Performance of visually or objectively culled ewe hoggets

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ABSTRACT

Visual culling of 16-month old Romney ewe hoggets without access to performance records was carried out by five different groups of farmers who had contributed rams to the Rotomahana Strain Trial. Reasons for culling decisions were recorded and then all ewes, including those 'culled', were retained and farmed as a single flock to compare lifetime performance of culled and selected ewe replacements. Each group of farmers put most of its culling emphasis on size (i.e. smaller sheep were culled), with varying culling emphasis on mouth structure, woolly faces and wool. Less than five percent of the culling emphasis was for foot structure or breed type. All groups of farmers were able to 'select' ewes that had subsequent performance (number of lambs weaned and wool weight produced) superior to their 'culled' group of ewes. There was about a two-fold range among breeders in the effectiveness of their culling in terms of economic returns for lambs weaned plus wool produced over three lambings. Evaluation of ewe production through to seven years of age showed that the effects of visual culling on subsequent ewe performance were maintained over the lifetime of the ewe.

The effect of 'culling' using performance traits in the same ewe hoggets as were subjected to visual culling was also assessed. Culling on most performance traits was more effective than visual culling, resulting in up to 50% greater economic returns. Post-weaning body weights or fleece weights or a combination of these traits, were the most useful objective culling criteria.

Keywords Sheep; culling criteria; visual culling; lifetime performance; lamb production; fleece weight; body weight

INTRODUCTION

In addition to selection of rams, sheep farmers put emphasis on the culling of ewe hoggets as a means of improving performance levels of their flocks. Most farmers cull hoggets on physical appearance, primarily based on size and conformation, wool quality, structural soundness and breed type (Butler, 1983). The present study was designed to assess the effectiveness of subjective visual culling in comparison with culling on objectively recorded performance.

METHOD

Visual and Objective Culling Procedures

Visual culling of ewe hoggets was independently carried out annually by five different groups of farmers who had contributed rams to the Rotomahana strain trial (Baker *et al.*, 1987). They were asked to identify the poorest 30% of a group of 16-month old Romney ewe hoggets and to provide a reason (or reasons) for 'culling' each sheep. The five groups of farmers independently culled from the same group of animals (the Industry Control group) on consecutive days without access to production records. All animals, including those 'culled' by the farmers, were retained and entered the breeding flock for assessment of lifetime performance in terms of reproduction and wool production.

Performance culling was also carried out as a paper exercise using unadjusted data, culling the lowest 30% for each trait or index. Performance culling effectiveness was assessed for several traits routinely recorded in the sheep breeding projects at Rotomahana. Measurements included live weights recorded at 3, 8, 13 and 16-months of age, lamb fleece weight (4 mo), hogget fleece weight (13 mo), face cover score (18 mo), hogget oestrous activity and two indices combining body weight (BW) and fleece weight (FW) using the weightings

of BW + 4FW (Clarke and Binnie, 1981).

Data from 201 Industry Control ewes born in 1979 and 1980 were analysed. The effects of visual culling and performance culling were evaluated in terms of the difference in performance between 'selected' and 'culled' ewes. Economic returns per ewe were estimated based on cumulative number of lambs weaned and total weight of wool produced, through the third production year. Assumptions were: $15 per additional lamb weaned and $3 per kg of greasy wool.

Lifetime Ewe Performance

The Rotomahana strain trial involved evaluating Romney rams from six sources (i.e. a control sampled from a wide range of Romney studs, the Ruakura High Fertility flock, three Romney group breeding schemes and a Romney stud flock), Coopworth rams from a large group breeding scheme and Border Leicester rams sampled widely from industry flocks. In addition to culling the ewe hoggets from the Industry Control group of sheep, each group of breeders was asked to 'cull' the ewe hoggets bred from rams of their breeding group. The Romney stud flock opted not to be involved in this trial.

By 1988 when the trial was terminated ewes born in 1979 and 1980 had complete ewe production records to seven years of age (i.e. 6 production years) for survival rate of ewes, ewe reproduction, ewe fleece weight and ewe body weight. Analysis of ewe performance traits was carried out within each production age using a least squares model which included year born (1979 or 1980), cull code (selected or culled) and strain (N=7; i.e. the Romney stud flock not included). All first-order interactions among the three main effects were either non-significant or accounted for a negligible percentage of the total variation, and were deleted from the model.

RESULTS AND DISCUSSION

Visual and Objective Culling of Industry Control Ewes

All breeder groups improved economic returns by their visual culling (Table 1) which put most culling emphasis on size with varying culling emphasis placed on unacceptable mouths, woolly face and wool. Relatively few sheep were culled for feet abnormalities or breed type. There was

TABLE 1 Distribution of visual culling emphasis (%) and effects of culling on subsequent ewe production and economic returns (Industry Control ewes: N=201).

