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Sheep Updates 2009

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Sheep for the new age Program Outline:

Morning session

Transition from Mulesing

- 7.30 Registration opens (tea & coffee available)**
- 8.30 Welcome** – Sandy White, convenor
- 8.35 Opening** – Greg Sawyer, Manager Animal Research, DAFWA
- 8.40 Incorporating breech strike resistance into your ram selection program:** how to use the data effectively, what genetic progress you can expect to make – Dr Johan Greeff and Dr John Karlsson, DAFWA
- 9.30 What tools do you have to manage breech strike post 2010?** Chemicals and husbandry options and first year results from managing unmulesed sheep on DAFWA Research Stations - Dr Rob Woodgate DAFWA
- 10.10 Morning tea**
- 10.40 Dags – Scouring and worm control** – Dr Brown Besier, DAFWA
- 11.20 A producer's perspective** – Managing large sheep enterprises with no mulesing - Bruce Michael, Murrayfield, Bruny Island, Tasmania
- 12.00 Lunch & Hands-on training scoring 'indicator traits' to select for breech strike resistance**

Afternoon session

Sheep CRC - Lifting Reproduction Rates

- 1.25 Welcome** – Dr Andrew Thompson, Program 1 Leader, Sheep CRC
- 1.30 The right sheep for the job:** Choosing the best genotype for profit and production; reproduction & wool interactions, maternal traits and profitability - Dr Mark Ferguson, DAFWA
- 2.10 The new ASBVs for reproduction** - Sam Gill, Sheep Genetics Australia
- 2.40 Within-flock selection of ewes;** Opportunities for gains in reproduction – Dr Sue Hatcher, DPI NSW
- 3.10 Afternoon tea**
- 3.30 Tools for reproduction:** The value of pregnancy scanning information; culling and feeding decisions - John Young, Farming Systems Analysis Service, Kojonup
- 4.10 Weaner survival and growth:** The interaction of weaning weight and post weaning growth rate on survival and production – Dr Angus Campbell, Mackinnon Project, Melbourne University
- 4.40 Putting it all together on farm;** The Bundilla Merinos Story, using ASBVs, RFID, objective measurement & lifting lamb turnoff – Rick Baldwin, Young, NSW
- 5.10 Summary and close** – Prof David Lindsay
- 5.30 Sundowner and Nibbles**
- Displays** - Lifetime Ewe Management, Pedigree Matchmaker and other tools for breeders

Scouring Management and Worm Control

Brown Besier, Department of Agriculture and Food WA, Albany

INTRODUCTION

The major thrust of sheep worm research in recent years has been the integration of worm control efficiency with sustainability, to ensure that resistance by worms to drenches does not prejudice their long-term effectiveness. A prime aim is to prevent the occurrence of the signs of severe worm infections, such as diarrhoea (scouring) and obvious ill thrift, as where this occurs significant production loss will also have occurred. However, even where recommended worm control programs have been followed, scouring remains a common occurrence, especially in winter rainfall regions when sheep are on green pastures. As dagginess is clearly linked to an increased risk of blowfly strike, specific attention to the cause and prevention of scouring should be an essential aspect of sheep worm management.

CAUSES OF SCOURING

There are numerous causes of scouring in sheep, including bacterial and other infections, plant toxicities and some mineral imbalances, but the overwhelming causes relate to worm infection. Research in WA indicates that the ingestion of green plant material itself is rarely the initiating factor in scouring, but diarrhoea due to worm infections is typically exacerbated when sheep are on green pastures. The worms chiefly involved ("scour worms") are *Ostertagia* (*Teladorsagia*), *Trichostrongylus* and *Nematodirus*. *Haemonchus contortus* (Barbers Pole Worm) does not cause scouring.

Taking action to prevent worm-induced scouring requires an understanding of the causal mechanisms, which chiefly relate to the level of the sheep's immune response. Sheep develop a highly efficient immunity to worms after the intake of worm larvae over a period of some months, and usually have their full adult immunity by the time they are about 18 months of age. However, there are times when this does not prevent scouring.

Immunity to worms is seen as: the failure of newly-ingested larvae to develop to adult worms; a reduction in worm egg output of a given worm burden; and in fully-immune sheep, the rejection of adult worms from the gut. The rejection of adult and larval worms is often accompanied by gut inflammation and mucosal damage, and where this exceeds a critical level, diarrhoea frequently results. The proportion scouring varies between individuals due to genetic factors, and between flocks due to the level of worm challenge.

PATTERNS OF SCOURING

Scouring due to worms occurs at predictable times of a sheep's life, and recommendations for treatment and prevention vary according to the cause.

- Lambs: young sheep which have not developed their worm immunity often scour when the number of worms overwhelms their capacity to manage without gut damage, and it is common in lambs from 4 to 8 months of age. It is typically accompanied by high worm egg counts, and an effective drench rapidly stops scouring. Ideally, they would be moved out heavily worm-contaminated paddocks when treated, to prevent continued worm pick-up and further scouring. Scouring in some or most lambs in a mob is difficult to totally prevent.

Once lambs have experienced several weeks of worm larval intake above a minimum level, immunity will develop. In Western Australia, lambs born in autumn and early winter may achieve

this before pasture dry-off in summer, but winter-born lambs are usually not fully worm-immune by that time, and must have additional exposure to worm larvae in the next winter period.

- Hogget age sheep: even if most lambs have developed their immunity by their first summer, some in the mob are often still susceptible to worms as hoggets. As noted above, winter-born lambs are usually not fully worm-immune by their second winter. Hence, scouring due to worms is common in hoggets (12-15 months of age) during winter or early spring, and usually reflects significant worm burdens. A drench is recommended once scouring commences, and usually it does not resume. There is little point to conducting worm egg counts, as even if counts are not high, worms must be suspected in at least part of the mob.

- Mature sheep: although fully worm-immune during the green-pasture period, sheep typically lose this capacity over summer and autumn, when there are no worm larvae to stimulate the immune response. When larval intake next occurs, in winter or early spring, this immunity quickly re-develops but if larval numbers are excessive, some individuals will be unable to handle the influx and scour due to gut inflammation. This is termed “larval hypersensitivity scouring” or “worm challenge scouring”, and is short-lived (1-2 weeks) and effective: few larvae develop to adult worms, so worm egg counts are very low or even zero. A drench is unlikely to have any significant impact. The extent and prevalence of this form of scouring varies greatly within a flock (from none to over 60%) and is especially difficult to predict, but there is a strong genetic basis to the propensity for hypersensitivity scouring which can be utilised in breeding programs.

A worm egg count is recommended to distinguish between scouring due to high worm burdens, which can be removed with a drench, and scouring due to “larval hypersensitivity”, which is far less drench-responsive. (Larval hypersensitivity is a relatively new finding – see the references for more information.)

- Ewes during lactation: a spontaneous but temporary drop in worm immunity often occurs at the time of lambing, and lasts for about 2 months. Worm burdens and worm egg counts typically increase, if pastures carry sufficient worm larvae, and in extreme cases the consequent infections and reduced immunity is seen as scouring (or deaths in Barbers Pole Worm areas). A drench is usually recommended if ewes are scouring severely at lamb marking, as they cannot easily be re-mustered for some time.

Scouring occasionally occurs in sheep in other circumstances, but usually reflects a break down in worm immunity (such as in sheep in critically poor body condition), or where they are faced with overwhelming numbers of worm larvae.

