THE EFFECT OF SLAUGHTER DATE ON CARCASS GAIN AND CARCASS CHARACTERISTICS OF FEEDLOT STEERS

R.B. Hicks[1], F.N. Owens[2], D.R. Gill[2], J.J. Martin[3], H.G. Dolezal[4], F.K. Ray[5], V.S. Hays[1] and C.A. Strasia[6]

Story in Brief

A group of 480 yearling crossbred steers averaging 703 pounds were used in an experiment to study the effect of time on feed on gain and carcass characteristics. The steers were divided into four treatment groups (120 steers) and fed either 100, 114, 128 or 142 days. Live weight daily gains decreased linearly with increased time on feed. Daily gains were 3.70, 3.49, 3.59 and 3.37 lb, respectively for steers fed 100, 114, 128 and 142 days. Similar linear trends in calculated carcass daily gains were observed (2.95, 2.88, 2.83 and 2.71 lb). Efficiency of feed use decreased linearly with time on feed (5.68, 6.10, 5.91 and 6.31 lb DM/lb gain). All carcass parameters showed linear trends with time on feed. Dressing percent increased from 63.2% for steers fed 100 days to 64.8% for steers fed 142 days. Fat thickness over the twelfth rib also increased with time on feed (.39 to .53 in). The percentage of the steers grading choice was 40, 60, 71 and 73%, respectively for steers fed 100, 114, 128 and 142 days. Numerical USDA yield grades increased with increased time on feed (2.2, 2.3, 2.8 and 2.8). Net return per head increased dramatically for steers fed a greater number of days ($32.28 at 100 days to $71.93 at 142 days). Economic analysis of this data indicates that returns increased with increased time on feed due primarily to heavier carcass weights and increased carcass value.

(Key Words: Steers, Feedlot, Serial Slaughter.)

Introduction

Knowing when to market cattle for slaughter is of critical importance to the feedlot industry. Marketing cattle for slaughter too early can reduce economic returns due to light carcass weights and failure of many carcasses to grade U.S. Choice. Typically, carcasses graded U.S. Good receive about $3-7/cwt less than those graded U.S Choice. Carcasses are also penalized for being light (weight <600 lb, -$4/cwt; and weight <550 lb, -$8/cwt). Similarly, marketing cattle too late can decrease returns due to excessively heavy carcass weights and a higher percentage of the carcasses with USDA yield grades of 4. There is typically an $8-14/cwt deduction for yield grade 4 carcasses compared to those with a yield grade 3. Based on market conditions and feed costs, the length of the finishing period may fluctuate. The purpose of this study was to evaluate the effect of slaughter date on carcass gains and characteristics. This information should be useful to determine the

---

[1]Graduate Assistant [2]Regents Professor [3]Head, Division of Agriculture, Panhandle State University [4]Assistant Professor [5]Associate Professor [6]Area Extension Specialist, Guymon, Oklahoma

relative importance of the various carcass characteristics on carcass value.

Materials and Methods

Steers, primarily crosses of British and exotic cattle, born in the spring of 1985 with an average initial weight of 700 lb, were purchased from one stocker operator near the Camargo, Oklahoma area. Steers had been pastured together and had not received supplemental feed on native grass. A total of 857 steers were trucked to Goodwell, Oklahoma on August 14 and 15. Weights were taken, and 480 uniform, upper medium frame No. 1 muscled steers were selected for feeding. Steers were allocated so that the mean weight was similar for each group of 30 steers placed in each of 16 pens. Each steer was ear tagged, received routine feedlot treatment (IBR-PI3-lepto vaccine, 4-way clostridium vaccine, Ivomec) and was implanted with Synovex S. The final diet consisted of 72.5% steam flaked corn, 6.3% hominy, 5% corn silage, 4% alfalfa, 3% cane molasses, 2% fat and 7.2% supplement [65% soybean meal, 14.7% limestone, 7.6% urea, 6.0% salt, 4.7% dicalcium phosphate, vitamin A-30 (1500 IU/lb), Rumensin-60 (27 g monensin per ton), .02% trace minerals (to add 35 ppm Zn) and Tylan-40 (9 g/ton)]. This diet was commercially prepared at Hitch Feedlot at Guymon, Oklahoma and transported twice daily to Goodwell for feeding. All feed weights were taken by truck scales which were checked daily against mill scale weights of total feed.

