FOODS AND CARCASS EVALUATION

Feed Efficiency and Carcass Characteristics of Ram Lambs Born in Three Seasons and Slaughtered at Four Weights

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Story in Brief

Over the past two years, 108 crossbred ram lambs from three lambing seasons were slaughtered at weights of 100, 120, 140 and 160 lb to study changes in live performance and carcass characteristics as slaughter weight increased. Twelve lambs weighing about 70 lb were started on feed at the same time, and three were removed as the average pen weight reached each of the designated weights. Feed consumption for each pen and individual weight gains were recorded from 70 to 100 lb and for each successive 20-lb weight interval. Lambs to be slaughtered were trucked from the Southwest Livestock and Forage Research Station, El Reno, Oklahoma, to the Oklahoma State University Meat Laboratory. After slaughtering, the carcasses were evaluated for USDA carcass quality, yield grade and yield of trimmed retail cuts.

The greatest changes in live and carcass traits occurred between the 100- and 120-lb weight groups and again at 160 lb. The 120- and 140-lb weight groups were much more similar for all traits than any other comparison. Overall, approximately 1.4 lb of additional feed per pound of gain were required in the 100- to 120-lb gain interval compared to the 70- to 100-lb interval. The 140- to 160-lb interval required 0.5 lb more of feed per pound of gain than the 120- to 140-lb interval. Daily gains differed little, although the final weight interval had the lowest gains.

Dressing percentage, fat thickness and yield grade all increased as weight increased, but the greatest differences occurred between 100 and 120 lb and again at 160 lb. Rib eye area increased consistently with each 20-lb increment. Yield of very closely trimmed retail cuts on a carcass basis decreased as the lambs became heavier and fatter. However, due to higher dressing percentages, the heavier lambs yielded similar amounts of very closely trimmed retail cuts as a percentage of live weight.

These data indicate that crossbred ram lambs maintain consistent, although less efficient, daily gains up to 160-lb slaughter weights. Increased fatness and continued muscle growth increase the proportion of carcass components in the live animal, and

this improved dressing percentage compensates for the extra trimmable fat in heavy carcasses. Depending on feed costs, producers may very well feed ram lambs to weights well in excess of 100 lb. And, as long as there are no additional handling problems with large carcasses, retail cut yield, as a percentage of live weight, counterbalances to a large degree the reduced per pound value of larger, lower cutability carcasses.

Introduction

The consistent high price of lamb, relative to other meats, suggests that lamb supply has decreased more rapidly than demand. One of the alternatives for increasing the supply is to feed lambs to heavier weights. In previous work (Research Report 1978), ewe lambs were found to be less efficient and to produce fatter carcasses when fed to 125-lb as compared to 100-lb slaughter weights. However, ram lambs, although less efficient and fatter at the heavier weight, were acceptable in both performance and carcass merit. In addition, an increase in dressing percent at the heavier weights was found to offset the extra fat trim, and yield of retail cuts as a percentage of live weight was observed to be quite similar. These results indicate that producers could feed ram lambs to heavier weights and still produce carcasses that would be acceptable in cutability.

The objectives of this study were: 1) to more fully understand the offsetting effect of dressing percentage *vs* fat trim in heavier lambs, and 2) to measure the live performance and feed efficiency of heavy weight ram lambs in different seasons.

Materials and Methods

Crossbred ram lambs produced from Suffolk, Hampshire, Suffolk x Hampshire or Hampshire x Suffolk sires mated to dams of various levels of Rambouillet, Dorset and Finnsheep breeding were selected from an 8-month lambing interval project in progress at the Southwestern Livestock and Forage Research Station. Thirty-six lambs from the fall 1977 season were placed on feed in January 1978; 48 lambs from the summer 1978 season were placed on feed in September 1978 and 24 lambs from the winter 1979 season were placed on feed in May 1979. Each pen was started on a finishing ration consisting of 45 percent alfalfa, 50 percent milo and 5 percent molasses when 12 lambs weighed between 68 and 72 lb for a pen average of 70 lb. When a pen of 12 lambs averaged 100 lb the lambs were sorted into upper, average and lower third weight groups, and one lamb from each group was chosen at random for slaughter. The same procedure was followed at pen average weights of 120 and 140 lb. This procedure allowed each lamb an equal chance of being one of the lambs slaughtered at 160 lb. Feed efficiency was calculated on total pen feed consumption and gain for each weight interval. Therefore, for each pen the values involved 12 head for the first interval (70 to 100 lb) and nine, six and three head for the respective, subsequent intervals.

