FEEDLOT PERFORMANCE AND CARCASS CHARACTERISTICS OF SMALL, MEDIUM AND LARGE FRAME WETHERS BACKGROUNDED ON WHEAT PASTURE

M.E. Nichols[1], H.G. Dolezal[2], G.Q. Fitch[3], W.A. Phillips[4]

Story in Brief

One hundred seventy crossbred wethers (approximately 7 months of age) were selected to represent small, medium, and large frame groups. Lambs were weighed, backgrounded on wheat pasture for 105 days and then serially slaughtered at 14 day intervals during a 56 day finishing phase. Approximately 24 hours postmortem, all factors affecting USDA quality and yield grades were obtained. Frame size had no effect on overall gains on wheat pasture, but small frame lambs gained significantly slower than their counterparts for the 56 day feedlot period. At a constant slaughter weight (105 lb), small frame lambs had higher dressing percentages, heavier carcass weights, more external and internal fat, and larger ribeyés than medium or large frame lambs. All three frame groups differed in actual fat thickness, percent kidney and pelvic fat, quality grade, and yield grade for weight constant comparisons. In this study, large, medium, and small frame lambs reached a 105 lb shrunk slaughter weight in 19, 30, and 55 days, respectively. Differences between frame groups at fat constant endpoints (constant fat thickness, constant quality grade, constant yield grade) were most notable for slaughter weight and hot carcass weight. Small, medium, and large frame lambs reached a constant subcutaneous fat thickness (0.15 in) at shrunk live weights of 101, 112, and 120 lb., respectively. Managing for differences in frame size of lambs backgrounded on wheat pasture could prove beneficial if mandatory yield grading and value based marketing become a reality.

(Key words: Lambs, Wheat Pasture, Feedlot, Carcass Traits)

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[1]Graduate Assistant [2]Associate Professor [3]Assistant Professor [4]Research Leader USDA-ARS, Grazinglands Research, El Reno, OK

Introduction

Consumer demand for foods with lower fat content have prompted the meat industry to produce and offer leaner products. Unfortunately, the current pricing structure in the lamb industry emphasizes dressing percentage which frequently rewards the production of fat. The lamb segment of the meat industry has not followed the lead of pork and beef producers in reducing the amount of needless fat on finished carcasses. With the advent of the proposed USDA lamb yield grade system which requires all lamb carcasses to be yield graded, lamb producers may have a mandatory system that could provide a financial incentive to produce leaner carcasses.

Lamb producers and feeders in the southern U. S. have a unique opportunity to benefit from this marketing change by utilizing wheat pasture to grow lambs without depositing excess fat prior to the feedlot phase. This system also allows the marketing of lambs in the spring when prices are typically the highest. To effectively utilize this system, it is crucial that producers recognize the variation in growth patterns of feeder lambs and manage accordingly. The objective of this study was to determine the differences in feedlot performance and carcass traits of lambs representing three different frame sizes that were previously grown on wheat pasture.

Materials and Methods

One hundred seventy Texas-Rambouillet wether lambs were selected based on frame size from a group of 2000 to satisfy three frame size groups (small-S, medium-M, large-L). Lambs were approximately 7 months old. Frame size determination was based on visual assessment by two experienced evaluators. Lambs were transported to the USDA Research Laboratory at El Reno, OK and fed prairie and alfalfa hay for a 3 wk adjustment period. Lambs were individually identified, dewormed and weighed prior to being placed on wheat pasture. Live weights were taken every 35 d following a 24 h shrink until the end of wheat pasture on d 105. Lambs were sheared between d 70 and d 105 while on wheat and individual fleece weights were taken. At the conclusion of the growing phase lambs were penned by frame size (2 pens per frame), and placed on 40% concentrate diet (corn and soybean meal) and 60% roughage (alfalfa hay). The concentrate level was increased gradually to 85% concentrate. All lambs were weighed at 14 d intervals and feed intake was recorded by pen and adjusted to a dry matter basis for each weigh period. Subsets of lambs (10 per frame) were serially slaughtered on each weigh date (0, 14, 28, 42, 56 d) at a commercial facility. Hot carcass weights were recorded at slaughter and approximately 24 h postmortem, chilled carcass weights as well as yield and quality grade factors were obtained.