TREATMENT AND PREVENTION

Successful scour management depends on prevention in the first instance, through an effective annual strategic worm control plan that aims to ensure that worm larval levels on pasture do not reach excessive levels at any time. Summer drenches to lambs and hoggets must be fully-effective as any surviving worms (which will be drench-resistant) will contaminate pastures in the critical late autumn period, and set up paddocks for high worm numbers later in winter. Similarly, autumn drenches to adult sheep (early April is recommended) should also be highly effective. A check of worm egg counts after a drench will indicate how effective it was.

Worm control programs should utilise pasture management for worms to ensure that sheep of any age, lambs or adults, do not meet extremely high numbers of worm larvae. In practice, this means keeping worm numbers low early in the season (with effective strategic drenches, as above), and monitoring worm egg counts of young sheep at intervals from late winter to the end of the green-feed period, so high-risk paddocks are noted. A routine drench at weaning is recommended, as lambs usually have moderate to high worm burdens at that time, and timely treatment will often prevent an outbreak of scouring. A weaning drench also reduces the level of pasture larval contamination.

Where worm disease outbreaks occur, the pastures will carry heavy worm larval loads, and be a risk until spelled from sheep for at least 3 months in winter, or for several weeks after the pasture has dried off.

Long-acting drenches have been advocated to reduce scouring, and can be used to prevent pasture contamination with worm eggs and hence provide clean pastures. However, these products can be highly selective for drench resistance, as the only worm eggs going onto pasture for a long period are from resistant worms. In WA, there is rarely a need for persistent drench products on a routine basis, but they can have a role in protecting sheep prior to exposure to heavily worm-contaminated pastures, where no alternatives are present. Where possible, this decision should be discussed with an advisor.

THE LONGER TERM

A longer term solution is to breed for worm resistant sheep, as over time the average worm egg output of the flock is reduced, with benefits for both scouring due to larval challenge and the effects of worms on sheep production. As some sheep with a high level of genetic worm resistance are also more likely to scour, scouring should also be used for culling decisions when selecting rams as hoggets. Removing scouring individuals where only a small proportion of an adult sheep flock are scouring is also recommended.

Despite the best attempts, however, some scouring almost always occurs: lambs are especially susceptible to worms, and in fact must receive a certain level of exposure to develop their immunity; and in mature sheep, the numbers of worm larvae needed to incite hypersensitivity scouring in genetically susceptible sheep is very low. Being aware of the likely cause and course of the scouring episode will enable appropriate treatment and timely crutching.

FURTHER READING – LARVAL HYPERSENSITIVITY SCOURING

Jacobson C, Bell K, Forshaw D, Besier B (2009). Association between immature nematode larvae and “low worm egg count diarrhoea” in sheep in Western Australia *Veterinary Parasitology* (in press)

Larsen JWA, Anderson NA, Vizard AL, Anderson GA and Hoste H (1994) Diarrhoea in Merino ewes during winter: association and with Trichostrongylid larvae *Australian Veterinary Journal* 71, 365-372

Larsen JWA, Vizard AL and Anderson NA (1995) Production losses in Merino ewes and financial penalties caused by trichostrongylid infections during winter and spring *Australian Veterinary Journal* 72, 58-63

Breeding sheep for resistance to breech strike:- Selection results in WA

LJE Karlsson, JC Greeff & AC Schlink, Department of Agriculture and Food WA

Introduction

Blowfly strike as a serious problem for the Australian sheep industry was first reported in the early 1900's. This also coincides with the first reports of the primary sheep blowfly, *Lucillia cuprina*. Observations at this time suggested that some sheep types appeared to be more susceptible to blowfly strike than others. This led to a four year experiment starting in the late 1920's that clearly demonstrated that sheep could be classified as fly strike resistant and susceptible lines primarily based on the degree of wrinkles on the sheep. The advent of the 'Mules Operation' and effective chemical controls in the 1930's effectively stopped future development of breeding for blowfly resistance.

In 2004 a major animal ethics campaign against surgical mulesing was launched against the wool industry. This led Australian Wool Innovation (AWI) to commission a major research program on alternatives to surgical mulesing for breech strike control. This paper reports the AWI and Department of Agriculture and Food (DAFWA) funded project at the DAFWA Mount Barker Research Station on 'Breeding for Breechstrike Resistance (BSR)' in the great southern area of WA, representing the winter rainfall areas of Australia. A similar experiment is being undertaken by AWI and CSIRO near Armidale NSW, representing the summer rainfall areas of Australia.

Biology

The gravid female fly is 'programmed' to seek out sites that will facilitate rapid growth of the larval stages. The main olfactory cue for the blow fly is smell associated with a nutrient rich liquid medium required by the first two stages of the developing blowfly larvae. This smell is associated with increased skin moisture and resultant increase in bacterial growth producing in the nutritional requirements for larval growth.

Sheep Factors

Early observations that some sheep were more predisposed to blowfly strike than others leading to recognition that skin wrinkles was one of the first traits associated with increased rates of fly strike. Subsequently additional sheep and wool traits have been recognised and are referred to as 'Indicator Traits'. The potential indicator traits and their association with the three main types of blowfly strike are shown in Table 1.

A standardised descriptive language of these traits have been developed by AWI, Meat and Livestock Australia (MLA), Sheep Genetics (SG), Australian Merino Sire Evaluation Association (AMSEA) and research organisations involved in this work. This is now available as a set of standard 'Visual Sheep Scores'. These traits are scored on a 1 to 5 scale where 1 is the most favourable and 5 the least favourable score.

The Visual Sheep Scores are available at: -

<http://www.sheepgenetics.org.au/ViewImage.aspx?ITEM=105&NAME=VisualSheepScores.pdf>.

Table 1

Potential Indicator Traits:-	Type of Strike:-		
	Poll	Body	Breech

Horn and/or deep fold at horn site	√√		
Wrinkles; Neck, Body, Rump/Tail & Breech	√√	√√	√√
Fleece Rot, Dermo, Suint, Wool Colour, Fleece Moisture	√√	√√	√√
Excessive wool coverage breech and points		√	√√
Dags and urine stain		√	√√
Crimp or staple structure, 'Water Proofing', Smell / Odour, Others?	√	√√	√√

Prevention of Flystrike

Broadly, prevention of flystrike includes the following two approaches:-

Non-Genetic

This includes; mulesing, preventative chemicals and management procedures such as time of crutching and shearing. These interventions have to be repeated for every drop of sheep and apart from mulesing, repeated at least every year. All these interventions come at some recurrent costs to the industry.

Genetic

The genetic approach has two strategies under consideration;

1. Selection for increased resistance (immune response). This has attracted considerable research effort since the 1990's, especially as it could lead on to potential vaccines. Some animals manage a 'self cure' at a considerable cost to the affected individual in terms of lost wool from the strike site. If the stress is severe enough there is often a break in the wool resulting in very low staple strength outcomes for the remaining fleece.
2. Selection of sheep that are less predisposed to fly strike. This is an indirect selection method involving Indicator Traits and the culling of any fly struck sheep in the flock.

Research Results from Breeding for Blowfly Resistance in WA

Because of the urgency to find alternatives to surgical mulesing the primary focus of this report will be on 'Breeding for Breech Strike Resistance'. However, we can also expect favourable responses to the other types of blowfly strike and changes in the other sheep welfare and economically important traits.

The incidence of fly strike in sheep is strongly influenced by environmental factors that govern fly activity as well as on sheep predisposing factors. Rain associated with warmer temperatures tends to increase fleece rot and result in body strike. In the winter rainfall environment both worm larvae picked up from the pasture as well as established adult worms are associated with scouring in late winter and spring result in breech strike if temperatures are high enough to allow fly activity.

