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Sheep Updates 2005 - Part 5

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CRYSTAL SPRING – CRYSTAL CLEAR AND CONSISTENT

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ABSTRACT

The following paper discusses the development and results to date of New South Wales latest prime lamb alliance. The *Crystal Spring* branded lamb alliance, established in August 2003, differs from many previous producer based alliances due to the program being initiated from a retail/wholesale base. The program has been a phenomenal success with producers receiving 53c/kg more (\$11.40) than saleyard carcase returns and comprehensive slaughter (percentages in specification, health issues etc) feedback. Retail consumer feedback has been positive although subjectively based. Despite recent difficulties faced by all parties the *Crystal Spring* branded lamb alliance continues to operate.

AIMS

In simple terms an alliance is an agreement between two parties to achieve common objectives. Price is not the only driver of the relationship, instead consumer requirements come first and the alliance works towards meeting their needs (Thatcher 1995). In addition product differentiation has been identified as being instrumental in achieving success in the market place (Carson 1995).

The use of strategic alliances by the red meat industry can improve the competitiveness of participants and the industry as a whole. If a retailer can demonstrate that their product comes from members of an alliance, and that all members of the alliance follow sound food safety precautions, this provides the retailer with a competitive advantage over others who cannot trace the origin of their products (Hayes et al 1997).

In New South Wales, over-the-hooks marketing had increased to 40% of sales in 2001 (ABARE 2001) but recent droughts have affected marketing decisions, reduced carcase weight specifications and tested loyalty of alliance members to their processor (McIntyre et al 2004). With such in mind and the continued success with a MSA grain-finished branded (*Riverina Blue*) beef line A.J Bush and Son's initiated the development of the *Crystal Spring* branded lamb alliance. Their primary aim has been the development a sustainable, consistent supply of quality assured lamb able to be differentially marketed against competitors generic lamb products within Sydney based retail outlets. Alliance member loyalty has been rewarded through premiums for QA assured product.

METHOD

A.J Bush and Sons are a vertically integrated family owned company. They own and operate processing, rendering (2), wholesaling, smallgoods and retail (36) outlets at Yanco and Sydney (NSW) and in Beaudesert (Qld).

Following discussions initiated by A.J Bush and Sons with members of the NSW DPI Lamb Alliance Development team in August 2003, a prime lamb supply relationship was set up with J.J Dresser and Co of Woodstock, NSW. The arrangement was for the weekly consignment of prime lambs from cooperating Cowra based producers starting in October 2003.

Lambs were supplied on a grid based contractual agreement with a guaranteed 10% premium offered above Wagga Wagga saleyard lamb returns for 18-22kg, 2 and 3 score carcasses. Base grid prices are negotiated on a weekly to fortnightly base. Penalties vary between 40c/kg to \$1.25/kg depending on weight and fat measurements. Transport costs from Cowra are covered by A.J Bush and Son. A skin handling fee (\$1.50/skin) is charged to cooperating producers.

Quality Assured protocols covering on-farm production, transport and slaughter protocols were developed between the alliance members. Feedback related to carcase weight, fat score, conformational issues as well as management related and offal health issues are provided to cooperating producers and agents post-slaughter.

RESULTS

From an initial agreement of 120 lambs weekly the alliance has expanded to now kill 240 lambs on a weekly basis with an expanded grid (18-24kg, 2 and 3 score). To February 10, 2005 27 producers had consigned 12929 lambs averaging 21.5kg (HSCW) and 12.2mm (GR) respectively. Base and actual grid premium averages of 444c/kg and 437c/kg respectively have been received. These represent premiums of 60 and 53c/kg respectively above Wagga saleyard price for similar lambs or a 16% (base grid price) and 13.5% (actual) price advantage, well above the agreed 10% premium set by A.J Bush and Son during alliance development negotiations.

Percentages in specifications have averaged 92% (range 55-100%) with an average carcase value of \$93.08 or \$11.40 more per lamb consigned. This equates to an additional \$5,662 per producer involved and an extra \$7,644 or 59c/head in commission for cooperating agents.

Feedback has been instrumental in the adoption and development of improved on-farm management practices and in an improvement in consignments meeting grid specifications.

Cooperating A.J Bush and Son retail outlets (7) were surveyed in February 2004 and May 2005. Management are extremely positive and supportive of the *Crystal Spring* alliance program with participating stores all receiving positive consumer feedback and price premiums of between 17 to 39% for the branded lamb products over generic lamb competitors. Selected A.J Bush retail outlets are located within large shopping complexes, competing against independent retailers and major supermarket chains. Sales and shelf space allocated to the branded lamb product have increased during the program.

CONCLUSION

To date the *Crystal Spring* alliance has been a resounding success with all involved consistently acknowledging the benefits of the branded lamb program. A.J Bush and Son are likely to expand retail outlet involvement in the near future.

However the current absence of fat score, offal and health issue feedback, an increase in 4 score carcases received by retailers within the past 3 months and the lack of promotional in-store material may impact on the future development of the *Crystal Spring* alliance.

KEY WORDS

Vertically integrated, quality assurance, lamb alliance

ACKNOWLEDGMENTS

Sincere thanks all members of the Prime Lamb Development team, cooperating producers, agents, Ivan Bush and staff at A.J Bush and Sons Yanco for their continued commitment to the production of a quality assured branded lamb product

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An Overview of Recent Developments in Dark and Medullated Fibre Testing

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ABSTRACT

Recent improvements and continuing developments are ensuring that the Australian Wool Industry has a reliable, effective presale test for Dark and Medullated Fibre contamination.

INTRODUCTION

Recent developments in Dark and Medullated Fibre (DMF) testing are part of an Australian Wool Industry initiative to remove, or at least reduce, uncertainty about the cleanliness of sale lots of Australian Merino wool. This uncertainty has risen in recent years following the introduction of specialist meat breeds and the crossbreeding of these breeds with Merinos. These specialist meat sheep, e.g. Damara, shed fibres that can be dark or medullated, or both dark and medullated.

AIMS

The aim of the recently developed DMF test is to support the Australian Wool Industry initiative through the provision of a relatively cheap, reliable testing service, whose results have a credible relationship to expected performance in subsequent processing.

METHOD

There are currently 4 projects aimed at improving DMF testing of Australian Merino wool. These are:

1. Development of an automatic DMF testing system;
2. Determination of an appropriate threshold for detection of a medullated fibre as a contaminant;
3. Monitoring DMF levels of 1% of sale lots from the Australian wool clip for the 2003/04 season; and,
4. Determination of the relationship between DMF results in presale testing and testing of wool top.

These projects are being undertaken by AWTa Ltd and CSIRO, Textile and Fibre Technology with funding from Australian Wool Innovation.

RESULTS

It is expected that, by the time of the Sheep Updates Conference in mid-July, projects 1, 2 and 3 maybe completed. However, substantial results are also currently available.

Automatic DMF Detection

The sample preparation, presentation and image capture elements of the system have been finalised by CSIRO and AWTa Ltd staff, and the prototype instrument has demonstrated¹ that both dark and medullated fibres can be detected on a limited number of samples. The prototype is about to move to the commercial laboratory for validation trials.