	Breeder group				
	A	B	C	D	E
Primary culling feature					
Size	51.6	68.2	43.5	64.0	43.9
Mouths (teeth or jaws)	21.0	4.5	21.0	26.6	29.8
Face cover	19.4	7.6	21.0	7.8	10.5
Wool	1.6	16.7	9.7	-	10.5
Feet	3.2	3.0	-	-	5.3
Breed type	3.2	-	4.8	1.6	-
Hogget performance (selected-culled)					
Body wt (16 mo), (kg)	5.6	8.0	5.1	5.3	6.1
Fleece wt (13 mo), (kg)	0.17	0.41	0.26	0.23	0.29
Ewe production (selected-culled)					
Lambs weaned/ewe joined[1]	0.55	0.80	0.37	0.53	0.77
Fleece wt (kg)[1]	0.40	0.89	0.81	0.59	0.68
Ewe returns ($)[2]	0.95	1.47	0.80	0.97	1.36

1 Accumulated over the first three production years.

2 Per ewe retained in the flock per year: based on values of $15 per lamb weaned and $3 per kg of greasy wool

TABLE 2 Differences (selected – culled) in hogget performance traits and subsequent ewe production and economic returns as a result of objective culling (Industry Control ewes: N=201).

	Hogget performance		Ewe production		
	Body wt (16mo) (kg)	Fleece wt (13mo) (kg)	LW/EJ[1]	Fleece wt[2] (kg)	Ewe returns[3] ($)
Culling criteria					
Weaning wt (3 mo)	5.5	0.33	0.31	1.36(0.83)	0.87
May wt (8 mo)	7.1	0.52	0.81	1.15(0.63)	1.56
Oct wt (13 mo)	8.6	0.57	1.10	0.90(0.90)	1.92
Two-tooth wt (16 mo)	9.6	0.57	0.98	0.78(0.78)	1.70
Lamb fleece wt (4 mo)	3.9	0.35	0.39	1.51(1.16)	1.04
Hogget fleece wt (13 mo)	6.6	0.81	0.98	1.49(1.49)	1.86
Face cover (18 mo)	2.1	0.07	-0.15	0.08(0.08)	-0.23
Hogget oestrus (No. tupps)	1.7	0.13	0.63	0.13(0.00)	0.98
May wt and lamb FW	7.4	0.58	1.04	1.58(1.00)	2.03
Oct wt and hogget FW	10.0	0.74	1.22	1.23(1.23)	2.21

[1] Lambs weaned/ewes joined accumulated over the first three production years.
[2] Includes all fleece weights recorded subsequent to the culling decision. Shown in brackets is the cumulative ewe fleece production for 2, 3, and 4-year-old ewes.
[3] Per ewe retained in the flock per year: based on values of $15 per lamb weaned and $3 per kg of greasy wool.

nearly a two-fold range among breeders in their visual culling effectiveness for improving economic performance.

Analysis of the effect of culling on objective performance traits in the same group of ewes (Table 2) shows that post-weaning body weights, fleece weights or combinations of these traits were the most useful culling criteria for improvement of subsequent ewe performance. This agrees with earlier predictions (Clarke and Binnie, 1981). Relatively low economic returns were achieved from culling on weaning weight or hogget oestrous activity. Economic returns realised from culling on face cover were negative, possibly because the Romney ewe hoggets, as a group, were quite open-faced.

In general, culling on performance records was more effective than subjective visual culling. The best culling groups (B and E) achieved about 75% of the economic returns made by selecting on either hogget body weight (October weight) or hogget fleece weight. Group B was able, by visual assessment, to achieve 83% of the potential selection differential possible for 18-month body weight and 50% of the selection differential possible for hogget fleece weight.

The relatively high ewe reproduction after culling on hogget fleece weight and the relatively high ewe fleece weights after culling on hogget body weight are both at variance with predictions made by Clarke and Binnie (1981). The present results suggest moderately positive phenotypic correlations between hogget fleece weight and ewe reproduction and between hogget body weight and ewe wool production. Clarke and Binnie (1981) noted that considerable variation existed in both the phenotypic and genetic parameter estimates on which their predictions were made.

Clarke and Binnie (1981) also noted that using

TABLE 3 Effect of visual culling on lifetime production of ewes (average production/ewe/year) from 2 to 7 years of age (All strains).

Trait	Selected	Culled	SED
Number of 2-year old ewes	837	372	
Number of lambing records	3930	1661	
Pre-lambing body wt, (kg)	65.4	60.1	0.6***
Ewe fleece wt (kg)	4.40	4.13	0.06***
Ewes lambing/ewes joined	0.92	0.89	0.02
Lambs born/ewe lambing	1.68	1.56	0.05*
Lambs weaned/ewe lambing	1.34	1.25	0.06
Lambs weaned/ewe joined	1.23	1.11	0.06*

hogget body weight as a culling criterion for ewe hoggets is likely to increase adult ewe body weights more than other possible hogget culling criteria. This may be undesirable if it increases maintenance feed requirements in the breeding flock. Accordingly, hogget oestrus and hogget fleece weight were their favoured hogget culling criteria. In the present study the difference between the selected and culled ewes for adult ewe body weights after culling on hogget body weight, hogget fleece weight or hogget oestrous activity was 9.6, 7.8 and 2.2 kg, respectively.