Selected Results

The BSR research flock at Mt Barker RS started in 2005 with 'screening in of 600 ewe lambs from 10 industry flocks. The 600 ewes used for the start of breeding in 2006 come from screening in from the collective DAFWA sheep flock.

The flock structure is as follows:-

1. Initial Flock Structure (3 x 200 Ewes):-
 - Selected A (Intense Selection);

Both Rams & Ewes selected on Blow Fly Resist.

- Selected B (Commercial or Industry);

Selected rams & unselected ewes.

- Control;

Both rams & ewes are unselected

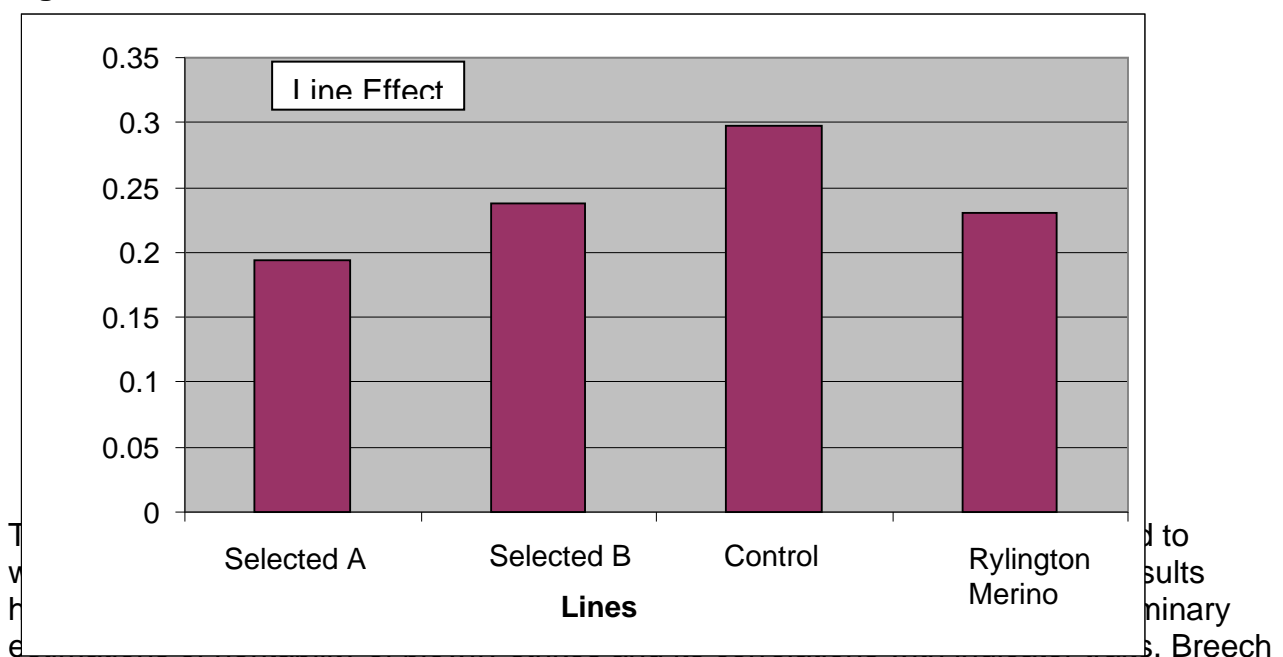
2. Rylington Merino (500 + 100) ewes from 2008

Between 2005 & 07 half of the progeny in each line were mulsed & the other half unmulsed. From 2008 all unmulsed.

In order to expose the susceptible individuals no preventative fly treatments are used and crutching and shearing conducted after the main spring fly season. During the fly challenge season monitoring is in place. Individually struck animals are treated with a short acting fly treatment.

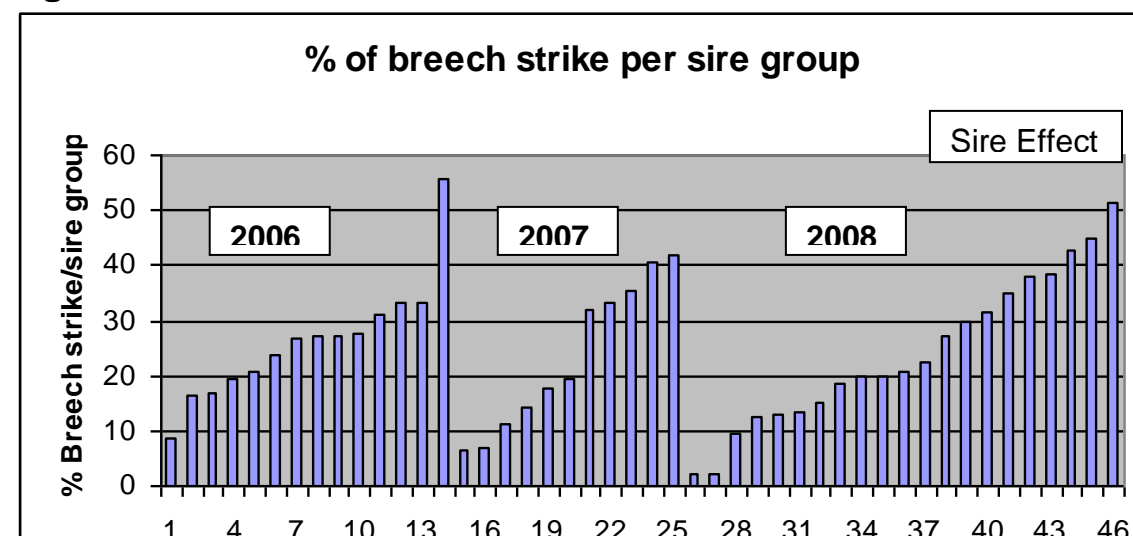
A summary of the incidence of breech strike in unmulsed sheep over 4 years in the four lines are shown in Figure 1.

Figure 1 Incidence of breech strike



strike has an estimated heritability of 0.57 and the genetic correlations with the indicator traits are positive. The variation between sires is shown in Figure 2.

Figure 2



Discussion

A discussion on the type of sheep required to be naturally less susceptible to blowfly strike typically generate some negative comments. The most common negative view is that 'plain' type of sheep has a lower fleece weight. Overall there is a slight increase on fleece weight with increased wrinkle scores. However, within the flock there will also be individuals that are above average on fleece weight and below average on wrinkle scores. The good news is that for traits such as; wool cover on the face, fertility, body weight and general hardiness the relationship with lower wrinkle scores is favourable. Therefore overall we believe that the type of sheep we are selecting for will be easy care and more productive.

Summary

The preliminary results indicate that genetic progress can be made in breeding for reduced incidence of fly strike in Merino sheep. The indicators traits provide the industry with a means to progress their breeding programmes to reduce fly strike without the necessity of allowing sheep to become fly struck as an indicator of blow fly resistance.

Acknowledgement

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Staff at Mt. Barker Research Station and the Albany Parasitology Lab.
Grower contributors of ewe weaners and some rams.

Future Ewe – matching genetics to the production system

Mark Ferguson, Department of Agriculture and Food WA & Sheep CRC

ABSTRACT

New research is helping to design a Merino ewe for the future that is more robust and has better maternal ability, the work has shown that:

- Selection for muscling increases the proportion of twins
- Selection for growth also increases the proportion of twins and improves ewe milk production and lamb growth to weaning
- Concurrent selection for growth and muscling will have no net effect on lamb birth weight and therefore no increase in lambing difficulties
- Genetically fatter ewes provide a better maternal environment for lambs resulting in high lamb birth weight when ewe nutrition is limiting
- Selection for high fleece weight can result in higher lamb mortality

INTRODUCTION

These are challenging yet exciting times for the Australian sheep industry. The industry is under pressure from a changing more variable climate, increased consumer demand for safe and welfare friendly products and the need to run more sheep per person and therefore handle them less often. At the same time there has been a significant change from the traditional dominance of income from wool to a balance between income from wool and meat. All these factors are forcing producers to re-think their sheep enterprises and indeed the type of sheep they are running. While these changes could all seem too much, it is a great opportunity to re-focus our sheep flocks on to a path of profitability within a variable future.