Medullation Threshold

Over 7,000 medullated fibres have been added to a small quantity (10kg) of wool top for processing into yarn and fabric. The medullated fibres were selected to include a large range of both fibre diameters (40µm – 200µm) and Med Ratios (MR's) (0.20 – >0.95). Approximately 15% of the medullated fibres had MR's > 0.60 and approximately 5% were flat fibres. Note that MR is defined as:

¹ D. Ramsay, CSIRO, TFT, personal communication.

$$MR = (\text{Medulla Diameter}) / (\text{Fibre Diameter})$$

Knitted and woven fabrics have been constructed and dyed into 3 shades that are known to highlight problems of medullated fibre contamination. Fabrics have been inspected at a commercial wool textile company and the results to date for 24 extracted contaminant fibres are summarised in Table 1.

Table 1.

Description of contaminant	Fibre Diameter (µm)	Med Ratio
Clearly Objectionable (12)	75	0.9
Marginally objectionable (12)	50	0.8

Monitoring of Sale Lots

A summary of the results of DMF monitoring by Clip Line, from July1, 2004 until April 30, 2005 is shown in Table 2.

Table 2

Clip Line	No of Samples	Dark Fibres/10g	Medullated Fibres/10g
Merino: Fleece	2568	1	5
Lambs	204	6	113
Pieces	323	7	24
Crutchings	41	89	22
Bellies	103	2	12
Stains	26	222	61
All Crossbred	434	8	200

These results indicate that the DMF test is detecting contamination with the expected relativities between clip lines.

CONCLUSION

Each of the 3 projects discussed is contributing to an improvement in DMF Testing of Australian Merino wool. The results of the 1% monitoring in particular confirm that the recently introduced DMF test is producing expected results for dark fibre contamination, and expected relative results for medullated fibre contamination. The absolute levels of medullated fibre contamination appear higher than expected based on the commercial performance of Merino wool textiles. The medullation threshold project will provide an objective basis to set the appropriate contamination threshold.

KEY WORDS

Dark, Medullated Fibre, Contamination

ACKNOWLEDGMENTS

The authors gratefully acknowledge the support of AWI in providing funds for the projects discussed in this paper. The innovative approach, flexibility and professional development skills of CSIRO, TFT staff have been critical to the success of the automated detection and medullation projects.

Opportunities and Implications for Wool Producers of the TEAM3 Prediction Equations

J. H. Stanton^{1,2} and K. M. S. Curtis¹,¹DAWA, ²Curtin University, WA

ABSTRACT

The TEAM3 prediction system uses additional raw wool attributes, and different coefficients to those used by TEAM2. This paper looks at possible opportunities for wool producers arising from the adoption of TEAM3 in the selection of Australian sale lots for a standard processing consignment.

AIMS

Wool processors can use the TEAM (Trials Evaluation Additional Measurements) equations to predict the processing performance of Australian greasy wool. TEAM3 equations have been developed by AWTA to better reflect current commercial processing (1). From 1 July, 2006, the TEAM3 equations will replace TEAM2 in the IWTO regulations and on AWTA certificates, and so form the basis of trade.

METHOD

In line with commercial practice, TEAM2 and TEAM3 equations with FD of range 21 \pm 0.5 μ m were applied to all additionally measured Australian sale lots in the 2003/2004 selling season. Sale lots were selected with a predicted H within 2 mm of the target of 65 mm for TEAM2 and 70 mm for TEAM3. The lower target for TEAM2 reflects under prediction relative to current industry performance arising from improvements in technology and practices (1).

RESULTS

It can be observed that different sets of lots would be chosen to deliver 70 mm hauteur tops using TEAM2 (+ 5 mm) and TEAM3 (Figure 1). The intersection of the two sets, set B (47% of all lots), represents the lots that would be chosen by both systems. The sale lots in set B gave an average TEAM2 H of 65.5 mm (standard deviation of 7.8) and a TEAM3 H of 72.7 (SD = 7.6).

Subset D has lower staple length (SL) and lower staple strength (SS) than set B. This is significant because under TEAM2, these attributes can be traded against one another. Figure 2 plots the SL against SS for the lots in both subsets B and D. This figure clearly identifies the lower SL/lower SS lots, a set referred to as D1. The decreased percent mid breaks (MID) and lower SL are the greatest differences between the raw wool measurements in D1 and B. This partly comes about because of the change in TEAM3 to using MID in place of MID*, where MID* was limited to a minimum of 45. With TEAM3, each 10 unit reduction in MID below 45 adds 1.5 mm to the predicted H, and thus the 30 units difference between subset D and subset D1 adds 4.5 mm to TEAM3 H. A further benefit is seen in the reduction in TEAM3 CVH from a marginal 46% in subset D to an acceptable 39% in D1.

Figure 1 Selection of sale lots for 21 μ m, 70mm using TEAM2 + 5mm and TEAM3 hauteur predictions.

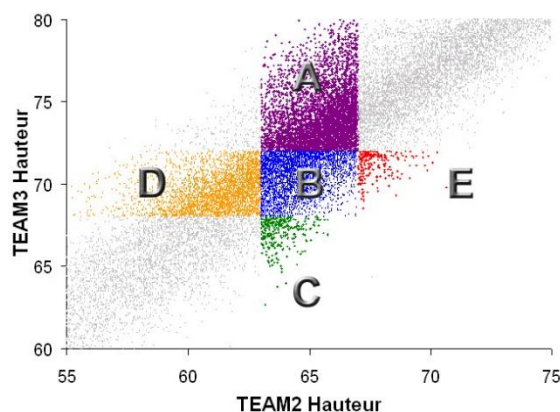


Figure 2 Staple length and strength for subsets D and B, and showing subset D1 below the diagonal line.

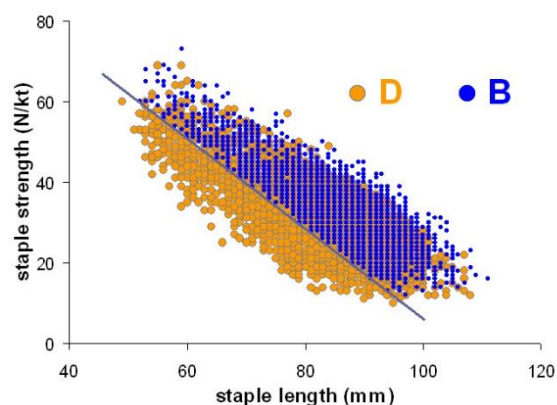


Table 1. Statistics for subsets of sale lots created when using TEAM2 (A,B,C) and TEAM3 (D, B, E) hauteur predictions on 21 μ m sale lots. The subsets are illustrated in Figure 1 (A, B, C, D, E) and Figure 2 (B, D1). Statistics for all sale lots in Figure 1 are given in the column headed “All lots”.

			TEAM2 selection		TEAM2 and TEAM3	TEAM3 selection		
All lots			A	C	B	D	D1	E
number of lots	N	45498	5230	293	3632	3812	975	229
clean weight	tonnes	40096	4981	191	3088	3133	752	176
fibre diameter (FD)	μ m	21.0	21.0	20.9	20.9	21.0	21.0	20.9
CV (FD)	%	22.3	22.2	23.8	23.0	22.5	23.3	23.6
yield	%	64.4	66.0	59.4	64.2	64.8	63.6	62.3
Vegetable matter	%	1.8	1.2	2.7	1.5	1.3	1.2	1.9
Percent mid breaks	%	53	49	56	59	58	28	53
staple length (SL)	mm	87	87	82	86	82	74	90
CV (SL)	%	16.3	14.3	24.0	17.6	15.1	15.5	22.5
staple strength	Nkt	33.6	32.8	35.7	33.7	31.2	30.3	34.0
TEAM2 H	mm	65	66	64	65	61	60	68
TEAM2 CVH	%	50	51	49	51	52	48	50
TEAM3 hauteur	mm	73	74	67	71	70	70	71
TEAM3 CVH	%	46	45	47	47	46	39	49
clean price paid	c/kg clean	826	856	784	838	828	806	826

DISCUSSION

The two prediction systems do not select the same lots for the contract specification used in this paper. While many trade offs are possible between raw wool characteristics, the sale lots selected by TEAM3 and not by TEAM2 (subset D in the paper) have lower SL and CV(SL). There is also evidence presented (subset D1) that low MID in this group can result in sale lots being used at levels of SL and SS lower than any used by TEAM2, in part due to the removal of the 45% minimum for MID.

