length (YSL) and post weaning eye muscle depth (PEMD)

Trait	Slope	Intercept	R^2
YWT	0.98	0.12	0.72
YCFW	1.00	0.07	0.63
YFD	1.00	0.01	0.74
PWT	0.98	0.07	0.69
YSL	0.98	0.19	0.75
PEMD	0.96	0.00	0.55

The results for major Merino traits in Table 1 show good alignment between the Flock Profile and ASBV flock mean, with slopes close to 1, intercepts close to 0 and a high R^2 for most traits. This gives confidence when testing commercial Merino flocks. In the commercial testing pilot phase a wether trial took place and there has been a call out for participants with good ram team history for external validation purposes.

External validation

Peter Westblade Memorial Merino Wether Challenge

External validation included matching flock profile values to raw cohort means in the Peter Westblade Memorial Merino Wether Trial (Wagga Wagga, NSW). During the trial 30 wethers from 50 cohorts (or properties) were randomly drafted off from their flocks as weaners, given an ‘even-up’ shearing and run in the one flock. 15 wethers from each flock were slaughtered after one year. The second half of each cohort were run together for another 12 months and then slaughtered. Body weights, fleece measurements and carcase traits were all measured. The remaining 15 sheep kept for an extra 12 months had genomic testing and had their flock profiles calculated. The raw cohort flock means were compared to flock profiles.

Figure 10 shows the comparison for flock profile vs cohort raw mean for adult clean fleece weight. Similar or higher R^2 values were observed for body weight and fibre diameter. Without knowing the pre-existing management of the sheep prior to joining the program, it was not possible to make adjustments to raw measurements. Nonetheless the results indicate a good relationship between flock profiles and cohort means, giving further evidence that flock profile is an effective tool to benchmark commercial flocks.

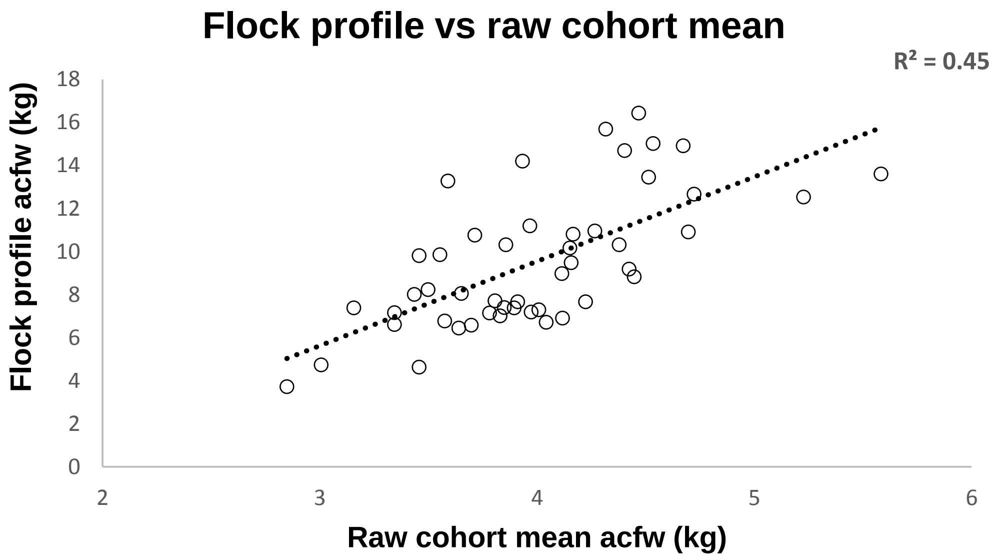


Figure 10 Flock profile for adult clean fleece weight (acfw) (kg) versus raw cohort adult clean fleece weight mean (kg). Circles indicate cohorts with a minimum of 20 sheep

Matching ram team history to flock profiles

As part of the external validation, commercial producers who had recorded their ram team history and used rams with ASBVs were matched by ram team history with current flock profiles. Consistently flock profile values were matched for each trait, with the ram team average from 3-6 years prior as seen in Figure 11. This is likely to be due to genetic lag. Often, the genetic merit of a flock will be one generation behind the ram team average. This is caused by the overlapping age profile of the commercial ewe flock.