METHOD

A series of experiments and analyses have been conducted to investigate the impacts of different selection strategies on the reproductive ability of Merino ewes. These experiments and analyses were designed to investigate the independent effects of differences in ewe growth, muscling, fatness and fleece weight genotype on their reproductive capacity. Ewe genotype was determined based on their Australian sheep breeding values (ASBVs) for the traits of interest. Experiments were conducted on 1.5 year old Merino ewes from both Merinotech WA and Billandri flocks.

RESULTS

The work showed that under high stocking rates or nutrition limited environments, ewes that have higher ASBVs for fatness will produce heavier lambs that have a higher chance of surviving than ewes with lower fatness breeding values. In addition this work showed that ewes with higher muscling ASBVs will produce a higher proportion of twins, lambs with lower birth weight (with no negative impact on survival) and in some circumstances lambs that grow slightly slower to weaning.

The work also highlighted that ewes with higher growth ASBVs will produce a higher proportion of twins, produce lambs of higher birth weight, and produce more milk and lambs that grow faster to weaning.

Importantly, the work confirmed the previous work of the late Dr Norm Adams and others that selection for increased fleece weight without increasing body weight, results in higher lamb mortality. Ewes with high ASBVs for clean fleece weight had around 10% higher lamb mortality in single born lambs than ewes with average ASBVs for clean fleece weight.

CONCLUSION

The work suggests that Merino breeders should focus on breeding for a balance between muscling and growth breeding values to maximise improvements in the number of lambs born and also improve lamb growth to weaning. In addition, by selecting for a combination of muscling and growth, the problem of increasing lamb birth weight and potentially lambing difficulties by selecting just for growth will not be apparent as concurrent selection for muscling nullifies this effect.

This work has demonstrated that there are a range of impacts of different selection strategies on ewe reproductive performance and these impacts have largely not yet been included when determining the value of selection for particular traits. It is also relatively unknown how the importance of selection for particular traits changes under different production systems or environments. New work under development by DAFWA with support from the Sheep CRC will further investigate the correlation between production traits and maternal performance and importantly determine the impact of various traits on whole farm profit. The new work will investigate how sheep production genetics can be best matched with production systems resulting in greater efficiency and ultimately more robust genotypes that minimise profit variability between seasons.

KEY WORDS

Breeding objectives, muscling, fat, growth

ACKNOWLEDGMENTS

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Paper reviewed by: Andrew Thompson

Within-flock selection of ewes: opportunities for gains in reproduction

Greg Lee and Sue Hatcher, NSW Department of Primary Industries & Australian CRC for Sheep Industry Innovation (Orange)

ABSTRACT

The diversity of net reproduction rate (NRR) of ewes within a flock can be used to make selection decisions regarding which ewes to keep in the breeding flock and which to cull. The difference in NRR between ewes in the top 25% of the flock and those in the bottom 25% was equivalent to an additional lamb per ewe annually. The likely future potential NRR of a ewe can be reliably identified using her combined reproductive performance at 2 and 3 years of age. Early life fertility is indicative of both the fertility and rearing ability of ewes in later life. Two within-flock ewe selection strategies can be used to improve the reproductive performance of Merino ewes in the current generation, culling poor performers early and keep productive ewes for longer in the flock. Within-flock variation in NRR indicates that the bottom 25% of ewes produce only 8% of lambs weaned in a flock while the top 25% weaned 41%. However the extent to which the NRR of the flock is improved will depend on the proportion of maidens in the flock and the difference in NRR between the culled adult ewes and that of the replacement maidens. These strategies have the potential to increase NRR by 15% over 10 years from 75% to 90%. Gain in NRR of this magnitude can be worth \$8.20 per ewe on its own or \$12.60/ewe where fleece weight and fibre diameter are used in an index to select replacement ewes.

INTRODUCTION

Net reproduction rate (NRR) or the number of lambs weaned per ewe joined is a composite trait influenced by many interdependent components (Snowder and Fogarty 2009) and can be a major driver of on-farm profitability particularly when prices paid for lamb and surplus sheep are high. Each of the major component traits (fertility - number of ewes lambing /ewes joined; fecundity - number of lambs born/ ewe lambing; lamb survival - number of lambs weaned/lambs born) are influenced by genetics but the heritabilities of each are very low (Safari *et al.* 2007). A selection program can lead to permanent, albeit slow, genetic improvement in reproduction. However both the variability of NRR (Safari *et al.* 2007) and repeatability of the 3 component traits are high (Lee and Atkins 1996) which indicates that within-flock selection of ewes can be used to complement genetic gains from a selection program. The challenge for commercial producers is to determine how to best use available information to establish the potential NRR of their flock and efficiently identify those ewes to keep in the breeding flock and which to cull.

RESULTS

Within flock variation in NRR and its components

Lee *et al.* (2009b) quantified the large degree of diversity of NRR within 3 flocks of Merino ewes. Based on their lifetime reproductive performance, 94% of ewes ranked in the top 25% were fertile each year, with both high fecundity (55 - 69% of ewes lambing carried twins) and high lamb survival (Table 1). In comparison, the bottom 25% of ewes were 40% less fertile, 35% less fecund with 43% fewer lambs weaned. The difference in NRR between the top and bottom 25% of ewes was equivalent to an additional lamb per ewe annually. This variation in reproduction was not related to the pre-joining liveweight and condition score of the ewes as there was only 0.4 kg and 0.1 score difference between the lowest 25% and the top 25% (Lee *et al.* 2009b). However there was a low, but significant positive correlation (0.11-0.18) with weaner/hogget liveweight connecting early growth with lifetime NRR.

Table 1. The average predicted lifetime reproductive performance of 3 resource flocks, and its components, for each quartile ranked on net reproduction of Merino ewes with the average s.e.d.*

Flock		Lifetime reproduction ranking			Average s.e.d
Average	Lowest 25%	2 nd quartile	3 rd quartile	Top 25%	

Fertility ¹	0.78	0.56	0.77	0.87	0.94	0.01
Fecundity ²	1.42	1.28	1.33	1.43	1.63	0.02
Lamb survival ³	0.73	0.47	0.74	0.83	0.90	0.01
Net reproduction rate ⁴	0.84	0.30	0.71	0.98	1.37	0.01

* Adapted from (Lee *et al.* 2009b) ¹ no. of ewes lambing/ewes joined; ² no. lambs born/ewe lambing; ³ no. lambs weaned/lambs born; ⁴ no. lambs weaned/ewe joined

Early life reproduction and potential lifetime NRR

There is a strong association between the combined reproductive performance at 2 and 3 years of age (i.e. maiden and 4-tooth) and later reproductive performance. Fertility in early life is indicative of both the fertility and rearing ability of ewes in later life. 'Twice-dry' ewes had significantly lower fertility, fecundity and lamb survival than ewes that lambed either once or twice at 2 and 3 years of age (Lee and Atkins 1996). Similarly there are significant relationships between weaning performance at 2 and 3 years of age and NRR and each of its component traits. Ewes that 'twice-rear' will have a high future NRR while ewes that 'once-rear' will have a future NRR closer to 'twice-rear' ewes than 'twice-dry ewes' (Lee and Atkins 1996). These findings have recently been confirmed in other resource flocks.