Initial cattle weights were shrunk, off truck weights at the start of the trial but were taken as on full-feed weights on days 30, 60 and 90 and on the day prior to slaughter. For calculation purposes, all full weights were shrunk by 4% to compensate for digestive tract fill. Four pens of cattle were trucked to Booker, TX and slaughtered on days 100, 114, 128 and 142 of the study. Liver abscesses were recorded, and carcass measurements were taken at 24 hours postmortem. Imposed across this experiment was a treatment to evaluate the effect of zinc methionine on performance and carcass parameters (described elsewhere in this publication). Statistical comparisons included slaughter date and level of zinc methionine (0 vs 1.8 g/head daily). There was no interaction between slaughter date and zinc methionine, so only the main effects of slaughter date are reported in this paper.

Results and Discussion

Live weight daily gains decreased linearly ($P<.05$) with increased time on feed (Table 1). Steers fed 100 days gained faster ($P<.05$) than steers fed 114 or 142 days (3.70 vs 3.49 vs 3.37 lb) and steers fed 128 days gained faster ($P<.05$) than steers fed 142 days (3.59 vs 3.37 lb). There was no difference in gain expressed on a carcass adjusted basis (assumed dressing percent of 62) but this may not be a valid comparison because there were differences in dressing percentage (Table 3) due to time on feed. These calculated gains were included to provide a comparison with reporting procedures used in past reports of OSU feedlot research. During the first 60 days on feed, steers destined to be fed 142 days gained less ($P<.05$) than the other treatment groups. This difference cannot be ascribed to slaughter date but must reflect a higher number of poor performing cattle being allocated by chance to the 142 day group. Feed intakes for the four treatment groups were similar.

Table 1. Effect of slaughter date on steer performance.

	Days on Feed			
	100	114	128	142
Number of steers	119	117	120	119
Number of pens	4	4	4	4
Weight, lb:				
Initial	702	703	703	704
Final[L]	1113	1143	1207	1229
Daily gains, lb:				
0-60[Q]	3.93[a]	3.92[a]	4.05[a]	3.68[b]
61-slaughter	3.75	3.29	3.41	3.33
0-slaughter, live[L]	3.70[a]	3.49[bc]	3.59[ab]	3.37[c]
0-slaughter, carcass[1]	3.86	3.85	3.86	3.73
Daily feed, lb DM:				
0-60	19.82	20.40	20.44	19.97
61-slaughter	22.82	22.28	21.82	22.26
0-slaughter	21.00	21.28	21.17	21.29
Feed/Gain:				
0-60[L]	5.05[b]	5.20[ab]	5.05[b]	5.43[a]
61-slaughter	6.10	6.79	6.41	6.70
0-slaughter, live[L]	5.68[b]	6.10[ab]	5.91[ab]	6.31[a]
0-slaughter, carcass	5.44	5.53	5.49	5.71
Metabolizable energy, mcal/kg	3.21	3.23	3.30	3.25

[abc]Means with different superscripts differ (P<.05).
[L]Linear trend (P<.05).
[1]Linear trend (P<.10).
[Q]Quadratic trend (P<.05).

Efficiency of feed use decreased linearly with increased time on feed. Steers fed 100 days were more efficient (P<.05) than steers fed 142 days (5.68 vs 6.31 lb DM/lb gain). Steers fed 114 or 128 days were intermediate in efficiency to the other two groups.

Gains and efficiencies during the 14 day intervals can be calculated as presented in Table 2. Problems with animal performance in cattle slaughtered at 142 days also biases these numbers. Calculated carcass daily gains for the 14 day periods between each of the treatment groups were 2.36 lb (100-114 d), 2.43 lb (115-128 d) and 1.64 lb (129-142 d). Rate and efficiency of gain tended to be lower during 100 to 142 days than earlier in the trial but carcass gain as a percent of live weight gain, averaged 71% and lean cuts (estimated closely trimmed retail cuts, including some bone and .5 inches or less fat) comprised 40% of carcass gain.

