

PREDICTING THE AREA OF A SHEEPSKIN FROM CARCASE MEASUREMENTS

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SUMMARY

Whilst area is a major trading specification for sheepskins, there is little objective information available to predict it from the carcase specifications used in livestock sale by description methods. Paired carcase and skin area data were collected and predictive equations were developed for both lambs and sheep. Preservation of skins by salting is shown to cause a 14% shrinkage of area, and trimming is shown to reduce area by 5% so it is important to recognise these effects if buying skins based on carcase weight.

Keywords: sheep, skin, woolskin, skin area, predictive equations

INTRODUCTION

Area is a major specification used in sheepskin trading, particularly of the processed leather pelt or woolskin product. There is little published information available about the sizes of skins from different sized sheep.

Sheepskin area is important for 2 reasons. Firstly there is the direct effect of skin size *per se* on yield. Secondly there is the issue of cutability. In further processing to make such items of clothing or seat covers, skins are often cut into fixed shapes. It is more efficient to cut these pieces from larger skins, which effectively yield more useable area, than from smaller skins of an equivalent area.

Experienced livestock traders have historically estimated skin size, and combined this with quality factors, to calculate a skin price whilst still on the live animal. Modern marketing of all agricultural commodities is becoming, however, more objective. As sale by description becomes more prevalent in the livestock industry, description of the carcase will expand to include more information on the skin as a product. The CALM livestock selling system gives estimated carcase data, and quality factors relating to skins (wool quality and length, vegetable matter contamination, etc.), but does not estimate skin area. Skin area prediction equations would be a valuable tool for helping to assign skin value more accurately.

The demand for larger more workable skins is complementary to the demand for larger lambs, both in the domestic market, as shown in consumer surveys (Hopkins *et al.* 1985), and for the export trade (AMLC 1994). The price premium offered for larger lambs should therefore include a skin premium as well as a carcase premium.

Skins are harvested at an abattoir and may be then stored or traded to another 'processor for further processing. They are quite perishable and are often salted for preservation. Salting is known to cause shrinkage of skins, so a further aim of these trials was to quantify the shrinkage due to salting, so that a prediction of size for both salted and fresh skins is possible.

METHODS

General

All measurements were carried out on the premises of one abattoir with carcasses and skins being treated in exactly the same way as that normally undertaken by the works.

Randomly selected carcasses of 684 lambs (no adult teeth erupted) and 204 sheep (2 or more adult teeth erupted) and their skins were tagged on the slaughter floor prior to removal of the skin. The lambs sampled varied widely in breeding and represented both young and old lamb categories. The sheep also varied widely in their breeding, weight, fatness and wool length, although the majority were merino type sheep. Hot standard carcase weights (HSCW) were recorded for each of the identified carcasses.

The sample of animals was partially based on the commercial slaughter run at the time; however the opportunity was also taken to measure a sample of 305 ewe lambs obtained from the Central Progeny Test Programme at Rutherglen Research Institute. These lambs were all from first cross ewes and were the progeny of 20 different sires which included Poll Dorset, Suffolk, White Suffolk, Hampshire Down and Wiltshire Horn. Carcase fatness was measured as tissue depth (mm) at the GR site on these lambs, and the skins from this sample were measured for length (cm) from neck to tail.

Skins were removed by a mechanical puller following a “work up” which did not include the removal of a brisket strap (common in some works). Skins were given a rudimentary trim concurrent with standard commercial practice, head and cheeks removed and the sleeve in the hind legs split, prior to measurement.

The area of each tagged skin was measured in square decimetres and recorded within 1 hour of slaughter using an Ellwood area measurement table. Care was taken not to stretch the green sheepskin and to ensure that there was no overlap of skin or wool.

Salt shrinkage

A sub-sample of 92 tagged skins was area measured then commercially drum salted and area measured again after two hours, 24 hours and 2 weeks later.

Trimming

A sub-sample of 50 salted lambskins were tannery trimmed and then remeasured. This was a minimal trim, which removed the bottom of the legs and any loose strips and excess cod or udder fat. This process is often done commercially before skins are traded.

RESULTS

Data for a total of 888 carcasses and skins were collected (204 sheep and 684 lambs). There was a wide variation in the green (ie fresh) skin area (GSA) at any given hot carcass weight (HSCW), the variation being greater in sheep than lambs.

A summary of the results is presented in Table 1.

Table 1. Summary of sheepskin area and carcass weight data

Sample	N	Sheepskin Area	(dm ²)	Carcass weight	(Kg)
		Mean (C.V.%)	Range	Mean (C.V.%)	Range
Lambs	684	85.5 (11.9)	60.2 - 122.6	17.9 (18.3)	9.9 - 29.8
Sheep	204	110.6 (11.5)	68.0 - 150.8	23.8 (18.5)	12.6 - 36.0
Total	888	91.2 (16.5)	60.2 - 150.8	19.2 (22.6)	9.9 - 36.0

Data for each group were analysed for a linear relationship using regression analysis with HSCW as the independent variable, and GSA as the dependent variable. The Systat computer package was used to analyse the data.

The linear regression prediction equation determined for all lambs was:

$$\text{GSA}(\text{dm}^2) = 40.8 + 2.5\text{HSCW}(\text{kg}) \quad (R^2 = 0.65) \quad P < 0.01.$$

This relationship indicates that, on average, the GSA of a lamb will increase by 2.5 dm² for each increase of 1 kg carcass weight over the range of normal slaughter weights.