Genetic variation in lifetime NRR

Heritability estimates for each of the lifetime NRR component traits (fertility, fecundity and survival) ranged from 0.11 to 0.19 (Lee *et al.* 2009a) and were higher than those previously published based on single year records. Furthermore each of the lifetime component traits had high positive genetic correlations (≥ 0.55) with lifetime NRR.

Selection strategies to improve current generation NRR

NRR in the current generation can be improved using a combination of two strategies based on within-flock ewe selection. Firstly, culling ewes that were dry at both 2 and 3 years of age or culling ewes failing to rear any lambs at their first 2 opportunities will achieve close to the maximum response in NRR of the entire breeding flock (Lee and Atkins 1996). Culling poor performers in early life will have minimal impact on the age structure of the flock and the number of surplus progeny (Table 2). Secondly extending the reproductive life of ewes with high NRR (for an additional 1 or 2 years) will achieve higher rates of improvement in whole flock performance due to fewer numbers of maiden ewes begin required as replacements. If both strategies are used the response is additive.

Table 2. Net reproductive rate of selected ewes at four – six years of age and of the entire breeding flock following selection based on two years of early reproductive performance.*

Strategy	Breeding ewes culled (%)	Flock structure (years)			Net reproduction rate		Ewe progeny surplus to breeding flock
		2	3	4-6	Selected ewes	All breeding ewes	
No culling	0	0.20	0.20	0.60	0.81	0.75	0.17
Cull dry/failed at least once	62	0.32	0.32	0.36	0.94	0.76	0.06
Cull dry at least once	47	0.29	0.29	0.42	0.91	0.76	0.09
Cull twice dry/fail	23	0.23	0.23	0.54	0.88	0.78	0.16
Cull twice- dry	12	0.22	0.22	0.56	0.86	0.77	0.17

* Adapted from (Lee and Atkins 1996)

Estimated economic effect of improving NRR

A combination of ewe lifetime selection (cull poor performers and keep high performers an additional 1-2 years) and genetic improvement (select rams using ASBV's for reproduction) can increase NRR from 75 to 90 % (i.e. +15%). Simulations using the Smart Merino (V1.3) software were based on a flock of 2,000 breeding ewes with 5 age groups and a base NRR of 75%. The base flock ewes cut 6 kg (greasy) of 20.5 μ m wool with an adult liveweight of 52 kg. Replacements were selected using a Merino DP7% index that uses a 7% micron premium plus high liveweight reproduction emphasis. Five year average wool market prices (2002-2007) and meat value for sale animals of \$45 for a 45kg animal were applied. The economic value of increased NRR to 82% in 5 years and 90% in 10 years was estimated under 2 scenarios: i) no

effective wool selection and ii) fleece weight and fibre diameter used in an index to select replacement breeding ewes (Table 3). Economic responses due to NRR and selection for wool can increase profit separately but the NRR response will provide greater selection intensities and complement the selection response.

DISCUSSION

Early identification of poor performers and retention of ewes in the breeding flock with high NRR is an effective means of making current generation gains in reproduction. The within flock variation in NRR identified by Lee *et al.* (2009b) suggests that achievable reproduction rates by Merino ewes are much higher than current expectations based on whole flock means. This finding along with the fact that reproductive performance across years is not a random event but a repeatable source of variation within ewes (Lee and Atkins 1996) provides the foundation for within-flock selection of ewes to improve NRR. The bottom 25% of ewes in the breeding flock typically produce only 8% of the total lambs and culling these ewes from the breeding flock as soon as they can be reliably identified can improve the average NRR of the 'selected' flock by nearly 20% (Lee *et al.* 2009b). However, the extent to which NRR of the whole breeding flock is improved will depend upon the proportion of maidens in the flock and the difference in NRR between the culled ewes' adult performance and that of the replacement maidens as maiden ewes have relatively poor reproductive performance. Increasing number of age groups in the breeding flock by retaining the top performers for an additional 1 to 2 lambings will reduce the proportion of maidens in the flock and increase both the selection intensity applied to the maidens and the number of high value young surplus sheep available for sale. Simulations of the estimated economic effect indicate an increase in NRR of 15% would be worth \$25,200 for a flock of 2,000 breeding ewes (+\$12.60 GM/ewe) due to the flock having an increased wool cut and weight of animals available for sale.

Reproductive performance at 2 and 3 years of age can be easily determined using information from pregnancy scanning and assessing udders of ewes at marking or weaning. Pregnancy scanning will provide data on both fertility and fecundity while udder assessment, indicating lamb survival, will identify those ewes who reared their lamb/s. A recent national survey of Merino sheep producers found that 32% scanned their ewe flocks for pregnancy status and 56% assessed both maiden and adult ewes at marking or weaning for reproductive performance (Curnow *et al.* unpublished data). Furthermore producers were actively using this information in their management decisions. However the survey indicated that maiden ewes were generally given a second chance to fall pregnant the following joining while adult ewes tended to be culled from the breeding flock on the basis of being dry once. Based on the findings of Lee and Atkins (1996) this current common decision process is clearly inefficient as it can lead to a high proportion (47 - 62%) of ewes being culled from the breeding flock solely on the basis of reproduction (Table 2) with fewer ewes being available for culling to achieve improvement in other production traits. Combining information from early reproductive performance (ie at 2 and 3 years of age) requires accurate identification and matching of individual ewes with their pregnancy scanning and udder assessment information. This can easily be achieved on farm using a variety of strategies ranging from the very simple (i.e. ear notches or coloured tags denoting, dry, single or twin at scanning and 'lambled and lost' at udder assessment) to more complex (i.e. manually recording numbered tags or full RFID).

CONCLUSION

Ewe lifetime selection involves using scanning information to cull low performing ewes and extend the life of high performing ewes in the breeding flock. Used in combination with genetic improvement, NRR of a flock can be increased by 15% in 10 years with an estimated economic effect of +\$12.60 gross margin/ewe.

KEY WORDS

within-flock ewe lifetime selection, Merino ewes, net reproduction rate, fertility, fecundity, lamb survival

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Managing Merinos on Murrayfield

Bruce Michael

The move to un-mulesed merinos is a holistic approach and there are many issues that are intertwined to enable this to happen. It has not cost us money but in fact has been an income earner and has made us better managers.

Murrayfield is situated on Bruny Island south of Hobart. The rainfall is 600mm falling evenly over the year with temperatures varying from 11C ° in winter and 20C ° in the summer.

Soils are mostly Dolerite and Mudstone soils with some sandy areas. The total area of the property is 4100 ha with 1750 arable ha. The business enterprise is based on Merinos plus a group of first cross ewes. The DSE ranges from 18300 in the spring time to 13400 DSE in the autumn, with 5500 ewes mated annually. Murrayfield was purchased in 2001 by the Indigenous Land Corporation for the benefit of the local Indigenous community and we are required to run the business using best business practices.

We decided to cease mulesing on Murrayfield after 2004 not because of the response by PETA (it was a small aspect) but it was the fact that this property was situated in a rapidly growing tourist area and nearly all the paddocks were very close to the main tourist road.

At Murrayfield, we find that there are 3 key aspects in managing un-mulesed sheep

1. Dag control
2. Wool colour
3. Breech wrinkle

Dag control

Dag control on Murrayfield relies on three management strategies

1. Energy management
2. Genetics
3. Pasture species

During August of 2002 and 2005 we lost 5% of the flock due to decreased energy amounts. Murrayfield has much less daylight than the rest of Australia and through winter we feel we are very deficient in energy in our production system due to decreased growing hours. This lack of energy reduces the immunity level of our sheep to fight off worm burdens, and we believe it is our major reason for scouring and dags.