For wool producers, the adoption of TEAM3 needs to be monitored closely. It will introduce additional raw wool characteristics that can be managed, and so increase the number of options to consider when preparing wool for the auction system. The selection by TEAM3 of sale lots with lower staple length, CVSL and MID will provide new opportunities for some production systems.

KEY WORDS

Hauteur, wool processing prediction, raw wool measurement, wool production

ACKNOWLEDGMENTS

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Paper reviewed by: Melanie Dowling

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Premiums and Discounts for Fibre Properties in Superfine Wool, Now and in the Future?

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ABSTRACT

Finer diameter wool will continue to attract a premium because fineness is the major determinant of achievable softness, lightness and comfort in garments and because it sets limits on processing performance particularly during spinning. However, wool producers need to be aware that they will not automatically get large premiums just by going finer. The highest premiums are only being paid when diameter is finer, staple strength (SS) is higher, curvature is higher, diameter distribution (CVD) is lower, and staple length (SL) is moderate. Because the processing and product advantages of lower CVD are similar to finer diameter, this premium is likely to become established while the separate premium for SS may lessen. The discount for long SL is now moderate and may disappear while the premium for high curvature (crimp frequency) should weaken.

AIMS

Wool producers have responded to higher prices for fine wool by fining their clip. The aim of this paper has been to extract an understanding of the causes and extent of variations in price in superfine wool due to fibre properties which may be useful in guiding breeding and management strategies.

METHOD

The price of raw wool varies over short time periods as a function of supply and demand, and over long periods as a function of fabric attributes demanded by the customer. Price premiums are strongly dependent on mean diameter because it is the major determinant of achievable softness, lightness and comfort and because it sets limits on processing particularly during spinning. The price of superfine Merino fleece wool over the last five years has been examined and compared with research results on processing and product performance as a function of fibre properties. Sale lot information, which included core test results and staple measurements from AWTA, for each lot sold at Australian auctions was examined. Results are presented for 17 μ m sale lots (16.5 to 17.4 μ m) as indicative of superfine wool.

RESULTS

Premiums for SS and CVD were jointly examined by binning lots according to CVD (2 % units wide) and SS (5 N/ktex wide). The results are shown in Figure 1 for the January to May, 2005. (Mean prices are only shown where there were at least 4 sale lots in that bin.)

Fig. 1 The price of superfine wool rises with SS and is steepest at low CVD.

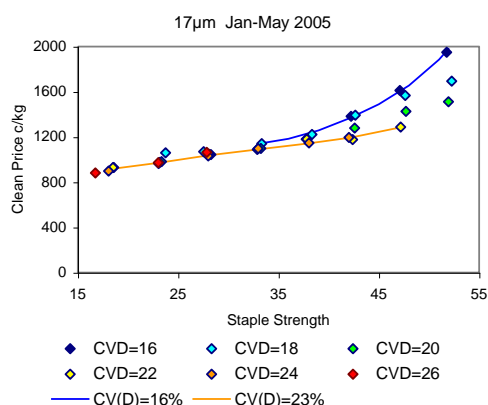
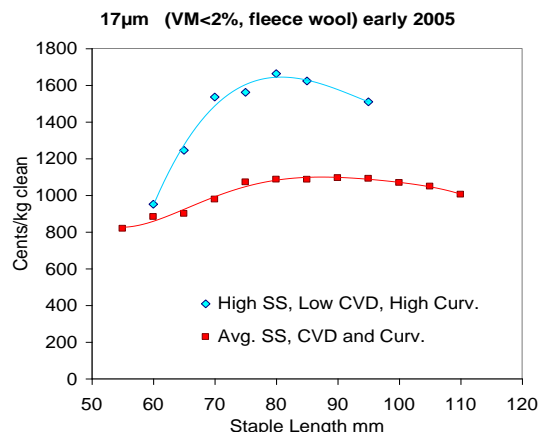


Fig. 2 The price for superfine wool turns down at high SL particularly for "premium" wool.



There is a curvilinear increase in price with both SS and CVD (Figure 1). The premium for high SS occurs predominantly at low CVD and vice-versa. The price as a function of SL (Figure 2) for average

and "premium" fibre properties shows that longer staple length is penalised. These and similar analyses consistently show that large premiums are predominantly confined to superfine wool of high SS, low CVD, high curvature and moderate SL.

DISCUSSION

As recently summarised (1), processing research has shown that finer wool gives superior yarn, spinning, weaving and fabric performance. A continuing trend for customers to prefer lighter and softer fabrics has driven the demand for, and production of finer wool (2). Premiums for fine wool will persist in the long term despite short term fluctuations in supply impacting on the size of the premium.

Processing research (1) has also shown that a 5 unit reduction in CVD gives the same change in performance and fabric properties as a 1µm decrease in mean diameter, plus it gives a longer top. Over time the CVD premium can be expected to mimic that for diameter.

Longer SL gives less waste and longer fibre length in top, which gives better spinning. Lower curvature, which equates to lower crimp frequency, consistently gives as good or better spinning performance and less waste (noil). If processing is not adjusted then higher curvature gives more bulk, less pilling and stiffer fabrics but these are predominantly an indirect effect of different fibre relaxation giving heavier fabrics. Thus there is the strange situation that the market pays a premium for two properties that are not advantageous for processing and work against increased on-farm productivity because selection on heavier fleece weight or faster growing wool is a selection on longer SL and lower crimp frequency (3). Comparison with prices from earlier periods show that the premiums for high curvature and penalty on long SL have both decreased and are now only markedly present in conjunction with high SS and low CVD in superfine wool. These dependencies should continue to decline.

Recent studies (1,4) have discovered that when CVD is low (little along-fibre diameter variation) then SS has only a small effect in processing. The SS premium appears to be, in part, due to restrictions placed on length distribution (CVH) in tops. Some mills (5) are already gaining commercial advantage by relaxing limits on CVH and opening up specifications to include longer SL in combination with lower SS.

KEY WORDS

Merino superfine wool, price premiums and discounts, fibre properties, future prices

ACKNOWLEDGMENTS

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Paper reviewed by: Dr John Stanton

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Manure in sheep feedlots: problem or opportunity?

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ABSTRACT

Nutrient from manure build up in feedlots unless they are regularly cleaned out. Nitrogen and phosphate levels are of particular concern to contamination of groundwater and waterbodies. Nutrient levels, in soils collected from four sheep feedlots, were analysed for total nitrogen and phosphorous. Groundwater was also tested at two sites. Elevated levels of N and P were found in the topsoils of all sites and the groundwater at the two sites which had bores. Three of the four sites were saturated with P. Leaching through preferred pathways such as old root channels appears significant. Options for managing nutrient build up in a feedlot include site selection and preparation, removal and spreading of manure, changing the ration mix and intensive cropping.