All carcass characteristics showed linear trends (P<.01) due to days on feed (Table 3). Daily carcass gains for the entire feeding periods were calculated assuming an initial dressing percent of 54. Carcass gains were greater (P<.05) for steers fed 100 days than for steers fed 128 or 142 days (2.95 vs 2.83 vs 2.71 lb). Carcass gains of steers fed 114 days were intermediate to the other groups (2.88 lb). Similar patterns were seen in daily cutability gains. These gains were estimated by multiplying daily carcass gain by percent cutability. Dressing percentage was lowest (P<.05) for steers fed 100 days (63.2 vs 64.5%).

Table 2. Interval performance calculated from differences among groups slaughtered on different dates.

	Days on Feed		
	100-114	115-128	129-142
Gain, lb	40	64	22
Daily gain, lb	2.86	4.57	1.57
Carcass gain, lb	33	34	23
Carcass gain, % of live gain	82.5	53.1	104.5
Daily carcass gain, lb	2.36	2.43	1.64
Estimated cutability gain, lb[a]	15.5	9.2	11.0
Est. daily cutability gain, lb[a]	1.10	.66	.78
Est. trimmable carcass fat, lb[b]	7.5	24.8	12.0
Est. trimmable carcass fat, %[c]	22.7	72.9	52.2

[a]Closely trimmed retail cuts, includes some bone and allows 1/2 inch of external fat.
[b]Carcass gain minus cutability gain.
[c]Percent of carcass gain.

Table 3. Effect of slaughter date on carcass characteristics.

	Days on Feed			
	100	114	128	142
Carcass wt, lb[L]	675[d]	708[c]	742[b]	765[a]
Daily carcass gain, lb[L]	2.95[a]	2.88[ab]	2.83[b]	2.71[c]
Est. daily cutability gain, lb[L]	1.52[a]	1.48[b]	1.42[c]	1.36[d]
Dressing percent[L]	63.2[b]	64.5[a]	64.1[a]	64.8[a]
KHP, %[L]	1.76[b]	1.74[b]	1.91[a]	1.98[a]
Fat thickness, in[L]	.39[b]	.41[b]	.49[a]	.53[a]
Marbling score*[L]	388[b]	412[a]	426[a]	426[a]
Percent choice[L]	40.1[b]	60.1[a]	70.8[a]	73.2[a]
Ribeye area, sq in[1]	12.98[b]	13.29[ab]	12.95[b]	13.42[a]
Percent yield grade 4[L]	0.0[b]	0.0[b]	2.5[a]	1.7[a]
Yield grade[L]	2.24[b]	2.32[b]	2.79[a]	2.82[a]
Cutability, %[L]	51.61[a]	51.39[a]	50.28[b]	50.20[b]
Liver abscesses:				
Incidence, %	4.2	11.1	5.0	5.9
Severity	1.0	1.8	1.4	1.0
Carcass value, $/cwt[L]	91.57[b]	93.09[a]	93.37[a]	93.61[a]
Net return, $/head[L]	32.28[c]	52.75[b]	69.31[a]	71.93[a]
Net return, cents/day[Q]	32.3[b]	46.3[a]	54.2[a]	50.7[a]

*300-399, slight; 400-499, small.
[abcd]Means with different superscripts differ (P<.05).
[L]Linear trend (P<.01).
[1]Linear trend (P<.10).
[Q]Quadratic trend (P<.05).

The percent of KHP fat was lower (P<.05) for steers fed 100-114 days than for steers fed 128-142 days (1.75 vs 1.95%). Fat thickness over the twelfth rib increased .14 inches from 100 to 142 days. The percent of steers grading choice increased linearly with time on feed (40.1 vs 60.1 vs 70.8 vs 73.2%). Rib eye area tended to increase (P<.10) with time on feed. Steers fed 100-114 days yielded a higher percent closely trimmed, boneless retail cuts than steers fed 128-142 days (51.5 vs 50.2%). In the last two kill groups, 2.1% of the carcasses had USDA yield grades of 4. The incidence or severity of liver abscesses was not influenced by time on feed.