We focus on four management strategies to reduce the impact of this problem.

1. Condition scoring ewes: Based on the Lifetime wool model, we aim to keep all our ewes at CS 2.5 through this winter. It is difficult to keep them above CS 3 due to climatic & economic constraints

2. Grain production: This has the most impact on weaners. Grain production is critical in supplying energy through the winter. Due to grain prices in Tasmania usually \$100 above mainland prices, we decided to grow our own grain. The money saved is used to offset some of the costs of the pasture renovation. As we have more grain available we are able to increase the level of grain the sheep receive.

3. Pregnancy testing: This allows us to better manage the feeding regime for the ewes in the two months from testing to lambing, by splitting up the ewes into their pregnancy status and feeding as required, this saves us money by better targeting of our energy supplies.

4. Pasture improvement: Murrayfield's long term aim is to redevelop pastures along the lines that Evergraze recommends, such as Lucerne, Phalaris, Fescue and Chicory. This in turn will

improve the level of energy in our system. Our first aim is to have enough new pastures to graze our merino weaners on all of these paddocks.

Genetics

Murrayfield started using genetics as a tool only last year as a way to manage unmulesed sheep. We have set the culling parameters as being:

- Ram hoggets anything above dag score 3 is culled
- Ewe hoggets anything above dag score 4 is culled
- In the older sheep we are culling off older ewes above dag score 3

We are flexible in the parameters but felt that it was important to start with the 'bar high'. We have already seen the effect of using these culling pressures in the progeny from the AI rams used in 2007 (Table 1). Of note is that the ram N159 had 2 out of the 30 rams with a dag score of 5.

Table 1

	Ycfw	Yfd	Ysl	Yss	Ywt	Yfat	Yem d	NL W	Yfe c	7%D P	dag score avg	ram hogs %>3
	%	mic	mm		Kg	mm	mm	%	%			
L 154	13.1 1	- 2.3 7	10.9 5	0.5 4	4.8 6	- 0.5 0	-0.42	3.4	- 37.0	155.1	1.65	0
L 009	18.0 2	- 1.5 9	9.07	2.6 8	3.9 1	- 0.8 0	-0.40	-0.3	n/a	148.7	1.97	11
N 159	19.5 4	- 1.6 9	8.35	0.3 3	2.3 5	- 0.4 5	-1.01	-0.7	-2.1	144.5	2.08	15
											1 - 5	

Data from 21/4/09 Merinoselect

The dag scores are on 2007 drop rams at Murrayfield and are not part of Merino select figures

Pasture type:

One of our biggest problems is the late summer/early autumn rain causing rapid growth in cocksfoot pastures. This causes severe scouring in weaners and is usually seen during high risk blow fly weather. We are slowly removing these pastures and putting in other species to reduce this problem.

Wool colour and breech wrinkle

Wool colour and breach wrinkle is determined by breeding. The breeding plan we have had in place since 2002 gave us the right sort of sheep to stop mulesing. Our breeding plan focusing on the following key points;

- Reduction of body wrinkle
- Improvement of wool color
- Improvement of style and length
- Increase in body weight
- Increase in fleece weight
- Maintain micron

Although all our classing has been visual for the top three traits we are now at a point that we need to start measuring the last three traits and this will offer us great potential to lift performance. The process to a much plainer type of sheep has not cost us money. Table 2 demonstrates Murrayfield's progress since 2002.

Table 2

	weaners		adult		
	micron	length mm	micron	length	% colour
2002	17.1	70	21	90	11.4
2003	17.9	75	19.8	90	6.5
2004	17.4	80	20.1	96	7.8
2005	16.9	75	19.5	91	4.8
2006	17.1	72	18.8	85	3.8
2007	17.5	70	18.9	93	3.7
2008	16.9	71	18.4	95	3.6
2009	16.5	69	18.4	96	2.0

From the last sale this selling season the comparative fleece value from 2002 to 2009 is \$29.26 (5.3 kgs) to \$35.56 (4.8kgs). The direction of our breeding can be seen in data from Table 1 when ram L154 has given us much plainer sheep but when all his statistics were put together he had a much better 7%DP index than ram N159 a ram that gave us a lot more body wrinkle and all his rams were culled.

We have found the day to day management of unmulesed sheep to be no different from mulesed sheep. The only management practice we have changed is that the hoggets receive an extra crutching in the spring. We have found that once the sheep pass hogget age they do tend to plain up and are easier to manage especially in regards to dags, the immunity level to worms for these older sheep is much higher and this also helps with dag control.

Worm control is still the same and sheep are drenched based on WEC, not if they are scouring.

Conclusion

Managing the Murrayfield flock was never aimed at allowing us to have unmulesed sheep. It is a result of a complete holistic form of management from information that already exists. As more information becomes available we will have a flock that will be much the better for not being mulesed.

Managing [breach] flystrike in [unmulesed] sheep

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ABSTRACT

In 2008, a decision was made to cease surgical mulesing of all lambs on DAFWA Research Stations. This commitment was to allow detailed information to be gathered about the management of unmulesed sheep under typical paddock conditions around the State. Analysis of the work will assist the development of sound, practical advice to help producers effectively manage flystrike in sheep.

Key field information gathered from running unmulesed 2008-drop sheep on research stations at Wongan Hills, Badgingarra, Beverley, Katanning and Mount Barker is summarised in this paper. The importance of a sound management plan, no description or discussion in the paper??, effective sheep worm control and dag minimisation, selection for less wrinkled sheep and a clear understanding of the different flystrike products are highlighted. No mention in the paper!!

AIMS

This work collected field data about the 2008-drop unmulesed lambs running on Badgingarra, Wongan Hills, Avondale, GSARI (Katanning) and Mount Barker Research Stations. Analysis was aimed at assessing risk factors for breach blowfly strike to assist with the development of sound, practical advice to allow producers to effectively manage flystrike in sheep.

METHOD

A review of the management calendar of each Research Station was undertaken in mid-2008. In particular, shearing and crutching times were noted in relation to the anticipated periods of significant blowfly pressure. Shearing and crutching times are critical in determining appropriate chemical choices for strategic protection against blowfly strike.

Lambs born during 2008 remained unmulesed and were individually identified from marking time onwards. Each animal was assessed at least once for breach wrinkle score and dag score according to the Australian Wool Innovations' Visual Sheep Scores Booklet (Publication GW026; http://www.wool.com.au/Publications/page__2272.aspx). Dag score was preferably assessed during spring 2008 and prior to any crutching. Breach wrinkle score was found easiest to assess within 2 weeks of shearing of the lambs.