INTRODUCTION

Intensive livestock production, whether in a feedlot or droughtlot, has the potential to cause a range of problems including groundwater contamination and run off, odour and dust, greenhouse gas emissions, increase in fly populations and spread of disease. Without intervention, nutrients, salts and pathogens in livestock waste accumulate and may leach into groundwater, run off into waterways or be lost in gaseous form.

AIMS

The aim of this preliminary research was to investigate nutrient levels in four sheep feedlots in dryland Western Australia to gain an insight into the pollution potential of sheep waste.

METHOD

Four feedlots were selected based on different soil types and time in operation. Soil samples were taken at depths of 0-10 cm, 10 – 20 cm, 20 – 50 cm and 50 – 100cm inside the pens (the manure layer was removed before sampling) and from surrounding paddocks and nearby bush. Samples were analysed to establish baseline levels for total N, total P, EC, pH, organic carbon and Phosphorus Retention Index (PRI). Soil cores at 2 sites were examined for macropores, and samples from within macropores and from the surrounding soil matrix were also analysed. Monitoring bores were installed at two of the feedlot sites and groundwater was sampled and analysed in October.

RESULTS

In half the macropores (old root channels and soil fissures) sampled, nutrient levels were commonly around twice the level measured in the soil matrix.

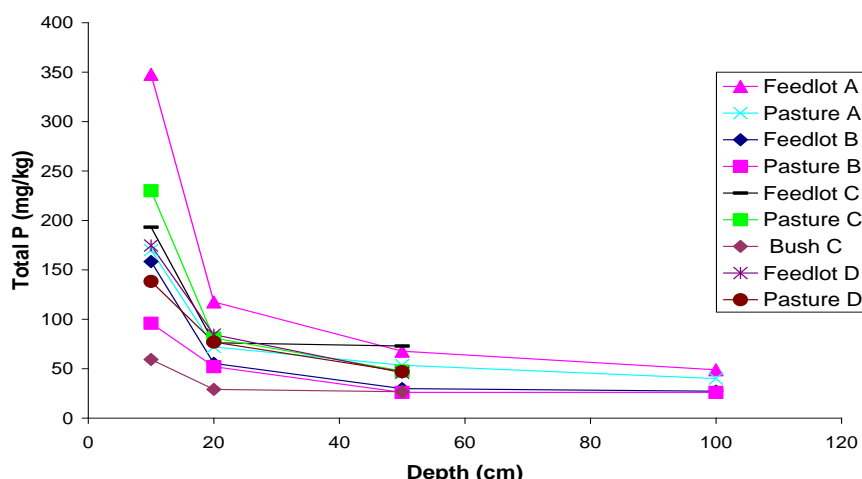
Total N and P

Total N and P profiles were similar for all four replicates. Feedlot A had the highest values for both total N and P, followed by C, D and B. The highest total N and P levels were recorded within Feedlot A, C and D in areas where manure had accumulated from deposition through runoff or where the sheep appeared to spend most of their time. Surprisingly, at Feedlot C average values of both total N and total P were higher in the paddock than the feedlot sites, though individual feedlot sites had higher levels. At Feedlot D, average nutrient levels of paddock sites were similar to those in the feedlot, though again the highest values were recorded within the feedlot. Figure 1 shows Total P for all sites.

Phosphorus Retention Index

The Phosphorus Retention Index (PRI) for all sites indicated the capacity for P retention of surface soils was low to moderate. Feedlot surface samples with the highest total P values had negative PRIs suggesting that P sorption was minimal at feedlots B, C and D. Below 10 cm PRI was constant or increasing at all sites. PRI values below 20 cm indicated large capacity to retain phosphorous.

Figure 1: Average total P for all feedlots and paddock samples



Groundwater

Total N and P exceeded NHMRC standards for drinking water and trigger levels for irrigation water.

CONCLUSION

At all sites, nutrient levels were highest in the areas where the lambs spent most of their time or where manure accumulated in runoff. The lowest average nutrient levels were in feedlot B on a relatively permeable deep sandy duplex soil. Manure from this feedlot had been cleaned out in early autumn, prior to a 60 mm rainfall event which would have reduced the nutrients available to be leached. In all but feedlot A (which had a very high PRI), phosphate sorption limits have been reached and phosphate from manure is probably being lost from the sites. At feedlots C and D there was no significant difference in nutrient levels between the paddock controls and feedlot sites. This is possibly because the paddock sites were under fairly high stocking rates, one being used as a holding pen (e.g. at shearing time, etc.), the other a sheep camp close to self feeders and lambs in the feedlot.

The groundwater analysis at two of the sites revealed high levels of nitrogen and phosphorus in water, suggesting that nutrients are being leached into the groundwater. Elevated nutrient levels in macropores suggest that nutrient leaching occurs primarily through these preferred flow pathways.

The levels of nutrients in the groundwater and the saturation of topsoils with phosphorous demonstrates that, even when used for a few months of the year for three to five years, nutrients will build up in a feedlot and potentially cause problems. Manure from sheep feedlots is a potentially valuable agricultural resource. Nutrients from livestock waste can be better utilised and have less pollution potential through;

- Better site selection and preparation. Choose a slope of 3 to 5% to minimise run off. Avoid permeable soils, exposed bed rock and shallow soils particularly where overlying fractured rock. Keep a safe separation distance between the feedlot and waterways (a minimum of 50 metres from intermittent streams) and use grasses or crops as a vegetative filter strip to use nutrients in run off. For long term use, pen surfaces can be made more impermeable by using compacted gravel or impermeable subsurface clays.
- Cleaning out the pens to reduce the levels of nutrients available to become a problem. Manure can be applied to other land (using a super spreader or multispreader), or value added for compost or horticultural use.
- Where small paddocks and self feeders are used, rotate pens and intensively crop these areas to use up nutrients stored in the soil.

KEY WORDS

Pollution, nutrient levels, soil and groundwater analysis, fly populations, manure management, feedlots, sheep

Paper reviewed by: **David Bicknell**

The State of Lamb Confinement Feeding in WA

Ned Crossley, Department of Agriculture, Western Australia

ABSTRACT

A Confinement Feeding System (CFS) is “a feeding program in a confined area in which all or most of the feed and water are supplied to sheep...” (MLA 2005) In 2002, the adoption of CFS for lamb finishing had been far greater in WA than in other states (19% compared to 3% nationally) (1). Increasingly, CFS is becoming best practice for finishing and faster turn off of lambs throughout the year, but is used also for deferring grazing - allowing more ewes to be carried; for maintaining breeding stock and preventing soil erosion in susceptible paddocks during drought.

ABARE and DAWA commissioned surveys to estimate the size of the confinement feeding sector and identify issues, needs and developing trends. Results show that the number of CFS in WA doubled from 2000 to 2003 and doubled again in 2003-04. Producers, livestock agents and processors recognised similar issues in three key areas influencing the viability of CFS. The key areas were (a) economics of CFS, (b) nutrition, health and welfare and (c) management and confirmed other research (2) that showed time in feedlot, feed conversion rates and cost of feed and store lambs to be key drivers of profitability. Other important areas of concern to respondents included the effect of limited abattoir capacity on competition (and price), choosing suitable lambs to finish and producer education. Improvements in all these areas are critical to the long term viability of the lamb confinement feeding sector.

