A TECHNIQUE FOR EVALUATING FAT LAMB PRODUCTION

I. J. INKSTER, K. E. JURY and J. P. MULLER
Ruakura Agricultural Research Centre, Hamilton

SUMMARY

Liveweight and slaughter data are reported from Southdown × Romney lambs, reared under fat lamb conditions, to illustrate a technique that has been used for evaluating fat lamb production of ewes of two different nutritional histories. A comparison is made of two similar groups of lambs of 56 lb liveweight and over in December, killed 6 to 7 weeks apart, to examine effects on carcass characteristics.

INTRODUCTION

THE EVALUATION of the effects of different treatments on dairy production is relatively simple, as samples can be taken throughout the lactation and the total production accurately defined in chemical and physical terms. In the case of fat lamb production, the lambs are changing with time in weight and body composition, and, while liveweight may be recorded at intervals, carcass composition can be evaluated only at slaughter. Thus, the times at which lambs are killed must be chosen to yield the maximum amount of information on the effects of the experimental treatments.

Three criteria may be used, independently or in combination, to select lambs for slaughter. These are age, liveweight and degree of fatness as determined by a commercial, fat lamb picker.

In commercial practice, at each of a number of drafts, all lambs meeting a liveweight and condition criterion are removed and killed. Under these conditions, comparisons between drafts are not valid, since a selected group at one point in time is being compared with the balance of the mob at a later time. Thus draft by treatment interactions, if present, would not be revealed.

In this paper, data from a current experiment are presented to illustrate a technique in which the lamb crop is divided into two on the basis of liveweight and the groups are killed in two drafts, approximately six weeks apart. The lambs under consideration are the progeny of ewes of different nutritional histories.

EXPERIMENTAL

In 1953, two flocks were established at the Whatawhata Hill Country Research Station to compare Romney ewes

under high and low planes of nutrition respectively. Ewes in these flocks have been transferred as 5-year-olds to run together in a fat lamb flock. Here they are mated to Southdown rams and managed according to normal commercial, fat lamb practice.

The following drafting system has been adopted for this fat lamb flock. In December all ewes and lambs are yarded and lambs drafted. Lambs are marked Down, Prime, Second or Reject by a commercial, fat lamb picker, the same picker having operated since the establishment of the flock. Lambs are weighed and on the basis of this liveweight the flock is divided into two drafts: lambs are allocated within age and previous plane of dam subgroups, and for singles and twins separately, to give two groups of similar liveweight. All lambs of 56 lb weight and over allocated to the first draft are killed the following morning, the balance of this group being weaned and taken off the experiment. All ewes are weighed and weaned ewes marked and drafted. Lambs allocated to the second draft are returned, with ewes, to pasture. In January second draft lambs are again graded by the same picker, weighed, and again lambs satisfying the weight criterion are killed.

Slaughter procedure follows normal commercial practice. Carcasses are placed in one of the four subjectively appraised grades (Down, Prime, Second, Reject) by a professional grader. Cold carcass weights are recorded and carcass measurements (Palsson, 1939) taken at the last rib level (A, B, C) and on the hindquarters (F, T, G).

In 1958, the first crop of lambs was obtained in the fat lamb flock from ewes born, and run for four seasons, under one of the two planes of nutrition. Data from lambs for the years 1958–63 are considered here. Over this period, date of the first draft varied between December 7 and 15, and that of the second draft between January 17 and 29, with a range of from 42 to 49 days between drafts.

In this paper, by considering lambs of 56 lb December liveweight and over killed in the two drafts, a direct comparison is drawn between groups of initially similar weight, killed at different times. The aspects of this comparison of interest here are the advantage of killing experimental lambs at different weights and the use of a weight criterion for slaughter in evaluating experimental treatments. To illustrate these, results of analysis of the six seasons' data are summarized.

RESULTS AND DISCUSSION

Analysis of variance of data from all experimental lambs showed a highly significant interaction ($P<0.01$) between ewe age and previous plane of nutrition for age and liveweight of lambs at first draft. Ewes which have just entered the fat lamb flock from the high plane lambed on average 6 days earlier than former low plane ewes, but this difference was not present with older ewes. Associated with this difference in age at first draft, lambs from former high plane 5-year-old ewes have been, on average, 6 lb heavier than those from former low plane 5-year-old ewes, whereas this difference has been small for lambs from 6-year-olds (0.4 lb) and older ewes (1.4 lb).