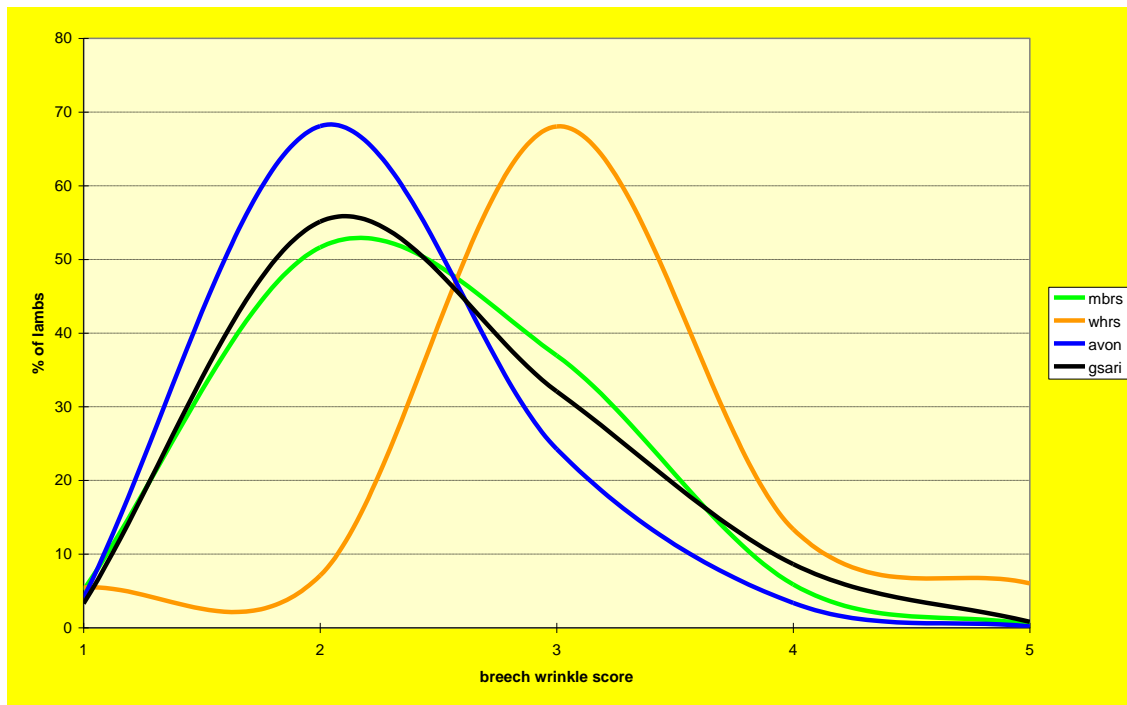
A detailed record of every flystrike detected in unmulesed sheep on each Station included the individual details of the struck animal and the site and size of the strike.

A database was constructed to link individual flystrike information with other recorded traits. The prevalence of breach strike in the cohorts within each mob with different scores of each trait and the relative risk of breach strike in the different dag score categories in lambs at Avondale were calculated.

RESULTS

Breach flystrike, in the unmulesed 2008-drop lamb mobs measured for this work, ranged from 3.5 to 11.4 per cent.

Breach wrinkle score distributions for measured mobs are summarised:



There appeared to be an increased prevalence of breech strike in animals with breech wrinkle scores of 4 or 5 when compared with animals in the same mobs with breech wrinkle scores of 3 or less. In Avondale lambs the prevalence of breech strike in animals with dag score 4 was approximately 13 per cent compared with 7.5 per cent or less in animals with breech wrinkle scores of 3, 2 or 1 ($p = 0.11$). At Badgingarra, lambs with dag score 5 attracted approximately 12 per cent breech strike, compared with less than 7.5 per cent in animals with breech wrinkle scores of 4, 3 or 2 ($p = 0.095$).

Dag score measurements in the 2008-drop unmulesed lambs varied considerably between the different Stations. Lambs at Avondale appeared to be affected more by sheep worms than those at other Stations, presumably due to excessive worm contamination of paddocks by the Avondale ewes during winter and spring 2008. The relative risk of breech strike in unmulesed lambs at Avondale were determined as 2.0, 4.0 and 7.0 respectively for dag score 2, 3 and 4 lambs compared to the risk in lambs with dag score 1.

A sound management plan regarding time of shearing, crutching and chemical applications is important in planning the transition from surgical mulesing. Wool withholding periods and export slaughter intervals should be taken into account.

CONCLUSIONS

Significant levels of breech strike were recorded in unmulesed 2008-drop sheep on each DAFWA Research Station. However, it is important to recognise that blowfly treatments were not applied to these sheep until after intensive monitoring showed reasonable blowfly pressure and therefore some strikes had already occurred.

Data from 2008-drop unmulesed sheep highlighted:

- the importance of effective worm control and avoidance of dags in unmulesed sheep to reduce the risk of breech strike (no mention of possible chemical treatments? Or effectiveness when they were applied?? – did they stop/reduce incidence?)
- and
- the importance of significant wrinkling in the breech area as a risk factor for breech blowfly strike.

It is also important to carefully plan the transition away from surgical mulesing with considerations of the timing of shearing and crutching and an understanding of the purpose, protective periods and

wool and meat withholding periods and export slaughter intervals of the different flystrike products.

No discussion in the paper??

This work is ongoing, with further measurements planned on 2009-drop unmulesed sheep on GSARI, Mount Barker and Esperance Downs Research Stations. Monitoring of unmulesed 2008-drop sheep will also continue on Avondale, GSARI and Mount Barker Research Stations during 2009.

KEY WORDS

Blowfly strike, unmulesed sheep, wrinkle score, dags, worms

ACKNOWLEDGMENTS

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Paper reviewed by: Chris Oldham

Value of Pregnancy Scanning and Differential Feeding of Dry, Single and Twin Ewes.

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Andrew Thompson, DAFWA, South Perth, WA.

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ABSTRACT

Scanning for pregnancy status and litter size provides the opportunity to cull dry ewes and also to differentially feed the dry, single and twin bearing ewes. Culling the dry ewes increases the fertility of the flock and reduces the total feed requirement. Differential feeding of the twin bearing ewes can increase production and survival from these ewes and their progeny.

This paper describes an analysis carried out for the Great Southern region of WA which utilised feed budgeting and the relationships developed in the Lifetimewool project to calculate the impact on wholefarm profit from scanning ewes and adjusting management of dry, single and twin bearing ewes.

The overall profitability of pregnancy scanning is determined predominantly by the proportion of twins in the flock because there is greater variation in the proportion of twin bearing ewes than in the proportion of dry ewes. If the proportion of twin bearing ewes in the mob is less than 20% then the increase in profit will be less than \$2000 for a typical farm running 4500 breeding ewes.

AIMS

This paper presents results of an economic analysis carried out on the value of scanning for pregnancy status and litter size for a spring lambing merino wool flock in the Great Southern region of WA. Identifying dry, single and twin bearing ewes allows the nutrition to be varied for each group. The intake of the dry ewes can be reduced which may allow more ewes to be carried and the intake of the twins can be increased which would lead to higher production from these ewes and their progeny.

The relationships developed in the Lifetimewool project have been used in this analysis to calculate the production of the ewes and the progeny of the single and twin bearing ewes. Feed budgeting allows the impacts on stocking rate and supplementary feeding to be calculated. Then combining the flock productivity and the feed budgeting allows the impacts on wholefarm profit to be examined.

METHOD

The calculations were done using the Great Southern version of the MIDAS model. The features of MIDAS that make it suited to this task are that the model includes the changes in production for single and twin born lambs when the nutrition of the ewes is altered during pregnancy and it also includes a powerful feed budgeting module that optimises animal and pasture management across the farm.

The model represents a 'typical' 1000ha farm in the 500-600mm rainfall zone of the Great Southern in WA. The analysis is based on a self replacing merino wool producing flock lambing in July/Aug, shorn in Jan/Feb and running 4500 ewes. Surplus ewes are sold as hoggets off shears at 1.5 years old. Cast-for-age ewes are sold at 5.5 years. Wethers are sold at 1.5 years of age.

Scanning for pregnancy status was done at mid pregnancy. At this point the management of the dry, single and twin bearing ewes could be differentiated. Three strategies were evaluated for the management of the dry ewes: (i) retain and feed less, (ii) feed less and sell after shearing, (iii) sell immediately. If dry ewes were sold it was assumed that there was a 12.5% reduction in the number of dry ewes subsequently. If ewes were sold immediately it was assumed they received a 25% price premium compared with selling after shearing – to account for the value of the wool on their backs.