AIMS

The aim of this study was to estimate the number of CFS operating across the country and in WA respectively and the numbers of lambs fed in CFS in WA. It also aimed to identify issues and problems restricting the viability of the confinement feeding sector.

METHOD

Surveys were undertaken by ABARE (January 2005) and DAWA (Autumn 2005) to collect data to quantify the recent growth in CFS and scope the issues and problems experienced within the sector.

The DAWA survey was circulated by fax to livestock agents and via them to their clients. Processors were interviewed by telephone. Questions were confined to determining lamb numbers and issues and problems with confinement feeding of lambs as this is the most common application for CFS in WA.

RESULTS

While neither survey had a large enough sample size from which to derive reliable statistics, they do indicate the relative significance of confinement feeding and the issues affecting the sector's viability.

Numbers of sheep CFS

The ABARE survey is yet to be statistically validated, however raw data show 22 (19%) of 119 WA producers in this survey were operating sheep feedlots, all for the purpose of finishing sheep for sale. The DAWA survey indicated that, of the 28 agents who provided these details, 14% of their sheep clients operated CFS for finishing lambs. Agents reported a rapid increase in the adoption of CFS; almost doubling between 2000 and 2003 and doubling again in 2003 - 04. Agents suggest that interest in CFS is still growing.

Numbers of Lambs finished in CFS

Neither survey enabled a reliable estimate of the number or percentage of lambs finished in feedlots however respondents to the ABARE survey finished on average 1200 sheep, the median value was 700. Sheep were commonly confined for 60 days. Thirty eight agents (half of those surveyed) in the DAWA survey sold 400,000 lambs and, processors estimates indicate that about 860,000 of 2.3M (37%) lambs slaughtered in 2004 were been finished in CFS between December 2003 and August 2004.

Issues and problems in CFS

Similar issues and problems were identified by producers, livestock agents and processors, though they naturally had different significance (rated by number of responses raising the issue) for the different groups. A summary of the responses is contained in Table 1.

Table 1. Major Issues and Problems affecting viability of the lamb confinement finishing sector.

Issue or problem	Producers Agents Processors		
	(n=26)	(n=42)	(n=11)
Economics of CFS (profitability, forward contracts, specialisation, ie breeders feeders and finishers)	H	H	M
Nutrition, health and welfare (Including backgrounding, ration formulation and water)	H	H	H
Diligent management of finishing system (Inc market awareness) and farm integration	H	H	H
Market issues (inc. abattoir capacity and lack of competition by processors, continuity of supply)	L	H	M
Site selection, design and management (environmental issues; waste nutrients, mob size:pen size)	M	M	-
Climate and environmental conditions (restrictions on growth rates, carcase contamination)	-	M	L
Lamb selection (genetics, reliable source)	M	M	L
Information and advice (market awareness, stock management, nutrition)	L	M	L
Quality assurance (including contamination)	-	L	M
Other external issues (inc Animal liberation)	M	M	M

(H= High, M= Medium, L = Low)

CONCLUSION

Trends

Adoption of CFS for finishing lambs appears certain to continue in order to meet market specifications and quality standards. Economics, nutrition and management are commonly recognised issues by all groups. However improvements in management, nutrition, lamb selection and genetics will reduce finishing times and improve economics of CFS. Effective extension will help improve understanding in these and related areas. Developing specialised roles (breeders, backgrounders and finishers) suited to environment, type of lamb and scale of production could also improve profitability for producers.

Strong alliances have developed between a number of processors and the suppliers, resulting in improvements in QA and continuity of supply. Greater availability of forward contracts would improve producer confidence of a profitable return and help them plan effective confinement feeding programs.

Objective measurement is becoming increasingly important for selecting lambs for entry to feedlots and dispatch to abattoirs. The use of precision can reduce costs by ensuring that lambs are of a sufficient weight and condition to finish and meet weight and grade at the abattoir. There is a general expectation that in time CFS will be the required method of finishing lambs.

KEY WORDS

Confinement feeding system, lambs, industry, survey

ACKNOWLEDGMENTS

Jane Speijers (DAWA) and Neil Bingham (ABARE) for help with questionnaires and to respondents.

Paper reviewed by: Kimbal Curtis

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Finishing lambs in a feed lot – Is it profitable?

Lucy Anderton, Regional Economist, Albany, DAWA

KEY FINDINGS

Reasonable sheep meat prices and increased demand for heavy weight lambs (22-24 kg dwt) have contributed to the increased interest in finishing lambs in a feed lot, but is it worth doing? The factors affecting profit are:

- The number of days spent in the feed lot, which is related to the initial weight of animal on entering the feedlot and the growth rate of the animal,
- Price of feed
- Feed efficiency (related in a way to first dot point)
- The difference in price between store sheep and finished lambs.

AIM

To identify if any profit is made by finishing lambs on a feed lot.

METHOD

A cost per head to finish a lamb in a feed lot was calculated by assuming the animals' intake of grain/pellets is 3.5% of average body weight and a 1% intake of hay. Other costs included are stated in table 1. No sales commission is included as it is assumed the animals are sold directly to an abattoir.

Table 1: Other costs included

Operation	Cost
Shearing \$/hd	4
Drenching \$/hd	0.6
Vaccine \$/hd	0.2
Labour @ 1.5 hours/day	30
Freight \$/tonne	40
Freight \$/hd	1.2

RESULTS

Figure 1 shows the cost per head of finishing crossbred lambs in a feedlot at a growth rate of 300 g/hd/day, feeding pellets at \$260/tonne. It clearly demonstrates the inverse relationship between the initial weight of the animal in the feed lot and the cost of per head to finish. The higher the initial weight the less time it takes to finish and therefore a lower cost. For example, the animal is put into the feedlot at 48 kg live weight it will take 13 days at a cost of \$15.60/hd to achieve the target weight of 52 kg/hd live weight which is 22.9 kg dressed at 44%.

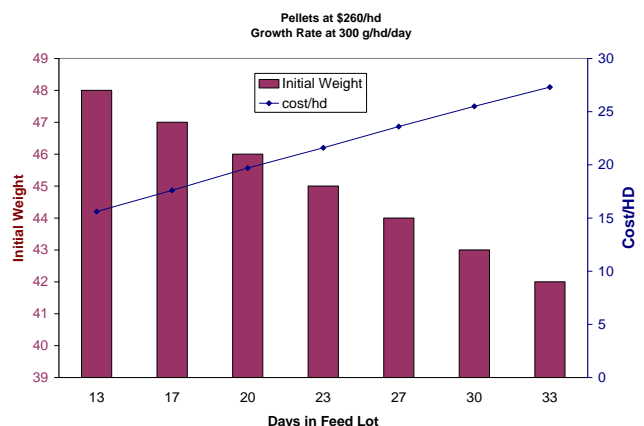


Figure 1: Costs per head of crossbred lambs in feedlot

If growth rates are lower than 300 g/hd/day then the animals spend more time in the feed lot which will increase costs, likewise if the ration is less expensive than \$260/tonne this will reduce costs per head, assuming it is of the same quality and does not compromise growth rate

Table 2: Calculated margin at different start weights for a finished 52 kg live wt (23 kg dwt) lamb growing at 300 g/hd/day with the cost of ration at \$260/tonne.