Differences in traits were tested for significance using analysis of variance procedures. Wheat pasture and feedlot performance parameters were analyzed using frame size as a fixed main effect. All slaughter and carcass traits were adjusted via polynomial regression equations to the mean initial weight within frame size. These adjusted traits were used to calculate least squares means at four different slaughter endpoints (constant weight, fatness, quality grade, and yield grade) using polynomial regression equations for each frame group. Percent U.S. choice by frame group over feeding time was calculated using non linear regression. Means were tested using Tukey's honest lsd procedure.

Results and Discussion

Wheat pasture average daily gain (ADG) stratified by frame size is presented in Table 1. While differences (P<.05) in gain existed between frame groups for the first and second 35 d periods, no differences were noted for the entire period (0-105d). During the first 35 d, a polyarthritis outbreak was diagnosed and all lambs were placed in a drylot for a 9 d treatment period which severely altered gains. During the last 35 d of the wheat pasture phase, forage availability was limited which would explain why the gains observed were lower than previous work by Noble et al. (1958) who reported gains around 0.39 lb/hd/d.

Feedlot ADG differed (P<.05) between frame groups but the pattern was not consistent across periods (Table 2). Small framed lambs had greater (P<.05) ADG than medium frame lambs during the first 14 d in the feedlot, however during the last two periods (0-42 d and 0- 56 d) the small frame lambs had the lowest (P<.05) ADG. These observations indicate that small

Table 1. Wheat pasture average daily gain (lb/d) stratified by frame size.

Days	Small	Medium	Large
0-35	0.037[ab]	0.049[a]	0.007[b]
0-70	0.191[b]	0.202[ab]	0.219[a]
0-105	0.144	0.153	0.139

[a,b] Means in the same row with a different superscript are different(P<.05).

Table 2. Feedlot average daily gain (lb/d) stratified by frame size.

Days	Small	Medium	Large
0-14	0.865[a]	0.748[b]	0.840[ab]
0-28	0.825	0.861	0.880
0-42	0.590[b]	0.681[a]	0.720[a]
0-56	0.600[b]	0.721[a]	0.728[a]

[a,b] Means in the same row with a different superscript are different($P<.05$).

framed lambs plateued in growth whereas medium and large frame groups maintained gains throughout the 56 d feedlot phase. No differences ($P>.05$) were noted between frame groups for feed efficiency (Table 3).

Carcass traits were examined at several different economically important slaughter endpoints to maximize the information gained from a serial slaughter design. The endpoints chosen for comparison were: 1) constant slaughter weight (105 lb), 2) constant subcutaneous fat thickness (.15 in), 3) constant USDA quality grade (low choice), and 4) constant yield grade (2.0). Multiple endpoint comparisons provide greater insight for interpreting growth and developmental differences in carcass traits. Since development is largely weight and age dependent, a weight-constant endpoint reflects carcass composition and quality in relation to degree of maturity. Among lambs of diverse types, a weight constant endpoint maximizes differences between early and late maturing types. Fat constant comparisons (constant fat thickness, constant quality grade, and constant yield grade) contrast differences between lambs at similar stages of development and provide useful marketing implications.

Table 3. Feedlot feed efficiency stratified by frame size in feedlot (lb feed/lb gain)[a].

Days	Small	Medium	Large
0-14	5.22	5.56	5.01
0-28	5.47	5.40	5.27
0-42	6.02	5.55	5.70
0-56	6.06	5.67	5.88

[a] Means were not different ($P>.05$).

Differences in carcass traits between frame groups were largely a function of the weight or degree of maturity of the lambs at the time of slaughter. Frame-related differences were greatest when comparisons were made at a constant slaughter weight (Table 4). At a constant weight, fat-related traits contrasted early versus late maturing frame groups. At a slaughter weight of 105 lb., early maturing, small frame lambs produced the heaviest, fattest carcasses (externally and internally). Although these carcasses had the highest quality grade, they were the lowest cutability. Conversely, the later maturing, large frame lambs produced the leanest, highest cutability but lowest quality carcasses.