For purposes of economic analysis, the following expenses were employed: Purchase price=$65/cwt, feed cost=$4.55/cwt dry matter, and yardage cost plus interest = 35 cents/day. The pricing structure used in determining carcass values is given in Table 4. Carcass values were calculated for each carcass and these were averaged to determine the mean carcass values for each pen of cattle. Such values may not match the carcass value calculated from mean carcass measurements as discounts may cancel premiums in many carcasses. Carcass value increased linearly (P<.01) with increased time on feed (Table 3). The average carcass value for each of the groups was 91.57, 93.09, 93.37 and 93.61 $/cwt. The net return per head also increased linearly (P<.01) with time on feed. Net return per head for the four groups was $32.28, $52.75, $69.31 and $71.93. Returns per day were greatest for steers fed 128 days (54.2 cents). The greater returns with increased time on feed were primarily due to increased carcass weights. Assuming constant market conditions, expected returns per head were greatest for steers fed 142 days. Carcass gains for the steers fed 142 days were lower than for the other treatment groups but weights still offset the increased feed and yardage cost. The effect of feed cost on net returns holding all other factors constant are presented in Figures 1 and 2. It is apparent that feeding these cattle for 142 days consistently resulted in increased returns per head. This becomes even more obvious when one considers that the cattle in this group were poorer performing cattle than the other treatment groups. Had feed cost been $5.39/cwt it would have been more economical to market the cattle at 128 days. Returns expressed on a cents/day basis, favor the cattle fed 128 days (Figure 2). Figure 3 shows the effect of purchase cost on net returns with all other costs held constant. Figure 4 shows the effect of yardage cost on net returns with all other costs held constant. This data indicates that returns increased with increased time on feed due primarily to heavier carcass weights and increased carcass value.

Due to the current trend towards leaner carcasses, this data was also analyzed using the same basic price structure as given in Table 4 to determine the incentive which would have to be paid for yield grade 1 and 2 carcasses to encourage earlier marketing of cattle. It was deter-

Table 4. Price structure for determining carcass value.

Base Value	Weight	Quality Grade	Yield Grade
$95/cwt	500-550 lb -$8	Std. -$9	1 +$1
	551-600 lb -$4	Good -$7	2 +$1
		Choice 0	3 0
		Prime +$2	4 -$8
			5 -$12

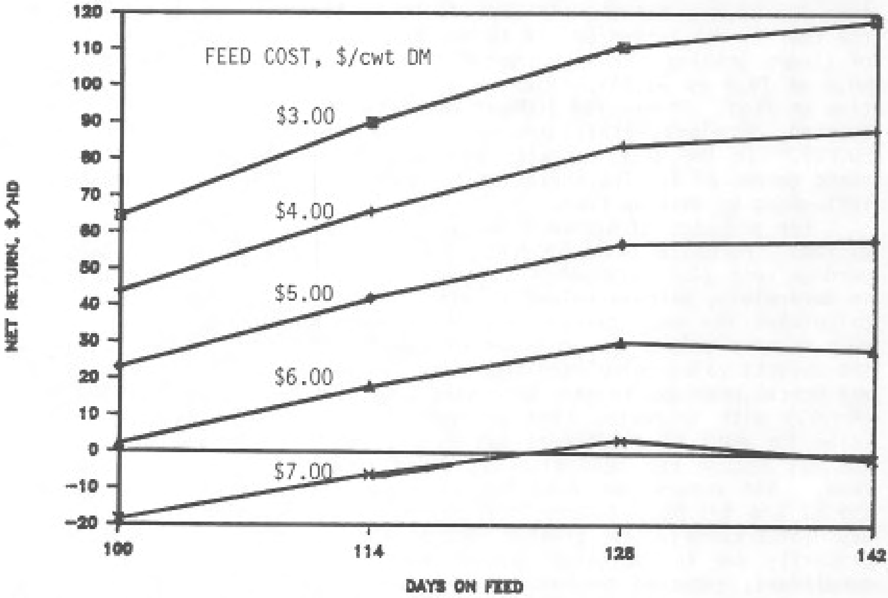

Figure 1. Effect of feed cost on net returns per head.