During the first two seasons all of the remaining lambs in a pen were sheared when the pen average was 120 lb. Fleece weights were recorded, and the slaughter weights for heavier weights were designated weight minus the average fleece weight. All dressing percentages were calculated as if lambs had not been sheared. During the last season the pens were shorn at an average weight of 100 lb, with the same accounting for fleece weight at heavier weights.

Lambs ready for slaughter were shipped to the OSU Meat Laboratory and held overnight without feed. The live weight used for dressing percentage and other calculations was the last Research Station weight obtained the day before slaughter. After slaughter, carcasses were chilled for 24 hours at 34°F and then evaluated for USDA quality and yield grade factors. Carcasses were double wrapped in heavy beef shrouds to prevent undue shrinkage prior to cutting.

In cutting, the rib eye area was obtained, and the right side was broken into major wholesale cuts. The leg and shoulder were separated into lean, fat and bone portions, and the percentage of boneless lean for these cuts was calculated on both a carcass and live-weight basis.

Two "bone-in" weights were taken for the rack and loin: 1) a "full cut" weight with all external fat removed, and 2) a "retail cut" weight where the flank portion of the loin and riblets of the rack were removed from the "full cut" closely trimmed loin and rack. Percentage yields of the "full cut" rack and loin were made on a carcass and live-weight basis. The "retail cut" rack and loin weights were combined with the boneless, closely trimmed leg and shoulder weights to obtain a yield of closely trimmed, higher-valued retail cuts as a percentage of live and carcass weights.

Results and Discussion

Live performance

A major concern with feeding any market animal to heavier slaughter weight is an associated decline in the performance of that animal, especially in terms of feed conversion. Seasonal differences also exist. Cold, wet winters increase the proportion of consumed energy to be used for body maintenance, and less is available for growth of muscle and bone and fattening the animal. Seasonal extremes in temperature, high or low, may also lower the appetite, and again, that decreases the amount of energy above maintenance and thereby lowers the efficiency of gain. Chronic disease problems, while not causing an increase in death rate, may lower performance, and levels and severity of infection vary within a flock from year to year.

As indicated in Table 1, lambs born in the summer of 1978 and fed through fall and winter seasons were the poorest performers overall. Even in the growing interval from 70 to 100 lb, which should be the most efficient, these lambs consumed less feed, had lower average daily gains and were far less efficient than would be expected at this size. The June lambs from which these lambs were a sample were afflicted by chronic health

Table 1. Feedlot performance for ram lambs fed to four slaughter weights in three seasons (lb).

Wt/lb	Season (head)[a]	Feed Intake	ADG	Feed/Gain
70-100 lb	I(36)	4.2	.72	5.7
	II(48)	3.9	.53	7.3
	III(24)	4.6	.75	6.2
100-120 lb	I(27)	4.5	.68	6.6
	II(36)	5.3	.57	9.3
	III(18)	5.7	.81	7.0
120-140 lb	I(18)	5.3	.71	7.5
	II(24)	4.8	.55	8.9
	III(12)	4.7	.63	7.4
140-160 lb	I(9)	5.2	.60	8.6
	II(12)	5.7	.64	9.1
	III(6)	4.3	.58	7.4

[a]Season:

	Lambs Born	Fed
I	fall '77	spring/summer '78
II	summer '78	fall/winter '78-'79
III	winter '79	summer '79

problems during the hot summer, including a coccidiosis outbreak. A polyarthritic condition, similar to that often observed in feedlot lambs, also was prevalent among the sampled lambs and their contemporaries. During this period the loss of mobility in varying degrees was an added factor in the lowered performance. Furthermore, the fall and winter periods of feeding in this year were far worse than normal for Oklahoma. That in itself would also affect performance adversely. In all weight intervals, more feed was required per pound of gain by this season's lambs, and although intake was similar to other seasons at the heavier weights, average daily gain was appreciably less in these lambs, except in growth from 140 to 160 lb.