Lambs differing in frame size were compared at fat constant related endpoints (Tables 5, 6, 7, and 8). At these endpoints the greatest differences between frame groups were in slaughter weights, carcass weights, and ribeye area. These data along with Figure 1, which graphically illustrates rate of fattening, indicate large frame lambs must be fed to heavier slaughter weights to achieve a comparable level of fatness to small frame lambs. Likewise, small frame lambs should be slaughtered at lighter weights to prevent overfattening. This is the same trend observed by Baird et al. (1988) for

Table 4. Slaughter and carcass traits stratified by frame size at a constant slaughter weight (105 lb).

Trait	Small	Medium	Large
Days fed	55.0	30.0	19.0
Slaughter wt. (lb)	105.0	105.0	105.0
Hot Carcass wt. (lb)	54.2^{d}	51.2^{e}	50.2^{e}
Dress %	51.6^{d}	48.7^{e}	47.9^{e}
Actual Fat Thickness (in)	0.18^{d}	0.11^{e}	0.07^{f}
Adjusted Fat Thickness (in)	0.18^{d}	0.11^{e}	0.09^{e}
Kidney, Pelvic Fat (%)	2.19^{d}	1.52^{e}	1.20^{f}
Ribeye Area (in^2)	2.20^{d}	2.05^{e}	1.98^{e}
Yield grade[a]	2.78^{d}	2.24^{e}	1.94^{f}
Proposed yield grade[b]	2.23^{d}	1.82^{e}	1.54^{f}
Quality Grade[c]	11.1^{d}	10.5^{e}	10.2^{f}
% Choice	98.9	98.7	95.9

[a] USDA, 1982.
[b] USDA, 1991(proposed).
[c] $Choice^{-}$ = 10, $Choice^{o}$ = 11, $Choice^{+}$ = 12; USDA, 1982.
[d,e,f] Means in the same row with a different superscript are different ($P < .05$).

Table 5. Slaughter and carcass traits stratified by frame size at a constant adjusted fat thickness (0.15 in).

Trait	Small	Medium	Large
Days fed	41.0	42.0	41.0
Slaughter wt.(lb)	101.1[d]	112.1[e]	120.3[f]
Hot Carcass wt.(lb)	50.6[d]	57.4[e]	61.1[f]
Dress %	50.1	50.6	50.8
Actual Fat Thickness(in)	0.13	0.144	0.14
Adjusted Fat Thickness(in)	0.15	0.15	0.15
Kidney, Pelvic Fat(%)	1.87	1.98	1.95
Ribeye Area(in^2)	2.15[d]	2.22[de]	2.27[e]
Yield grade[a]	2.44	2.58	2.52
Proposed yield grade[b]	2.02	2.06	2.02
Quality grade[c]	10.8	10.9	11.0
% Choice	98.2	100.0	100.0

[a] USDA,1982.
[b] USDA,1991(proposed).
[c] Choice$^-$ = 10, Choice^o = 11, Choice$^+$ = 12; USDA,1982.
[d,e,f] Means in the same row with a different superscript are different ($P<.05$).

Table 6. Slaughter and carcass traits stratified by frame size at a constant quality grade(low choice).

Trait	Small	Medium	Large
Days fed	20.0	13.0	15.0
Slaughter wt. (lb)	90.2[d]	92.6[e]	101.4[f]
Hot Carcass wt.(lb)	42.7[d]	43.8[d]	48.1[e]
Dress%	47.2	47.4	47.5
Actual Fat Thickness(in)	0.07[d]	0.05[e]	0.06[de]
Adjusted Fat Thickness(in)	0.09	0.08	0.08
Kidney, Pelvic Fat(%)	1.30	1.10	1.10
Ribeye Area(in^2)	1.86	1.82	1.94
Yield grade[a]	1.94[d]	1.77[e]	1.84[de]
Proposed yield grade[b]	1.59	1.44	1.48
Quality Grade[c]	10.0	10.0	10.0
% Choice	89.6	91.0	92.4

[a] USDA,1982.
[b] USDA,1991(proposed).
[c] Choice$^-$ = 10, Choice^o = 11, Choice$^+$ = 12; USDA,1982.
[d,e,f] Means in the same row with a different superscript are different ($P<.05$).

Table 7. Slaughter and carcass traits stratified by frame size at a constant yield grade(2.0).