Often the age structure of commercial ewes will vary from 18 months to six years of age, where a six year old ewe may have been sired by a four year old ram out of a five year old ewe. This is an extreme example however; because of the varying age of ewes, this causes genetic lag behind current ram teams as observed in Figure 11. It also demonstrates the importance of making sure the best possible ram team available is purchased each year. That means culling out low-value rams (ASBV-wise) and buying the best possible replacements. RamSelect.com.au is a very effective way of tracking ram teams.

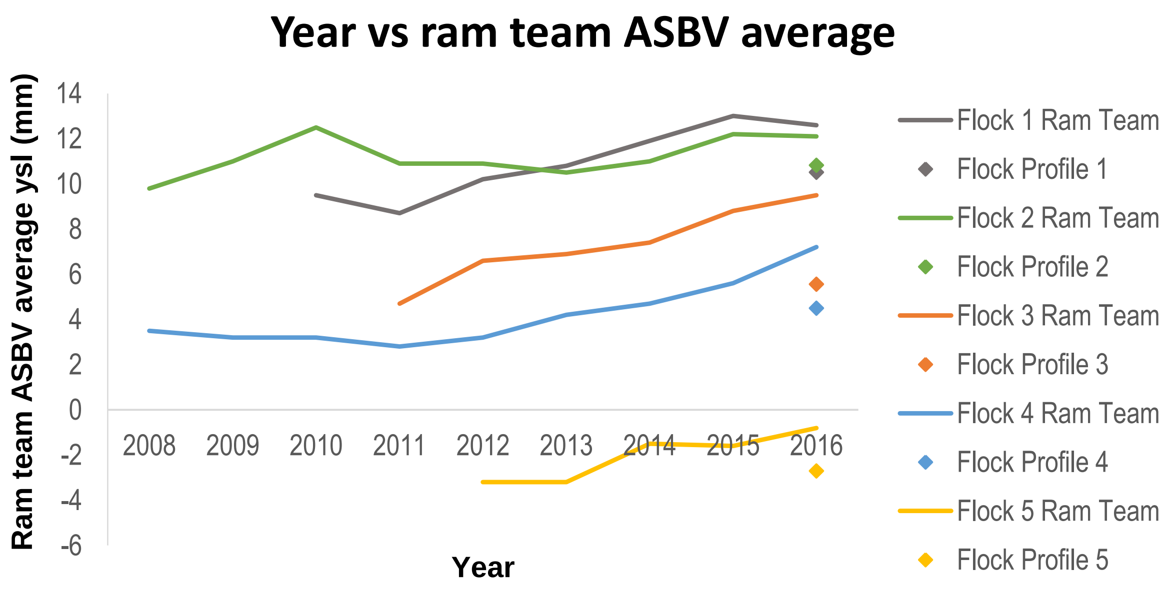


Figure 11 Comparison of the flock profile values for five flocks for the yearling staple length (YSL) trait in millimetres (mm), indicated by diamond markers, to ram team average ASBVs for YSL, indicated by lines

Flock profile for commercial breeders

Flock profile reports are sent via email and are available online via RamSelect.com.au. The accuracy of a flock profile can be increased by buying rams that closely relate to the genomic reference population.

It is recommended that you test your latest drop of Merino lambs every 3-4 years to 'check-in' on your flock. Each year it is strongly advised that you use RamSelect for your ram buying decisions.

Conclusion

Flock profile has gone from concept to commercial product in under two years after much effort from Sheep CRC, Animal Genetics and Breeding Unit and Sheep Genetics. After stringent internal and external validation, the development team are confident of the product on offer to any commercial producer regardless of their ram source. Flock profile enables commercial Merino producers, whether they are using ASBVs or not, to benchmark where their flock is positioned on the ASBVs measurement scale for important traits. It will also enable them to select rams with superior ASBV measurements that will ensure genetic progress in future lambing generations.

Given the success of internal and external validation methods, the flock profile product has been commercially released.

For more information please contact Melanie Dowling on +61 (0)477 748 430 or melanie.dowling@dpird.wa.gov.au.

A flock profile test can be requested from the Sheep CRC on +61 (0)2 6773 3466 or sheepDNA@sheepcrc.org.au.