Table 1 summarizes differences between drafts and the effect of ewe's previous nutritional plane and their interaction for lambs of similar December liveweight, killed in the two drafts. Although those killed in the second draft were, overall, 7 lb heavier at slaughter than first draft lambs, this difference varied markedly from season to season. For carcass weight, this draft difference varied from 2 to 4 lb according to season, averaging 3 lb over the 6 years. It is clear, therefore, that, over the 6 to 7 weeks between drafts, growth rate has been low. The small difference in weight at slaughter between lambs from former high and low plane ewes was evident for each ewe age: the selection for slaughter on a weight basis has meant that weights of lambs included have been similar for both groups of 5-year-old ewes, and so an estimate of treatment effect is evident different from that found when data from all lambs were considered. When the magnitude of treatment effects in a flock are of interest, then, as for slaughter on the basis of condition, misleading differences may be obtained.

Except for eye muscle depth (B) measurements were greater for the heavier second draft carcasses (Table 2). For lambs killed, the effect of ewe's previous plane on fat cover over the eye muscle (C) was evident both for lambs from ewes in their first lambing in the fat lamb flock and also at subsequent lambings.

Adjustment, by covariance, for variation in carcass weight left draft effects on measurements essentially as in Table 2. The similarity of the B measurement at the two times of slaughter, together with a positive relationship between B and carcass weight resulted in a marked difference ($P<0.001$) after adjustment, with first draft carcasses having relatively deeper muscle sections. Similarly, muscle width (A) and fat cover (C) were relatively greater

TABLE 1: SLAUGHTER WEIGHTS AND DRESSING %: EFFECTS FOR LAMBS ⩾56 LB DECEMBER LIVEWEIGHT

	Draft Means		S.D. within	Differences		Interaction
	I	*II*	*Subgroups*	*Draft (II–I)*	*Plane (H–L)*	*Draft × Plane (H–L)II–(H–L)I*
Number of lambs	210	211				
Liveweight at slaughter (lb)	62.5	69.4	5.7	7.1***	0.4	−0.4
Dressing %	44.3	44.5	2.4	0.1	−0.4	−0.6
Carcass weight (lb)	27.7	30.9	2.4	3.3***	−0.1	−0.5

TABLE 2: CARCASS MEASUREMENTS: EFFECTS FOR LAMBS ⩾56 LB DECEMBER LIVEWEIGHT

*Carcass Measurement**	Draft Means		*S.D.*	Differences		Interaction
	I (*210*)	*II* (*211*)	*within Subgroups*	*Draft (II–I)*	*Plane (H–L)*	*Draft × Plane (H–L)II–(H–L)I*
A (mm)	51.7	52.2	2.5	0.5*	0.0	−0.3
B (mm)	26.9	26.9	2.5	0.1	−0.3	−0.6
C (mm)	2.4	2.8	1.2	0.4***	−0.3*	−0.3
F (cm)	21.8	22.5	1.0	0.7***	0.0	0.0
T (cm)	16.7	17.3	0.6	0.6***	0.1	0.1
G (cm)	21.0	21.7	0.7	0.7***	0.1	−0.2

* Measurement sites are those of Pálsson (1939).

TABLE 3: RELATION OF HOOF TO CARCASS GRADE

	Carcass Grade				
Picker's Grade	*Down*	*Prime*	*Second*	*Reject*	*Total*
Down	68	60	4	—	132
Prime	71	129	32	—	232
Second	9	87	70	1	167
Reject	2	10	25	—	37
Total	150	286	131	1	568

($P<0.01$) in the first draft but depth of crutch (F), leg length (T) and hindquarters width (G) were relatively greater in the second draft ($P<0.01$). Thus killing in two drafts has resulted in two groups of lambs which, in these terms, varied in conformation. The advantage of a system involving killing at different drafts is in allowing evaluation at different slaughter ages and, concomitantly, weights.

The object of using the present method was primarily to investigate treatment-draft interaction — *i.e.*, to examine whether effects of ewe's previous nutritional plane on lamb weight and carcass characteristics were different at different times after lambing. This interaction for slaughter weight and carcass measurements was overall non-significant (Tables 1 and 2) and was inconsistent from season to season.

Also of interest in relation to the system of slaughter considered here is the carcass grade distribution. Overall a higher proportion of second than of first draft carcasses graded Down: while the data were inadequate satisfactorily to test year-to-year variations in distribution, in each year there was an increase in the proportion of Down carcasses between drafts for females (28% to 49% overall) but little change for males (28% to 30%). Of first draft lambs 29% graded Down, on the hooks, 53% Prime and 18% Second, whereas the second draft graded 39% Down, 48% Prime and 13% Second, although there was some seasonal variation in these distributions.