Trait	Small	Medium	Large
Days fed	23.0	21.0	21.0
Slaughter wt.(lb)	92.1[d]	98.6[e]	106.3[f]
Hot Carcass wt.(lb)	44.0[d]	47.2[e]	51.2[f]
Dressing %	47.7	48.1	48.1
Actual Fat Thickness(in)	0.08	0.08	0.08
Adjusted Fat Thickness(in)	0.10	0.09	0.09
Kidney, Pelvic Fat(%)	1.39	1.26	1.25
Ribeye Area(in^2)	1.92	1.93	2.01
Yield grade[a]	2.00	2.00	2.00
Proposed yield grade[b]	1.65	1.54	1.57
Quality Grade[c]	10.1	10.2	10.3
% Choice	92.3	96.0	97.1

[a] USDA, 1982.
[b] USDA, 1991(proposed)
[c] Choice$^-$ = 10, Choice^o = 11, Choice$^+$ = 12; USDA,1982.
d,e,f Means in the same row with a different superscript are different ($P<.05$).

Table 8. Slaughter and carcass traits stratified by frame size at a constant proposed yield grade(2.0).

Trait	Small	Medium	Large
Days fed	40.0	40.0	40.0
Slaughter wt.(lb)	105.6[d]	111.7[e]	119.7[f]
Hot Carcass wt.(lb)	50.3[d]	56.3[e]	60.6[f]
Dress %	50.0	50.3	50.6
Actual Fat Thickness(in)	0.13	0.14	0.14
Adjusted Fat Thickness(in)	0.15	0.14	0.14
Kidney, Pelvic Fat(%)	1.84	1.90	1.91
Ribeye Area(in^2)	2.13[d]	2.19[de]	2.26[e]
Yield grade[a]	2.42	2.52	2.50
Proposed yield grade[b]	2.00	2.00	2.00
Quality Grade[c]	10.8	10.9	10.9
% Choice	98.1	100.0	100.0

[a] USDA,1982.
[b] USDA,1991(proposed).
[c] Choice$^-$ = 10, Choice^o = 11, Choice$^+$ = 12; USDA, 1982.
[d,e,f] Means in the same row with a different superscript are different ($P<.05$).

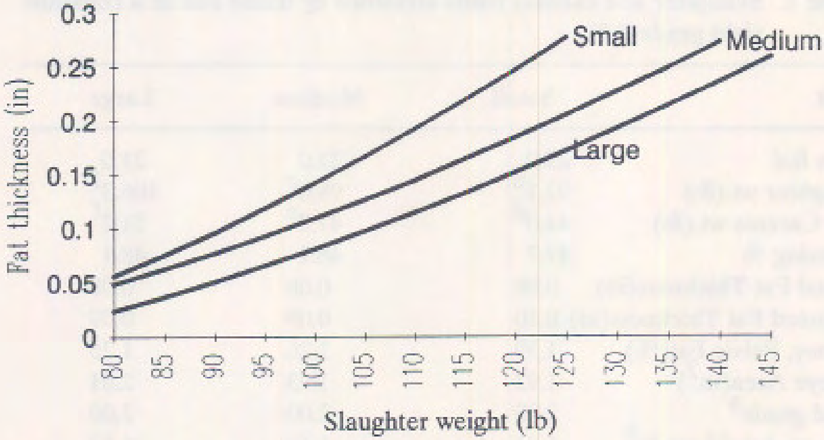

Figure 1. Frame size differences in fat thickness by slaughter weight.

lambs place directly into the feedlot, but results here indicate by backgrounding, lambs reach a fat thickness of 0.175 in. at heavier weights within frames.

Tables 7 and 8 allow for comparisons between frame types of the current and proposed USDA yield grades (1982 and 1991). If the proposed yield grading system is implemented, the most notable change from the present system will allow for heavier weight lambs with slightly more external finish to qualify for the more desirable yield grades (1, 2, and 3). This shift should still reflect reasonable cutability yields since the proposed standards require kidney and pelvic fat removal prior to grading.

In summary, frame size can be used to project the weight required for a lamb to achieve an identified level of carcass fatness. Acknowledging and managing for differences in frame size of lambs backgrounded on wheat pasture and then placed in a feedlot should prove economically beneficial to producers in the Southern Great Plains region. Likewise, such management strategies should prove more efficient if mandatory yield grading and value-based marketing becomes a reality.

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