Initial Weight	36	38	40	42	44	46
Store sheep \$/hd (net)	36	38	40	42	54	56
\$/head @ 350 cents/kg	80.5	80.5	80.5	80.5	80.5	80.5
Cost per head	38	34	31	27	24	20
Margin	7	8	10	11	3	5

The end margin is dependent on the start weight and value of the animal. The first four weights in table 1 are store animals (<18 kg dwt), but the 44 to 46 kg animals could be sold as finished lambs in the 18 – 20 kg (dwt) weight range at a value of 280 cents/kg. The effect of increasing the initial value reduces the end margin for the 23 kg dwt lamb, finished in a feed lot and sold at \$80/hd.

Other costs not included in the above analysis are “back grounding” the animal to acclimatise them before entering the feed lot. The variations to this are significant depending upon availability of different sources of nutrition and its quality such as stubbles or perennial pastures. However, grain should be introduced into the diet 14 days before confinement. At 200 g/hd/day of barley (gradually introduced) the cost will be 0.42 cents per head.

The cost associated with deaths and/or animals not finishing will increase the cost per head as will the inclusion of capital costs. There are large variations in the capital costs involved depending on what is already on hand. Most producers are very innovative. My estimation to establish a feedlot from scratch for 500 sheep assuming two mobs of 250 it is \$30,000, which is \$7,500 discounted over 20 years at 7%. Table 2 shows the margin including these costs based on the same information as in table 1. That is, targeting a 23 kg dwt with the initial weights as stated, growing at 300 g/hd/day on a ration costing \$260/tonne.

Table 2: Calculated margin at different start weights

Initial Weight	36	38	40	42	44	46
Cost per head (5% losses)	40	34	33	29	25	21
Margin	5	9	8	10	2	4
Cost per head (incl capital costs)	53	49	46	43	39	35
Margin	-8	-7	-6	-4	-12	-10

CONCLUSION

The main profit drivers are the weight the animal enters the feed lot, the growth rate per day and the cost of the ration. A further and very important issue to consider is the price of lambs less than 18 kg (stores) and 18-20 kg compared to the price of heavier lambs (22-24 kg). The last five-year average price for 18-20 kg dwt sheep at Katanning saleyards is 285 cents/kg, where as the five-year average for 22-24 kg dwt is 279 cents/kg. This results in higher dollars per head for the heavy weight sheep but in fact the producer is being paid less cents per kilo.

To minimise costs in the feed lot the management starts before lambing, preparing the ewes and rams, aiming for a short lambing period to minimise the tail. Good growth rates from weaning onwards are needed to achieve the weight before entering the feed lot.

KEY WORDS

Feedlot, profitability, lambs

ACKNOWLEDGMENTS

Producers I have spoken to about their systems, Andrew Daw, Paul Barrett and Matthew Johnson.

Paper reviewed by: Rob Davidson, WAMMCO International

Repeated live weights can marginally improve prediction of compliance to market specifications

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ABSTRACT

Failure to comply with market specifications can lead to lambs being substantially discounted. To investigate the potential use of serial live weights in prediction of compliance to market specifications, data from 679 lambs finished in Western Australia for the QLAMB[®] market were used to build prediction models for carcass weight and fat depth. Using repeated live weights did not improve prediction of carcass weight or the ability to meet weight targets. However, repeated live weights explain a small component of the variation in fat depth at slaughter (24.7% of variation) and could lead to a slight improvement in the prediction of which animals will comply with market specifications for fat depth. These models were also able to predict carcass value of 90% of animals within $\pm \$8.62$. When 32 extreme outliers were removed this was improved to $\pm \$6.60$. However, the carcass value of some lambs was poorly predicted, suggesting that fat scoring may be required in conjunction with live weights when selecting animals to fit market specifications.

AIM

The aim of this study was to determine whether repeated live weights could assist in predicting which animals will finish within specifications.

METHOD

A subset consisting of 679 lambs was selected from a larger Sheep CRC database. These animals were selected by applying the following three criteria; firstly, they had three or more live weights, allowing growth rate to be estimated. Secondly, the management group that they were in had at least 10 lambs (management group was defined as animals that were weighed in the same group throughout their life). Lastly, the dataset was restricted to properties finishing for the QLAMB[®] market. ASREML⁽¹⁾ was used to estimate individual growth rates within management group from the serial live weights. This growth rate was used in combination with initial and final live weight in linear models to estimate carcass weight and fat depth. These linear models were performed in R⁽²⁾.

The following parameters were assessed in these models for their ability to predict carcass weight and fat depth:

1. Final live weight
2. Predicted live weight at slaughter
3. Initial live weight
4. Predicted live weight plus initial live weight
5. Full model (Predicted live weight, initial live weight and growth rate)

The amount of variation explained by each of these models is presented along with their ability to predict which animals would finish within two sets of market specifications. The same models were then used to predict carcass value under the QLAMB[®] grid. Two different specifications were tested within the grid:

1. Carcass weight between 17 and 24 kg, fat between 6 and 12 mm
2. Carcass weight between 18 and 27 kg, fat between 10 and 15 mm

RESULTS

Prediction of carcass weight

There was little difference between models in their ability to predict carcass weight. Using all predictors available improved the prediction of compliance by only 1% when predicting which animals had carcass weights between 17 and 24 and no difference discriminating which animals had carcass

weights between 18 and 27 kg. The small differences between the model including final live weight and overall compliance exists as the decision to sell animals is currently based on final live weight.

Prediction of fat depth

The average compliance to specifications to fat depth was lower than that for carcass weight (Table 1). Prediction of compliance to specifications varied between the two different targets for fat depth. When low levels of fat cover were required (6 to 12 mm) increasing information lead to improved compliance to specifications. However, when moderate levels of fat cover (10 to 15 mm) were required, the compliance to specifications decreased, along with the ability to differentiate between the models.

In this data set initial weight explained a proportion of the variation in fat depth and could be used to select animals which were more likely to reach heavier carcass weights without exceeding fat specifications. However, it was not possible to fully explain either which animals would hit market specifications or to fully explain carcass value. Research in 2005-06 will include measurements of fat depth and be expanded to use measures of fat score to improve compliance to market specifications.

Table 1. Ability to predict carcass characteristics and compliance to specifications in two target markets (17 to 24 kg weight and 6 to 12mm fat; 18 to 27 kg weight and 10 to 15 mm fat) from models using serial live weights and growth rates.

Model used to predict compliance with specifications	Percentage of variation explained by model ($r^2 \times 100$)		Percentage of animals meeting specifications	
	Carcass weight	Fat depth	Carcass weight	Fat depth
			17-24 (18-27)	6-12 (10-15)
Final Weight	56.3	16.0	96 (99)	82 (70)
Predicted weight	56.3	18.5	97 (99)	83 (70)
Initial weight	44.3	17.3	95 (99)	82 (71)
Predicted plus initial	56.3	21.5	97 (99)	84 (71)
Full model	56.9	24.7	97 (99)	86 (71)
Overall compliance ¹	-	-	95 (99)	78 (61)

¹ Overall compliance achieved by the producer

Carcass Value

Accurate prediction of carcass value using serial live weights would allow producers to determine the best time to sell each individual animal within their flock. Therefore, a comparison was made between actual carcass value and a prediction made from all live weight measurements on individuals. Including all data it was found that 90% of the time carcass value could be predicted within \$17.24. However there was a single contemporary group of 32 animals where carcass value was not predicted well, as fat depth was overestimated. If this group of animals was removed the carcass value could be predicted within \$13.20.