Pedigree sensor technology

Beth Paganoni, DPIRD, South Perth

Corresponding author: beth.paganoni@dpird.wa.gov.au

Introduction

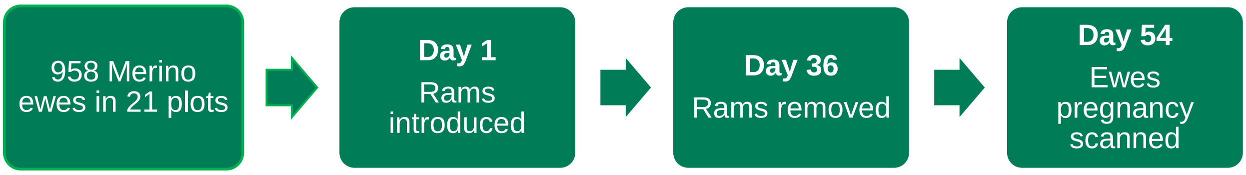
Pedigree and rear type information for sheep is important for our industry to improve breeding values for reproductive traits. Current techniques of collecting pedigree and rear type information are expensive, such as blood sampling for DNA, and labour intensive, such as mothering up lambs to ewes at birth.

Using bluetooth sensors to match up lambs to ewes is a novel technique that could reduce labour expenses. In a recent experiment it was hypothesised that by using bluetooth sensors to monitor the interactions between ewes and lambs, pedigree and rear type could be determined with similar accuracy to blood sampling for DNA or the mothering up technique.

The department's Beth Paganoni

Materials and methods

Joining and scanning



Mixed age Merino ewes (n=958) from the breech strike resource flock at Katanning, WA, were allocated genetically onto 21 small plots (1ha), with between 30 and 75 ewes per plot.

One Merino sire from both susceptible and resistant lines of the flock was joined with each plot of ewes on 2 February 2016. The ewes and rams were removed from plots on 10 March 2016 and separated.

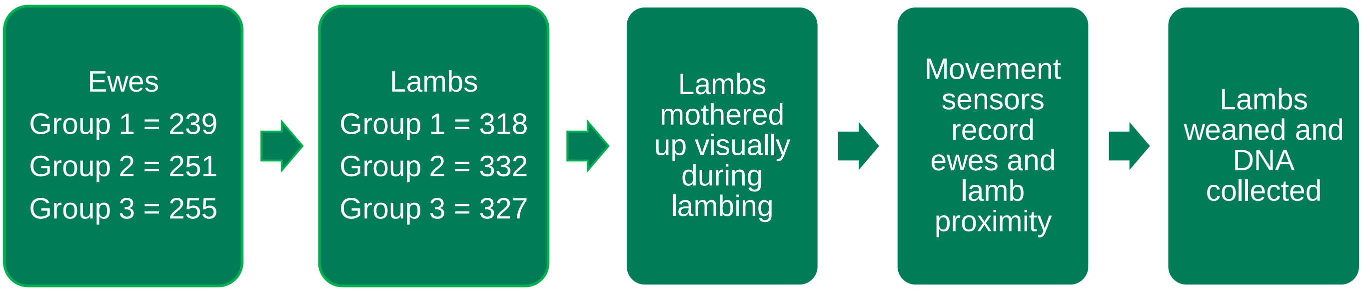
The ewes were scanned via ultrasound for pregnancy and litter size on 29 March 2016, 54 days after the rams were introduced. Dry ewes were removed from the flock (n=135).

Lambing

Prior to lambing the ewes were randomised into three groups; group 1 = 239, group 2 = 251 and group 3 = 255 ewes. All ewes were fitted with neck plates for easy identification and each group was grazed on three similarly sized paddocks. The mean date of birth for lambs was 28 July 2016.

Twice daily lambing rounds by two technicians were conducted and newborn lambs were identified to their dam. Three lambs (one alive and two dead) were not identified to a dam. Each group was mustered and the lambs were weighed, marked and tailed on 1 September 2016 before being returned to their respective lambing paddocks.

On 28 September 2016, 56 dry ewes were added to group 1 (total = 295 ewes), 49 dry ewes were added to group 2 (total = 300 ewes) and 49 dry ewes were added to group 3 (total = 304 ewes), to increase grazing pressure.