When killing on the basis of condition the objective is to slaughter lambs of a certain degree of "finish" — that selection of lambs for slaughter by the fat lamb picker is unsatisfactory was demonstrated clearly in the present experiment (Table 3). Of lambs killed, 25% of those whose carcasses graded Down or Prime had been given hoof grades of Second or Reject. Because only the heavier lambs were killed, the proportion of Second or Reject carcasses marked Down or Prime by the picker was high at 27%.

CONCLUSIONS

The theoretical requirements of a slaughter technique in fat lamb experiments are that the maximum amount of information is obtained about the effects of the treatments. The practical requirement is that the information may be a guide to the optimum drafting procedure to be used in any season, and for any schedule of prices for different weights and weight grades. It is considered that the tech-

nique used in this experiment can be useful in meeting both the theoretical and practical requirements.

From the point of view of this paper, it is unfortunate that the data presented do not reveal draft × treatment interactions, although draft differences were evident. Had the experimental treatments been "breed of sire", "breed of dam", or variations in a management factor, one might have expected the technique to be more revealing.

The professional fat lamb "picker" can play a valuable part by enabling one to relate the results of an experiment directly to current commercial practice. However, when evaluating the effects of treatments on fat lamb production, the sample of lambs to be killed and evaluated should be so selected that the results of the experiment can be used in the future, when it may be desired to produce different weights or grades of lamb.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of Miss P. M. Tennent who was responsible for the records of this experiment and Miss J. E. Webster for statistical computation.

REFERENCE

PALSSON, H. (1939): *J. agric. Sci.*, *29*: 544.

DISCUSSION

PROF. I. E. COOP: *Is this system really better than killing all the killable lambs at one draft? The criterion of treatment effect could be age-corrected weaning weight plus a comparison of carcass weights and quality, this comparison to be on both an equal weight basis and an equal age basis.*

There are two points to be considered here. The first is that a "killable" lamb is an ephemeral concept which can change with the feed situation on the farm. The second point is that "killable" lambs are assessed subjectively, and as our data show, this is subject to observer error. While the system Professor Coop suggests would have the advantage of describing what would happen in practice in a given season, the technique we have described permits one to predict what might happen if a different system of "picking" is used, and under conditions where the market demands different weights or grades of lamb.

S. D. WALKER: *What were the twinning percentages of the high and low plane groups? Were all the lambs singles or all twins?*

For former high plane and former low plane ewes, the percentages of twins born were respectively 26% and 17%. Only 44 lambs actually reared as twins are included in these data.

DR D. G. EDGAR: *Can you account for the earlier lambing date of the high plane ewes as 5-year-olds? Was it due to the earlier onset of the breeding season?*

Tupping records are available for only two seasons, and these are incomplete. In 1962, the mean date of lambing of the former low plane 5-year-old ewes was 4 days earlier than that of the high plane ewes, and there was no difference in date of onset of the breeding season. In 1963, the low plane 5-year-olds lambed, on average, 8 days later than the former high plane ewes and, in the first 16 days of the mating period, no low plane 5-year-olds were mated, in contrast to 33% of the high plane 5-year-olds.

T. G. ROBERTSON: *The object of this paper was to find out whether there was a treatment by time interaction which must be allowed for. In this case there was not but in other cases there may be. Is it intended to follow up this work with other treatments — say, a comparison of breeds — using the same technique?*

Not at present. The technique was really presented at this meeting to stimulate discussion, and in the hope that other workers will find it useful.

DR A. H. KIRTON: *Is it desirable to have a lower cut-off slaughter point such as the 56 lb liveweight used in this experiment?*

We agree that, ideally, all lambs chosen for the first draft should be slaughtered. The minimum of 56 lb liveweight was chosen for economic reasons to ensure that unsalable, reject carcasses were kept to a minimum. In the data presented there was only one reject carcass.

DR A. H. CARTER: *Although the slaughter technique described may have defects, it appears preferable to any practicable alternatives; in particular, slaughter at one time of all animals above some threshold of weight (or condition) can introduce very serious bias if the proportions selected differ as between treatments.*

In my experience the greatest single factor affecting lamb slaughter weights and hence carcass weights is age at slaughter. In the data presented were the live and carcass weights corrected for age differences?

For the purpose of this paper, age correction has not been carried out. However, the difference in weight at first draft for 5-year-old ewes did remain significant after adjustment for age. In considering such analyses the treatment effect on age would have to be borne in mind.

J. D. J. SCOTT: *Do the speakers consider that slaughtering on liveweight would be more efficient than the conventional picking system?*

We cannot answer that question. The picker was not asked to select the lambs suitable for slaughter, but to predict, without reference to liveweight, what a lamb would grade on the hooks.