SAMPLING FLEECES TO ESTIMATE YIELD OF CLEAN WOOL.

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SUMMARY.

Fleeces from 85 Merino ewes and wethers were skirted, separated into 12 portions according to position, and scoured.

Yield of clean wool decreased from shoulder to rump, and the yields along the back were slightly higher than those on the sides.

The yield of all regions was highly correlated with that of the whole fleece and that of the skirted fleece, but the midside region is the most convenient sampling site.

I. INTRODUCTION.

Clean fleece weight is of primary importance in a programme of sheep selection which uses fleece measurement as an adjunct to visual appraisal. Various techniques have been reported for estimating the clean scoured yield of whole fleeces from small samples. The literature was reviewed by Pohle, Wolf and Terrill (1943), Pohle and Hazel (1944), and Pohle, Hazel and Keller (1945), while reporting their findings on suitable sampling sites. There is fair agreement among these workers that the midside and shoulder sites give the most accurate assessment of whole fleece yield.

Only two Australian references are known. Lockart (1954) studied the distribution of yields at different locations on 26 pelts from Merino ewes. He found that the coefficients of correlation between yields of small samples and the yield of a composite sample from the opposite side of the fleece were greatest for the shoulder-midside-hip area, being 0·91–0.94. Lang (1955) reported a correlation coefficient of 0·68 for the relationship between midside yield and unskirted whole fleece yield for 20 Merino sheep.

In the present study, unskirted Merino fleeces were divided into regions and scoured. The variation in yield in the different regions was examined, as well as the relationship between region yields and whole fleece yield.

II. MATERIALS AND METHODS.

Eighty-five unskirted fleeces, without belly wools, from 3-year-old Merino ewes and wethers on a south-eastern Queensland property were available.

The fleeces had been grown for a period of 12 months. Each was weighed, laid on a classing table, skirted and divided into 12 portions, A–L, as shown in Fig. 1. The regions A, B, C, D on the left side consisted of the neck, shoulder, midside and thigh wools respectively, while the corresponding regions on the right side were I, J, K, L. The wool along the back was divided into regions E, F, G, H, with F being adjacent to the midside regions C and K. In this subdivision, samples C and K were made approximately 100g. in weight, as is used for routine measurements in this laboratory. The other samples were slightly larger.

The skirtings from each fleece were divided into three portions for ease of handling in the small scour. They were later recombined to give a single estimate of the yield of the skirtings for each fleece. The whole fleeces were weighed immediately prior to subdivision, and the various portions immediately after subdivision.

The samples were scoured in a 4-bowl laboratory scour. After partial drying to a low moisture content, the scoured samples were held in an unventilated room to come to equilibrium with the air in the room. They were then weighed, and the moisture content determined by heating a number of samples to constant weight at 103°–106°C.

The samples were graded visually into groups of increasing vegetable matter content. The percentage of vegetable matter was determined on representative samples from each group by the method described by Lipson (1943).

The percentage of scouring residuals was determined on a number of scoured samples from each body region by Soxhlet extraction with a constant boiling mixture of benzol, alcohol and water. All yields were calculated as the percentage of bone-dry clean wool (free of vegetable matter and scouring residuals) in the greasy wool at the time of subdivision. The yields of the whole fleeces, skirted and unskirted, were calculated from the clean wool weights of the regions.

III. RESULTS AND DISCUSSION.

(1) Variation in Yield with Location.

The mean yields and standard deviations for the regions are shown in Table 1. This table is semi-diagrammatic and follows the lay-out of Fig. 1.

Table 1.

Mean Yield of Each Region and Standard Deviation of Each Region Yield.

D 60·9 ± 3·7	C 61·7 ± 3·6	B 61·9 ± 3·8	A 61·6 ± 4·1
H 61·0 ± 4·2	G 61·1 ± 4·0	F 62·2 ± 3·9		E 62·5 ± 3·9
L 60·7 ± 4·3	K 61·4 ± 3·8	J 61·8 ± 4·4	I 61·6 ± 4·2

Skirted fleece : 61·4 ± 3·4
Skirtings : 53·3 ± 3·8
Unskirted fleece : 58·3 ± 3·3

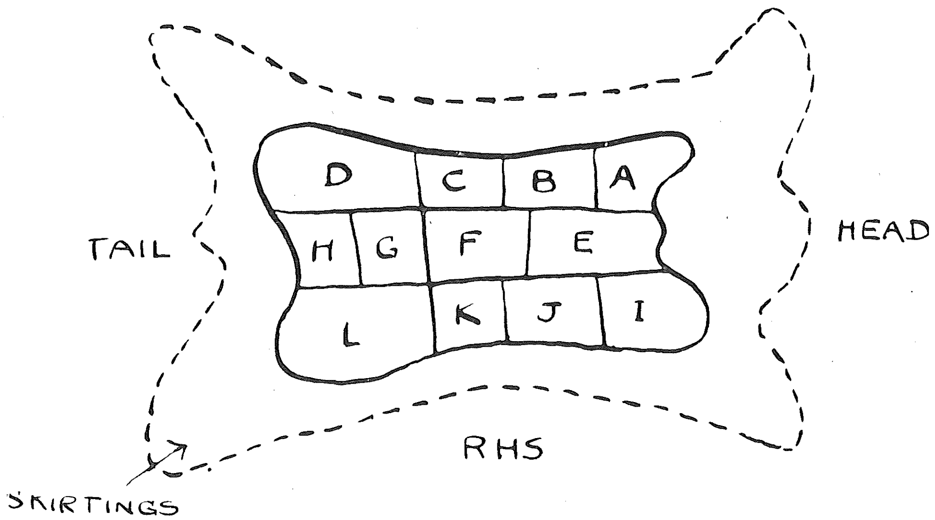

Fig. 1.
Diagram Showing Fleece Regions.