CONCLUSION

By using serial live weights rather than a single live weight it was possible to slightly improve predictions of which animals would comply with market specifications. However the improvement in the ability to hit specifications was minor and varied depending on the target specifications. Carcass fat depth was poorly predicted with serial live weights. Future research will determine how many fat score measurements would be required to better predict compliance to specifications. It may also be possible to use live weights to screen for lambs that are more likely to be too lean or too fat so that the number of lambs to be fat scored is reduced. Lastly, use of this information may result in increased returns by determining the optimal time to sell each animal, thus capitalising on the variation between sheep in their ability to meet specifications.

KEY WORDS

Market specifications, serial live weight

ACKNOWLEDGMENTS

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Paper reviewed by:

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Mulesing accreditation – to be or not to be?

Di Evans, WA Department of Agriculture

KEY MESSAGE

The issue of compulsory accreditation for mulesing has been raised but there are many benefits in supporting the National Mulesing Accreditation Program on a voluntary basis.

INTRODUCTION

Mulesing has been in the spotlight for over 12 months due mainly to the influential campaign by the high profile US based animal rights group People for the Ethical Treatment of Animals (PETA) to ban the procedure. The impact of this has placed enormous pressure on retailers to boycott Australian wool. In November, 2004 the sheep and wool industry responded to this major threat by announcing the phasing out of mulesing by 2010. Subsequent to this, the Federal Minister for Agriculture called for a review of the mulesing section of the national sheep welfare code (1). A key element of the draft mulesing appendix was the recommendation to introduce compulsory accreditation for mulesing operators by 31 Dec 2006 (2). A mulesing accreditation program for contractors and farmers, developed by the Livestock Contractors Association (LCA) based in New South Wales, received funding in 2004 from Australian Wool Innovation to expand the program nationally over three years (3). Due to the increased pressure placed on the industry to demonstrate high welfare standards, plans have been developed to fast-track the accreditation program over the next two years.

REVIEW

Benefits of being accredited

- With the phasing out of mulesing within the next five years, the logic and value of introducing compulsory accreditation has been raised. However, there are several benefits for operators who become accredited irrespective of whether it becomes a legal requirement including:
- The non-surgical mulesing technique based on the use of the collagenase protein, which is currently being developed by a research team at the University of Adelaide, may only be available to accredited operators.
- Use of analgesics (pain killers) in the future may only be available to accredited operators. Currently, there is no suitable commercially available analgesic but if one should be developed, then it is likely to have restricted use.
- Training and accreditation is likely to improve skills in some area. Most operators who have attended training, have gained additional knowledge and expertise especially in relation to shear preparation and sharpening. In addition, anecdotal evidence indicates that many operators are not following best practice standards.
- Those already using best practice techniques will be formally recognised for this and are given an assurance that they have already attained a high level of competency.
- Training and accreditation doesn't only cover mulesing but also other areas of lamb marking including tailing, castration, stock identification and vaccination as it is very important that these other procedures are performed to a very high standard.

Structure of the National Mulesing Accreditation Program

Currently, the program is being coordinated nationally with the LCA providing experienced instructors and retaining control of the content and structure of the program.

Training consists of three levels;

- Mulesing demonstration – half day only combined into training workshop
- Mulesing training – full day hands-on practical

- Mulesing accreditation – half day to be held some time after the training day

Training workshop format – The first part of the workshop covers background information on the program; key features of good and poor mulesing; shear setting, grinding and sharpening; maintenance of other equipment; hygiene practices; demonstration of and then practical training in mulesing and other lamb marking procedures including vaccination, castration, tail docking, stock identification, insecticide application; discussion of accreditation standard.

Accreditation format – The assessment consists of a statement of previous mulesing experience; chemical label identification exercise; health and safety questions and practical demonstration of mulesing and lamb marking skills. To achieve accreditation, a total of at least 85 per cent must be achieved with at least 80 per cent in each individual section. The most important aspects are not cutting the bare skin and selvage, as well as a high standard of hygiene and sharp shears.

National Mulesing Guidelines

Australia has now followed in the foot steps of Merino New Zealand, who had developed a national set of guidelines for mulesing (4). Recently, Guidelines for Mulesing in Australia was published (5). This key document, which has been developed by the Livestock Contractors Association in collaboration with several industry groups, underpins the National Mulesing Accreditation Program. It is very comprehensive and contains the following information:

- Legislation and codes of practice relevant to mulesing
- How to prepare for mulesing in relation to stock condition, selection of paddocks and consideration of weather conditions
- Detailed information of selection, maintenance and correct use of appropriate equipment
- Specific information on hygiene standards including use of containers and disinfectant
- Key elements of the recommended correct mules technique
- Recommendations for good post mulesing management

CONCLUSION

For those producers who currently mules their own sheep, the decision will be to become accredited or not. Factors which may influence the decision to become accredited include not having access to an accredited operator, potential lack of flexibility if relying on another operator and improving own skills. It is recommended that even though accreditation may not be undertaken that all producers should attend a mulesing demonstration to learn about best practice standards. For mulesing contractors, the question will centre on their own future expectations in relation to their business in both the short and medium term. No doubt there will be increased demand for accredited contractors in the short term and depending on the outcome of current research to develop a non-surgical alternative, accredited operators will be well placed to acquire new skills and technology for achieving a bare breech.

KEY WORDS

Mulesing, animal welfare, accreditation, guidelines

Paper reviewed by: Brown Besier and Michael Paton, WA Department of Agriculture

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The Economic and Research Implications of Managing Merino Sheep with out Mulesing

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ABSTRACT

The commitment by the Australian sheep industry to discontinue the practice of surgical mulesing by 2010 raises a number of issues. Mulesing has undoubtedly been most effective in lessening the incidence and severity of blowfly strike under Australian conditions, and to replace it will require a change in management for many.

The availability of effective, long-acting chemicals, combined with extra crutching, will enable flystrike to be contained, but will inevitably place extra pressure on the development of chemical resistance in the fly population. The extra cost of new management practices is estimated to be in the range \$1.50 to \$2.50 per head, in a number of management scenarios.

A major problem forecast is the availability of labour for crutching and possibly shearing, due to the laborious nature of crutching unmulesed sheep. This will be regardless of price.

A genetic approach is seen as the only realistic long-term solution. To make this possible it will be necessary to cease mulesing immediately in a range of flocks of recognised genetic superiority to enable selection of superior genotypes within these flocks. Mulesing currently impedes this by masking sheep of both desirable and undesirable genotype.

INTRODUCTION

Some perspectives on the whole issue:

- Mulesing was developed when the only effective method of preventing breech strike was crutching.
- Most of the Merinos are now plainer bodied than they were in the first half of last century prior to mulesing being developed and widely adopted.
- We now have chemicals that provide 12-24 weeks protection against flystrike, the like of which were unimaginable when mulesing was developed. Many of these chemicals are currently used to prevent breech strike on mulesed sheep. Their use eliminates breech strike during the protection period and they are considered a means of managing the risk of even a low incidence of breech strike.

Effect on Shearing and Crutching

A major effect of not mulesing will be an increase in the cost of shearing and crutching due to a combination of increased dag and the difficulty of crutching around skin folds on the breech. Estimates based on crutching mobs of sheep that are not mulesed indicate that the rate of crutching will approximately halve due to increased time required to crutch each sheep. This will increase crutching cost by approximately 90c - \$1.00 but may vary according to the degree of breech wrinkle and dags. Shearing costs are also likely to rise, but by a lesser extent because the increased shearing time will only be a small proportion of the time taken to shear the whole sheep. A very real issue will be maintaining the wool harvesting labour pool, as the job, particularly of crutching, will in the short term become much more laborious.