Sensors

Lambs fitted with sensors

When the lambs in group 1 were on average 10 weeks of age, movement sensors (attached to a clip-on dog collar) were fitted to all ewes and lambs.

The group was moved to a new paddock (57ha) of green annual pasture (approximately 4000 kg dry matter/ha) for three days before the sensors were removed.

The sensors were then fitted to the second group of ewes and lambs who were grazed on the same 57ha paddock for two days before being fitted to the third group, also grazed on the same paddock, for four days.

All ewes and lambs had electronic identification that was matched to the sensor identification at both the fitting and removal of the sensors.

Sensors fitted to ewes were programmed as beacons and those fitted to lambs as receivers. Proximity measures were collected via bluetooth at 30 hertz (hz) over a 1-15 metre range.

The data was extracted from the sensors using binary algorithms. Each time a lamb sensor received a signal from a ewe beacon it was recorded as a ‘hit’. Lambs were matched to the ewe that they had the most ‘hits’ with over the measurement period. Two methods of data processing were used; the La Trobe and the New Zealand methods.

Lambs were weaned and weighed on 11 November 2016. In December, a blood sample was taken via venepuncture to the jugular from each lamb and stored on a blood card for DNA processing.

In February 2017, a blood sample was also collected from the dams and sires and stored on a similar card. All the cards were then sent for DNA processing to determine the genetic dam and sire for each weaned lamb. One ram had died since mating in 2016 and therefore had no blood sample collected.

Results

In Table 2, DNA is assumed as the ‘gold standard’ and compares the accuracy of matches achieved by mothering up at birth (98%) versus the matches achieved by fitting the bluetooth sensors pre-weaning (94%).

The difference between the pedigree results from the sensors compared to DNA can be attributed equally between no matches (i.e. the sensor went flat, recording faults, the file couldn’t be analysed etc.) and incorrect matches (these include instances where the collar number wasn’t matched correctly to the lamb or dam).

However, when ‘no matches’ are removed from the dataset the difference between the two methods becomes insignificant.

Table 2 Accuracy of dam pedigree ascertained by mothering up lambs at birth or fitting bluetooth sensors pre-weaning (approximately 70 days of age) compared to DNA results from a blood sample taken at weaning. La Trobe (LT) and New Zealand (NZ) data processing methods are shown

	Number of animals	Percent of matches
Animal numbers		
Lamb blood cards submitted	973	
DNA parentage result	933	
Sensor fitted to above lambs	925	
Sensor fitted to above lambs and dams	915	
Matches to DNA		
Lambs and dams with sensors fitted	915	
Mothering up matches	896	97.9
LT sensor matches	858	93.8
NZ sensor matches	854	93.3
Mothing up - No match or mismatch		
Mothering up no match	3	0.3
Mothering up mismatches	16	1.7
Sensors – No match or mismatch		
LT sensor no match	29	3.2
LT sensor mismatches	32	3.5
NZ sensor no match	29	3.2
NZ sensor mismatches	28	3.1

Table 3 shows the results for the 51 lambs that did not have DNA results returned (no sample or failed sample). Mothering up and sensors make up nearly an extra 5% of pedigree information here.

Table 3 Accuracy of dam pedigree ascertained by fitting bluetooth sensors pre-weaning (approximately 70 days of age) compared to mothering up lambs at birth where no DNA results are available. La Trobe (LT) and New Zealand (NZ) data processing methods are shown

	Number of animals	Percent of matches
Animals without DNA		
Mothering up but no DNA	51	
Sensor fitted to above lambs	51	
Sensor fitted to above lambs and dams	45	
Matches to mothering up		
LT sensor matches to mothering up	44	98
NZ sensor matches to mothering up	44	98
All methods matching	44	98
Sensors – no match or mismatch		
LT sensor no match	1	2.0
LT sensor mismatches	0	0.0
NZ sensor no match	1	2.0
NZ sensor mismatches	0	0.0

Conclusion

Sensors provide an accurate alternative to mothering up and blood sampling for DNA to determine the dam pedigree of lambs. Mothering up at birth, when performed by competent technicians, was the most accurate technique and has the advantage of providing extra valuable information such as date of birth and birth weight. Nevertheless, sensors provide a less invasive alternative, which can provide an equally accurate result if programming and application errors are minimised.

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