RESULTS

Profitability

Optimum management of the dry ewes in a normal season involves identifying the dry ewes and selling at shearing (Figure 1). During the period from scanning to weaning they are offered less feed than the reproducing ewes. The value of identifying and managing the dry ewes increases with an increasing proportion of dries in the flock and the increase is approximately \$5 per extra dry ewe. However, beyond the point that the flock cannot self replace, unless old ewes are retained an extra year, it is more profitable to retain the dries than to sell.

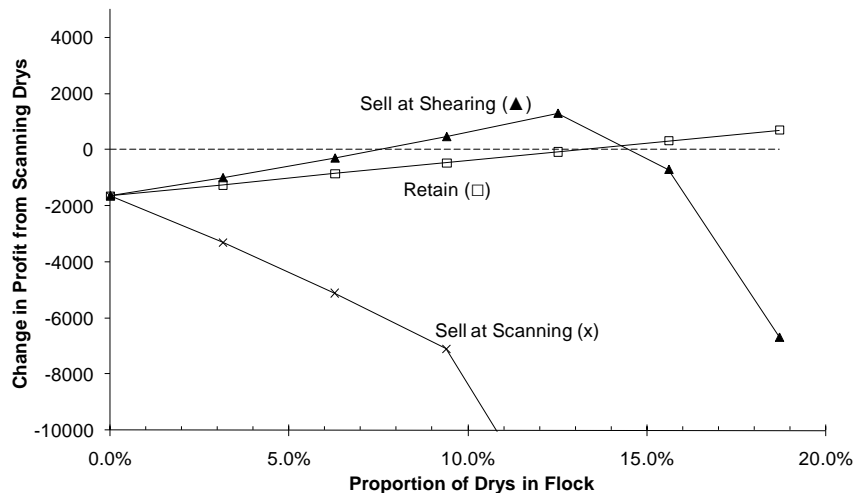


Figure 1: Change in the value of scanning for pregnancy status with variation in the proportion of dry ewes in the flock.

The optimum management of the twins involves preferential treatment post scanning and achieving a higher condition score at lambing. The value of identifying and managing the twin bearing ewes increases with an increasing number of twins in the flock (Figure 2). The increase is approximately \$3.50 per extra twin ewe which is less than the increase from extra dry ewes (\$5/dry ewe), however, the potential number of twin bearing ewes is much greater.

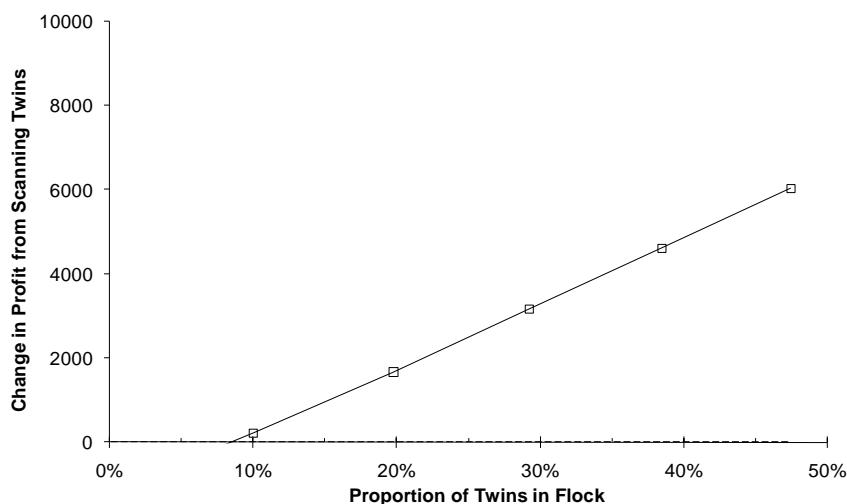


Figure 2: Change in the value of scanning for litter size with variation in the proportion of twin bearing ewes in the flock.

Optimum CS profiles for ewes

The optimum condition score profiles for the dry, single and twin bearing ewes are an extension of the profiles developed in the LifetimeWool project. The optimum profile is to join in condition score 3, and then allow slow weight loss through to mid pregnancy. The targets in late pregnancy vary depending on the pregnancy status.

1. Dries: Maintenance or slow weight loss. The limit on the level of weight loss depends on the supply of feed during spring and early summer to achieve weight gain for joining or selling.

2. Singles: Regain lost condition so they lamb at the same or better condition than at joining.
3. Twins: Gain extra condition. The aim is for the twin bearing ewes to be 0.3 CS greater than the single bearing ewes. Feeding the twin bearing ewes is the priority in late pregnancy and an extra 0.3 CS on the twin bearing ewes at lambing returns about \$2/ewe more than the same condition on a single bearing ewe.

Impact of seasonal conditions

The profitability of scanning to identify pregnancy status is higher in poor years (Fig 3) because the value of redirecting feed from dry ewes to reproducing ewes is higher.

Also, the optimum management for the dry ewes varies with the type of season. With a poor season (70% pasture growth) selling at scanning is equally profitable to retaining ewes, if the pasture growth is lower than this then selling at scanning would be the most profitable management option.

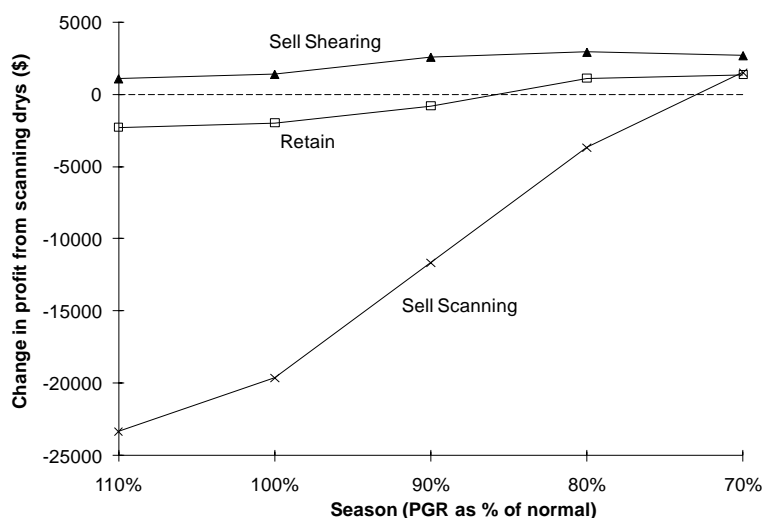


Figure 3: Change in the value of scanning for pregnancy status with variation in seasonal conditions and pasture growth.

CONCLUSION

The profitability of scanning for pregnancy status and litter size depends on the proportion of dry ewes and twins in the flock. The overall profitability is determined predominantly by the proportion of twins in the flock because there is a greater variation in the proportion of twin bearing ewes than in the proportion of dry ewes. If the proportion of twin bearing ewes in the mob is less than 20% then the increase in profit will be less than \$2000 for a farm running 4500 breeding ewes.

When twin bearing ewes have been identified they are the priority mob for better nutrition in late pregnancy and the target is to achieve a condition score 0.3 higher than the single bearing ewes at lambing.

The return from identifying and managing the dry ewes in a flock is greater in mobs with a high proportion of dry ewes such as the maiden ewes. The benefits are greater in poor seasons when the value of the feed saved by reducing the nutrition to the dry ewes is greater. Retaining the dry ewes to shearing and then selling is the most profitable strategy unless the season is very poor in which case selling at scanning can be more profitable.

KEY WORDS

Pregnancy scanning, MIDAS, Profitability

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