The lowered performance of one season's lambs makes overall summarization of performance characteristics difficult. In general, however, it can be observed from Tables 1 and 2 that: 1) as would be expected, each pound of gain requires more feed as live weight increases: 2) by far the most efficient period of growth is from 70 to 100 lb: 3) the two intermediate intervals (100 to 120 and 120 to 140 lb) are generally the most similar.

The decision of a producer to feed lambs to much heavier weights would depend, then, upon the cost of feed in perspective to both the reduced efficiency of heavy lambs in feed conversion and the ultimate market value of heavier market lambs.

Carcass traits

Ultimate market value of heavy ram lambs depends upon carcass desirability, the most important factor being the yield of a higher-valued, more desirable retail product. Although great seasonal differences were observed in live performance, carcass characteristics were similar within slaughter weight groups across seasons without seasonal trends.

In Table 3, it can be seen that dressing percentage, fat thickness and yield grade all increased as slaughter weight increased. Furthermore, the 120- and 140-lb slaughter weights are quite similar, being intermediate to the two extremes. Rib eye area increased with each 20-lb increase in slaughter weight. This indicates that muscle growth was still occurring, and meatier chops may be more desirable to consumers in the retail case. Quality scores increased with weight and fatness, except in the 160-lb group, where grade evaluation of carcass maturity became a factor. Generally, carcasses from heavier weight lambs were fatter externally and internally, had higher numerical USDA yield grades, higher quality scores and larger rib eye areas.

As the yield grades in Table 3 would indicate, the carcass cut-out information in Table 4 shows the percentage yield of retail cuts on a carcass basis was lowered as the lambs became heavier and fatter. Compared to the lightest slaughter weight (100 lb), carcasses from the 120- and 140-lb groups were similar in yield of trimmed retail cuts. The 120-lb group was lower in yield by 3.5 percent than the light-weight lambs, and the 160-lb group was by far the lowest in cutability, being about 7.0 percent lower in yield than the 100-lb group. The decline in yield of leg, loin and shoulder was fairly constant across slaughter groups, while the percentage of closely trimmed rack changed the least.

Although the decline in trimmed retail cut yield on a carcass basis was quite distinct as lambs became heavier, the counterbalancing effect of improved dressing percentage should be considered in determining the "real" live value. As shown in Table 5 and depicted graphically in Figure 1, the improved dressing percentage of heavier lambs may largely compensate for extra fatness. In fact, the 120-lb group yielded 0.5 percent more trimmed retail cuts on a live weight basis than the 100-lb group. Therefore, between these weights, increased dressing percentage was due to a lower proportion of offal and "dress-off" items to carcass components other than trimmable fat. However, at progressively heavier weights, fat became a larger advantage in dressing percentage, as shown by declining yields on a live weight basis.

Table 2. Overall means for feedlot performance across all seasons for four weight intervals.

Wt/lb (head)	Feed Intake (lb)	ADG (lb)	Feed/Gain (lb)
70-100 lb (108)	4.2	.64	6.5
100-120 lb (81)	5.1	.66	7.9
120-140 lb (54)	4.9	.62	8.1
140-160 lb (27)	5.2	.61	8.6

Table 3. Overall means for general carcass characteristics of ram lambs slaughtered at four weights (across seasons).