Effect on Dag and Stain

Both dag and stain are likely to increase, not in all flocks in all years, but they are likely to be a major problem in some years. The extent of the problem will be determined by a combination of the management program, season and climate. From the aspect of wool clip contamination, the stain *per se* is unlikely to be an issue providing stain free procedures are followed, that is to crutch within three months prior to shearing.

Effect on Labour

Assuming flocks move to the use of chemical products instead of mulesing to prevent breech strike, the high level of efficacy of the currently available chemicals will mean there should not be an increase in labour for checking sheep or treating struck sheep. Additional labour will be required for chemical application. The only uncertainty is the efficacy of the products on heavily wrinkled or daggy breeches and the risk of the development of resistance to all compounds used. Though we have gone 25 years so far without resistance being detected to cyromazine, increased use may shorten the effective life of any products used. If protection periods are reduced these may result in a major increase in labour requirements.

Increased chemical use will increase the chance of unacceptable wool residues

Breeding

In reality, genetic selection is attractive, but there is not enough information currently available – the widespread practice of mulesing in fact now continues to hamper attempts to find a genetic solution. It masks the genetically less desirable sheep as well as the genetically attractive individuals – all breeches are reduced to a common denominator.

- To select for increased bare skin in the breech, or short tails, has been rarely attempted in the normal Merino population, although progress by innovative and far-sighted individuals is promising (J. Karlsson, pers. comm.). In order to implement this, it would seem imperative to cease mulesing in a range of flocks now considered superior for the commonly accepted economic production traits. This would require cooperation with some buying clients, as unmulesed sheep would require special management in most areas.
- Crossing with other breeds may offer an avenue to reduce wool around the breech and reduce tail length, but from experience will compromise many of the desirable production attributes of Merinos.
- Identification of Merino sheep with at least some of the desired phenotype would seem to be another way to proceed, if suitable animals are identified. It would remain to determine the genetics of the traits observed. Recently a number of sources of such sheep have been publicised, and no doubt more will arise as the industry increases in awareness of the whole issue.
- Equipping Merino sheep with a strong natural, genetic resistance to blowfly strike would seem to be another area to be pursued.

Other Research Options

- As an ongoing aspect, eradication or genetic sabotage of *Lucilia cuprina*, the Australian Sheep Blowfly, may be revisited.
- Attempts to develop an effective vaccine have been unsuccessful over some decades, and only new technology could be expected to re-establish this method of flystrike control as a likely option.

Estimated cost of not mulesing

Most scenarios dealing with comparisons between mulesed and unmulesed sheep look at mortalities, flystrike, etc. This is not real, as it is taken for granted that flystrike will be controlled – ie. sheep welfare will be maintained. An example of a 4000 ewe flock is used as a framework:

Extra costs associated with managing unmulesed sheep, summer-autumn shorn, is estimated to be of the order of \$1.47.

The situation where hogget sheep would need crutching in April/May is not included above, nor any extra losses, perhaps inevitable, from blowfly strike.

Shearing costs could be expected to increase by at least \$0.10 (5%) per sheep, on top of any other increases.

The total cost associated with management of unmulesed sheep could be as high as \$2.50 per head. Most of this additional cost is associated with extra crutching cost and increased crutching frequency.

KEY WORDS

Mulesing, crutching, genetics, cost, blowfly strike, flystrike

Paper reviewed by: Dr Rob Woodgate

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How do lambs fare during curfew

Dr. Robin Jacob

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ABSTRACT

This paper provides a brief review of research done on the effect of curfew on lamb in relation to food safety, animal welfare, meat yield, and meat quality issues. Recently completed research in relation to meat quality and meat yield makes this broad approach possible. Whilst curfew is important for preparing lambs for slaughter, the length of the curfew period can affect a number of these 4 key issues. Curfew needs to be integrated with other on farm and processing practices to achieve the best result for the producer, the processor and the consumer

INTRODUCTION

Under commercial conditions food and water are withheld on farm just prior to transport as well as during transport. Water is subsequently made available and only food is withheld during lairage. The purpose of these curfews is to prepare lambs firstly for transport to the abattoir and then subsequently for slaughter.

REVIEW

Food safety

Curfew on farm aims to reduce faecal and urine soiling of the skin during transport. Skin soiling can lead to carcass contamination through direct contact but also due to aerosols created when the hide is removed (Bobbitt *et al.* 2000). Carcass contamination due to leakage from the oesophagus, anus and bladder are also potential sources of contamination during processing.

However there is a balance between curfew time being too short and too long because the physical consistency of gut contents and the species mix of microbes in the gut both change with curfew time. Extended curfew may cause gut contents to be more fluid in nature and to contain higher concentrations of pathogenic bacteria. The feed type prior to transport will also have an effect on physical consistency of gut contents with green pasture being worse than hay for food safety purposes (Gregory *et al.* 2000). Furthermore urine contamination cannot be eliminated completely by curfew because some urine is produced even when lambs have no access to water.

Animal welfare

Contact with humans, dogs, unfamiliar surroundings, temperature extremes, physical exercise, mixing with unfamiliar animals, food deprivation and water deprivation are some of the unfamiliar experiences that lambs may encounter during the preslaughter period. These factors have the potential to compromise lamb welfare so care is needed to avoid extremes.

The welfare of lambs whilst in transport, at saleyards and in lairage are regulated by the various Codes of Practice (Anonymous 2004). Adherence to these codes can be used as a defence in a legal sense. However beyond these minimum standards, consumers may also take welfare practices into account when making purchasing decisions (Grunert *et al.* 2004). The welfare of lambs during curfew could be an important part of perceptions consumers form about the lamb industry in the future.

Meat yield

Both liveweight and carcass weight are affected by fasting and dehydration such that extended curfews may reduce carcass weight and value (Thompson *et al.* 1987). Dehydration begins within 24 hours of water deprivation so it is important for lambs to rehydrate during the lairage period (Jacob *et al.* 2005). Research has shown that various additives including electrolytes, salt and betaine used on farm prior to curfew often have little effect on hydration status and carcass weight after curfew (Jacob

et al. 2003). Bruising should also not be underestimated as a potential cause of carcass weight loss in lambs. Dog bites in the hock area cause severe bruising and dramatic trimming to remove the bruise after slaughter. Dogs on farm should be muzzled. Pulling the wool of lambs during handling can cause subcutaneous bruising

Meat quality

Stress and exercise during curfew can reduce muscle glycogen concentration and eating quality particularly in merino genotypes (Gardner *et al.* 1999). Sheep Meat Eating Quality (SMEQ) specifications are currently being designed and when released will have recommendations for curfew times to attain desirable eating quality standards. Direct consignment can reduce muscle glycogen loss compared to indirect consignment via saleyards (Walker *et al.* 2000). However “tailgate slaughter” is not recommended either as lambs need several hours to settle and recover from transport after arrival in lairage.

CONCLUSION

Optimal lamb management during curfew is important for yield, quality, food safety, and consumer acceptance of lamb. Curfew should be as short as possible within the practical limitations of keeping lambs clean during transport and slaughter. Where direct consignment is possible, this should be considered preferable to indirect consignment.

KEY WORDS

Lamb, curfew,

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