The culling criteria evaluated in Table 2 differ in the ease with which they can be measured and the time when they are measured. Many commercial farmers would prefer to carry out early culling of ewe hoggets to avoid the costs of wintering animals unlikely to become ewe replacements. The present results suggest that 8-month body weight or an index combining this weight with lamb fleece weight would effectively meet such a goal.

Effects of Visual Culling in all Strains on Lifetime Ewe Production

The effect of visual culling, averaged over the different strains and cullers, on ewe lifetime production is presented in Table 3. The difference between the selected and culled groups of ewes averaged 5.3 kg for ewe body weight and 0.27 kg for annual ewe fleece weight, both in favour of the selected group. This relates to differences of 6 kg for 16-month body weight and 0.32 for hogget fleece weight, and reflects the high repeatabilities often observed for these traits. Differences between the selected and culled ewes for the reproduction traits all favoured the selected ewes, but these differences were significant only for litter size (lambs born per ewe lambing) and net reproduction (lambs weaned per ewe joined).

Ewe age had a major effect on all traits summarised in Table 3. Ewe body weights were highest at 6 years of age (Fig. 1). The average difference of 5.3 kg between the selected and cull ewes was consistent across all ages. Ewe fleece weights plateaued at 3 to 5 years of age with a definite decline in 6- and 7-year-old ewes (Fig. 2). Net ewe reproduction peaked at 5 years of age (Fig. 3) with a consistent difference between selected and culled ewes through 6 years of age but a smaller difference at 7 years of age as a result of low survival from birth to weaning of lambs of selected ewes.

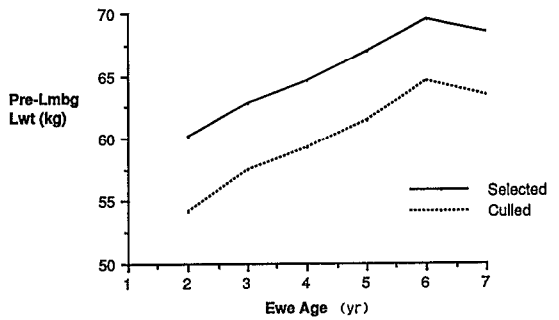

FIG.1 Lifetime body weights of selected and culled ewes.

FIG. 2 Lifetime wool production of selected and culled ewes.

FIG. 3 Lifetime net reproduction (lambs weaned/ewe joined) of selected and culled ewes.

Because data presented here are from a flock of sheep that had not been subjected to any

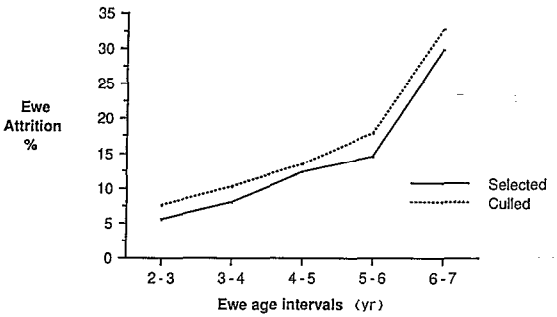

FIG. 4 Annual attrition rates of selected and culled ewes.

deliberate form of culling from birth to 7 years of age, they offer a unique opportunity to study natural attrition rates in ewes (Fig. 4). Annual attrition rates in both the selected and culled ewes rose from 5% as 2-year-olds to about 13% as 5-year-olds and then increased considerably in 6- and 7-year-old ewes. Although the culled ewes consistently had a slightly higher attrition rate than the selected ewes, this difference was not statistically significant.

Optimum Culling Age

TABLE 4 Age distribution in 3 theoretical flocks resulting from casting-for-age at 5, 6 or 7 years of age.

	Ewe age					
	2	3	4	5	6	7
4 age classes	0.28	0.26	0.24	0.22		
5 age classes	0.24	0.22	0.21	0.18	0.15*	
6 age classes	0.21	0.20	0.19	0.16	0.14	0.10

The lifetime production of the ewes also permitted an examination of the optimum culling age in this flock. Three situations were examined; culling of cast-for-age ewes at 5, 6 or 7 years of age. Based on the attrition rates observed in the selected ewes (Fig. 4), the resulting three theoretical flocks would have had age distributions as shown in Table 4.

From the observed age effect on lamb (Fig. 3) and wool production (Fig. 2), total flock returns were estimated in terms of lambs sold ($15 per lamb), total wool produced ($3 per kg for lamb, hogget and ewe wool) and value of cull ewes ($18 for 5-year-olds, $12 for 6-year-olds and $5 for 7-year-olds). Culling of 5-year-old ewes gave the highest economic returns with a 6% decline in economic returns when culling 6-year-olds and a further 3% decline when culling 7-year-olds.

CONCLUSIONS

Compared to random selection, visual culling of ewe hoggets resulted in superior ewe production in terms of both reproduction and wool production. The higher production level was maintained throughout the ewe's lifetime. While visual culling without records was effective when carried out by experienced farmers, performance culling on hogget body weight or hogget fleece weight or a combination of these traits was consistently found to be more effective and yielded up to 50% greater economic returns than the best visual culling.

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