The linear regression prediction equation determined for sheep was:

$$\text{GSA}(\text{dm}^2) = 62.6 + 2.0\text{HSCW} \quad (R^2 = 0.70) \quad P < 0.001.$$

If all the results (sheep and lambs) are combined this gives an equation of:

$$\text{GSA} = 34.4 + 3.0\text{HSCW} \quad (R^2 = 0.73)$$

A sub-sample of 305 lambs was measured for carcass fatness (tissue depth at the GR) and green skin length (GSL: Table 2) and gave a regression equation of:

$$\text{GSA} = 48.5 + 2.0\text{HSCW} \quad (R^2 = 0.61)$$

Table 2. Summary of results for the 305 lambs which had additional carcass and skin measurements

Mean (C.V.%) carcass length (cm)	Mean (C.V.%) carcass weight (kg)	Mean (C.V.%) GR measurement (mm)	Mean (C.V.%) Skin area (dm ²)
107.6 (5.2)	18.1 (14.9)	10.8 (36.3)	84.4 (8.1)

The addition of GR measurement to the regression equation improved the explanation of variation by only 1%,

$$\text{GSA} = 46.5 + 2.3\text{HSCW} - 0.3\text{GR} \quad (R^2 = 0.62)$$

however the inclusion of skin length, which should approximate to body length and could hence be measured on the live animal, improved it by a further 6%.

$$\text{GSA} = 16.8 + 1.9\text{HSCW} - 0.2\text{GR} + 0.3\text{GSL} \quad (R^2 = 0.68)$$

The sub sample of 50 salted lambskins that were given a tannery trim had, on average, 4.6 dm² removed, equating to about 5% of the total area, although this ranged from 0 to 5.6 dm² or 0 to 10% trim.

The summary of results relating to salt shrinkage is presented in Table 3.

Table 3. Area reduction over time (using green skin area as a base) after preservation by drum salting of 50 lambskins

Time after salting	2 hours	24 hours	2 weeks
Mean Shrinkage %	10.3	11.8	13.5
C.V. %	7.0	9.0	8.0
Range (%)	0.3 - 17.7	1.7 - 22.4	4.7 - 22.4

DISCUSSION

The study measured the relationship between carcass weight and skin size. If the current trend towards increased car-case weight continues (AMLC 1994), then the average size of lambskins should increase also. The "Elite" lamb category of 22+ kilograms should have green skins around 100 dm², or 12.5 dm² or more larger than the traditional 17 kilogram trade weight lambs. These skins are attractive to both fellmongers and woolskin tanners alike.

This study demonstrates that there is a large variation in skin sizes from sheep of similar carcass weight, and that this variability is greater in mature sheep than it is in lambs. Although no evidence of grain damage occurred, it is possible some variability may be due to a permanent stretch caused by the skin puller. In this trial nothing was done to attempt to measure this other than to try to put the skin on the table in a relaxed state (not stretched in any way). The same puller was used in all sheep following the same work up, and was set up as per the Colomer guidelines (Gratacos *et al.* 1989) to minimise stretch. Pre-slaughter management factors, breed and sex, have all been shown to affect skin thickness (Hegarty and Oddy 1993) and, as such, may have affected the degree of stretching caused by the puller. It should also be noted that the exertion required by the puller will be different on carcasses of different types, weights and sex (Wybom and Reed 1992).

Despite this variation in individual skins, hot carcass weight can be used to predict average skin area within a reasonable tolerance. Due to the different equations for sheep and lambs, it is important that the correct equation is used to achieve the best estimate.

The addition of GR measurement to HSCW gave little if any improvement to the accuracy of prediction, not surprising given the strong correlation between carcass weight and fatness. It is probably not likely to warrant the extra effort on a cost benefit basis. The addition of skin length would improve the prediction marginally. Whilst skin length is commonly used in the industry to estimate area of the removed skin, skin length is not a currently described measurement in livestock trading. Whilst it could be measured on the live animal, the extra effort would not be warranted.

Salting reduces skin area by about 14%, and most of this occurs immediately upon salting. Whether this is as a result of dehydration or simply the skin "relaxing" to a constant size is not clear. This does demonstrate, however, the importance of vendor and purchaser understanding whether the area being negotiated is green or salted. The equations quoted here relate to fresh skins and would require a 14% deduction if the estimation was done on salted skin area. Similarly an understanding of the level of trim is important. In this trial a tannery trim averaged 5% but ranged from 0% to 10%. Some works trim more off in the work up (eg a brisket strap) and this would need to be factored in for each specific works.

ACKNOWLEDGEMENTS

This study was funded by the MRC. The study could not have been done without the full cooperation of Castricum Bros Export Pty. Ltd., in particular Peter Castricum, Jim Nolan, Maurie Nichols, Ray and Darren Vinton. Grateful thanks also to Peter Hobbs, Phil Kenney, Ron Harris and Barry Warren for assistance in collecting the data, and to Jim Maden for his statistical advice and expertise.

REFERENCES

- AMLC (1994). Statistical Review July 93-June 94 (Australian Meat and Livestock Corporation: Sydney).
- GRATACOS, E., COSTA, R., SANS, J. and PORTAVELLA, M (1989) Report from Colomer Munmany, S.A.
- HEGARTY, R.S. and ODDY, V.H., (1993) New South Wales Agriculture. Final Report to MRC, DAN 049.
- HOPKINS, A. F., CONGRAM, I.D. and SHORTHORSE, W.R. (1985) Research Report No 19. Livestock and Meat Authority of Queensland.
- WYBORN, L.G. and REED, H.L. (1992) *Meat Science* **31: 95**.