An analysis of variance of yields of the 12 regions of the skirted fleece is shown in Table 2.

Table 2.

Analysis of Variance of Region Yields.

Source of Variation.	Degrees of Freedom.	Mean Square.	Component of Variance.
Between sheep	84	127·0*	10·1
Between regions ..	11	23·4*	0·2
Residual	924	5·3	..

* P < 0·001.

The variation in yield between sheep and the variation in yield between regions are highly significant. Two trends emerge from the results. The yields decrease from shoulder to rump and are slightly lower on the neck than on the shoulder. Lockart's (1954) results show a similar pattern. The yields along the back are slightly higher than those on the sides. This, however, does not agree with Lockart's findings. The different methods of sampling and environmental effects may be responsible for this. The property from which the samples in this study were obtained has an average yearly rainfall of about 28 inches. It is possible the wool along the backs of these sheep was somewhat leached by the relatively heavy rainfall. Also, the fleeces were carrying fairly large amounts of vegetable matter, particularly in the necks and lower regions.

There is also a tendency for each region on the left side to slightly outyield the corresponding region on the right side. The differences are very small and fall far short of significance, but it is of interest that the same feature is shown in Lockart's results. This has also been noted twice previously when samples have been taken from left and right midsides.

The individual results reveal that most of the differences are small and random, but occasional large differences favour the left-hand side more often than the right.

(2) Estimation of Whole Fleece Yield.

Table 3 shows the coefficients of correlation between the yield of each region and the yield of the whole fleece, both skirted and unskirted.

Table 3.

Correlation Coefficients and Regression Estimates—Sample and Fleece Yields.

Region.	Yield of Skirted Fleece and Yield of this Region.		Yield of Unskirted Fleece and Yield of this Region.	
	Correlation Coefficient.	Estimate.	Correlation Coefficient.	Estimate.
A	0·86	16·35 + 0·73A ± 1·73	0·80	17·25 + 0·67A ± 1·99
B	0·91	10·77 + 0·82B ± 1·44	0·85	11·92 + 0·75B ± 1·77
C	0·85	10·91 + 0·82C ± 1·79	0·77	13·36 + 0·73C ± 2·11
D	0·89	10·07 + 0·84D ± 1·52	0·84	11·24 + 0·77D ± 1·82
E	0·76	19·56 + 0·67E ± 2·22	0·74	18·48 + 0·64E ± 2·25
F	0·88	13·46 + 0·77F ± 1·62	0·87	12·14 + 0·74F ± 1·67
G	0·83	18·20 + 0·71G ± 1·88	0·77	19·28 + 0·64G ± 2·13
H	0·83	20·13 + 0·68H ± 1·89	0·77	20·82 + 0·61H ± 2·12
I	0·73	24·83 + 0·59I ± 2·34	0·64	26·93 + 0·51I ± 2·57
J	0·84	20·01 + 0·67J ± 1·82	0·79	20·47 + 0·61J ± 2·05
K	0·84	14·24 + 0·77K ± 1·84	0·78	15·54 + 0·70K ± 2·09
L	0·89	18·67 + 0·70L ± 1·59	0·82	19·49 + 0·64L ± 1·90
Skirtings Yield .	0·65	..	..	..

The regression estimates of whole fleece yield are also listed. Pohle and Hazel (1944), and Pohle, Hazel and Keller (1945) used the inverted regression in which whole fleece yield is regarded as the independent variable. In this study the view has been taken that the variates are subject to similar sources of error and that the situation can be appropriately represented by a normal bivariate distribution.

Regression estimates would, in any practical applications, be calculated from a random sample of a batch of fleeces and applied to the remaining fleeces. As an empirical approach, the regression of skirted fleece yield on left midside yield was calculated, using only 42 of the 85 available results. The prediction equation obtained was used to estimate the yield of the other 43 fleeces and led to the predicted standard error of estimate. If it is, however, thought that the inverted regression should be used, the estimates in Table 3 can be simply modified. In particular, the errors of estimate should be increased by a factor $\frac{1}{r}$, where r is the listed correlation coefficient.

Table 3 does not reveal any marked superiority of any other regions over the easily located midside portion. All regions lead to standard errors of estimate which would be regarded as acceptable for most purposes. The left side is very slightly superior to the right side, but the difference is so small that a much more extensive investigation would be required to test the significance of the difference.

(3) Estimation of Clean Wool Weight.

For this batch of samples there was very much more variation among fleece weights than among yields, and the relationship between greasy and clean wool weights of the unskirted fleeces was exceptionally strong (correlation coefficient = 0·95, standard error of estimate = 0·23 lb., mean greasy fleece weight = 6·93 lb.). Use of either midside yield would reduce the standard error of estimate to 0·16 lb.

IV. CONCLUSIONS.

The data presented show that the midside region of the fleece gives a good estimate of the yield of the whole fleece. Other regions are equally accurate but not perhaps so easily identifiable in the shearing shed. For this batch of samples the yield of the midside sample closely approximates that of the whole skirted fleece, but overestimates the yield of the unskirted fleece.

If the aim is to rank fleeces in order of yield, there is clearly no advantage to be gained from the use of a regression estimate which merely shifts the mean and multiplies the deviation from the mean by a constant amount. This is not the case when the yield is used to calculate clean fleece weight. However, the labour of scouring representative whole fleeces to obtain the appropriate prediction equation would only be warranted in exceptional circumstances.

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