	Average live weight (lb)			
	100	120	140	160
Dressing percent[a]	47.5	50.3	50.7	51.6
Quality score[b]	11.8	12.6	13.3	12.8
Fat thickness[c]	0.16	0.26	0.29	0.35
Percent kidney/pelvic fat	2.8	3.4	3.5	3.6
Rib eye area[d]	2.15	2.45	2.66	3.01
USDA yield grade	2.9	3.5	3.8	4.3

[a]Cold carcass wt ÷ live wt x 100.
[b]Avg choice = 11, High choice = 12, etc.
[c]12th rib, in.
[d]Sq in.

Table 4. Percentage of very closely trimmed retail cuts on carcass basis of ram lambs slaughtered at four weights (across seasons).

	Average live weight (lb)			
	100	120	140	160
Shoulder[a]	14.67	13.43	13.03	12.67
Leg[a]	17.52	15.94	15.45	14.89
Rack[b]	8.30	8.33	8.03	7.97
Loin[b]	13.05	11.87	11.98	11.44
Retail cuts[c]	49.43	45.90	43.58	42.67

[a]Boneless, virtually all fat removed.
[b]Bone in, riblets or flank portion attached, external fat removed.
[c]Boneless leg, shoulder, bone in rack and loin, riblets and flank portion removed, virtually all fat removed.

Table 5. Percentage of very closely trimmed retail cuts on live basis of lambs slaughtered at four weights (across seasons).

	Average slaughter weight (lb)			
	100	120	140	160
Shoulder[a]	6.97	6.73	6.59	6.54
Leg[a]	8.32	7.99	7.83	7.69
Rack[b]	3.94	4.19	4.07	4.12
Loin[b]	6.20	5.93	6.07	5.90
Retail cuts[c]	22.48	23.06	22.07	21.98

[a]Boneless, virtually all fat removed.
[b]Bone in, riblets or flank portion attached, external fat removed.
[c]Boneless leg, shoulder, bone in rack and loin, riblets and flank portions removed, virtually all fat removed.

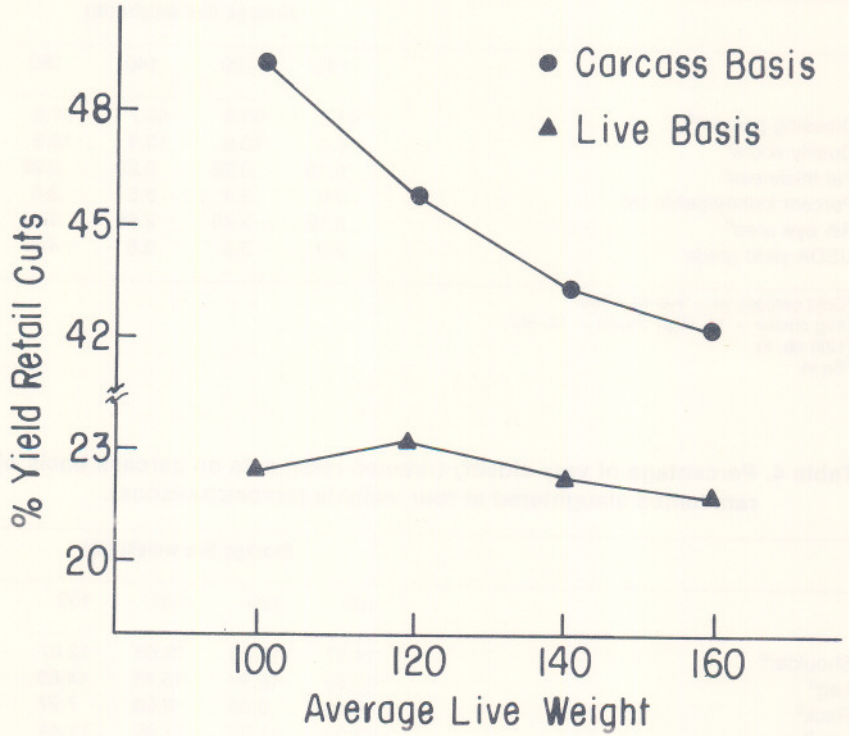

FIGURE 1. Decline in yield of very closely trimmed retail cuts with increasing live weight.