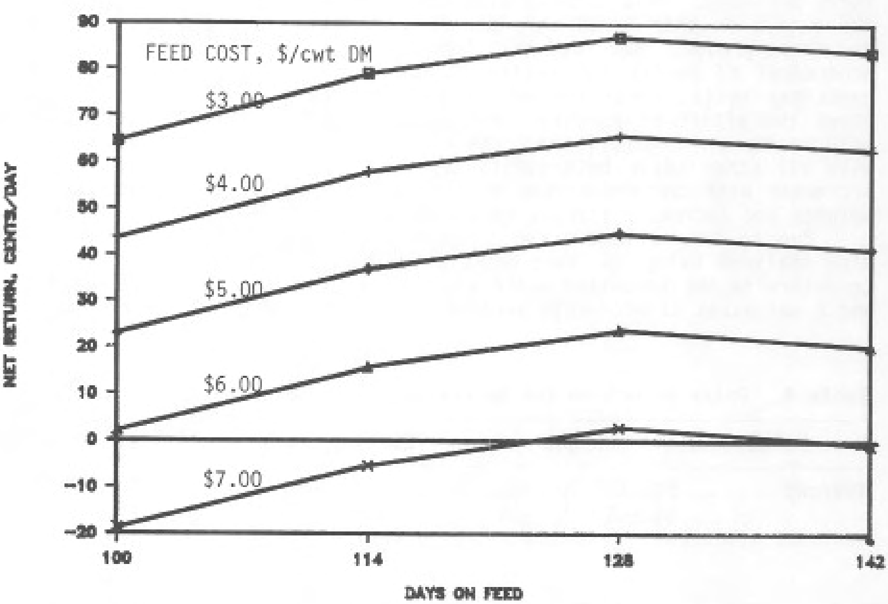

Figure 2. Effect of feed cost on net returns per day.

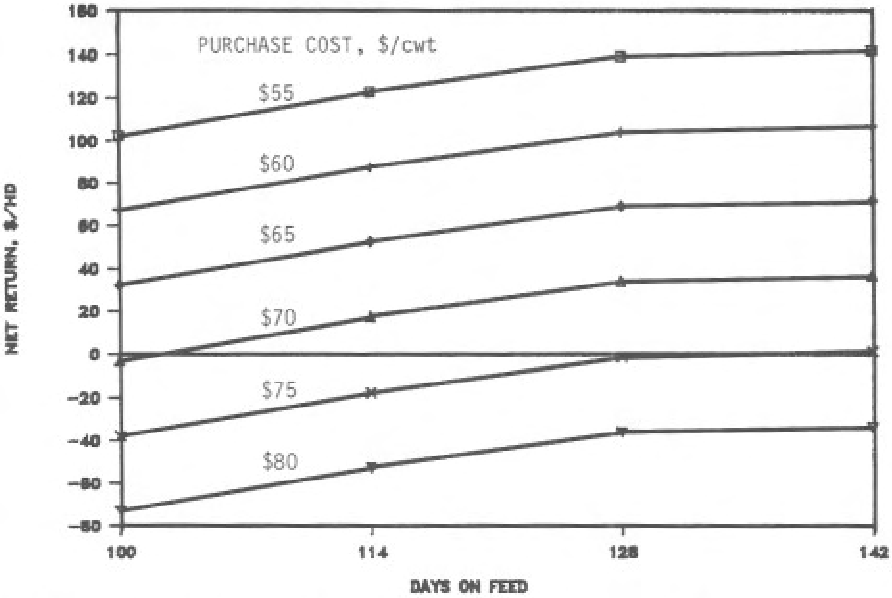

Figure 3. Effect of purchase cost on net returns per head.

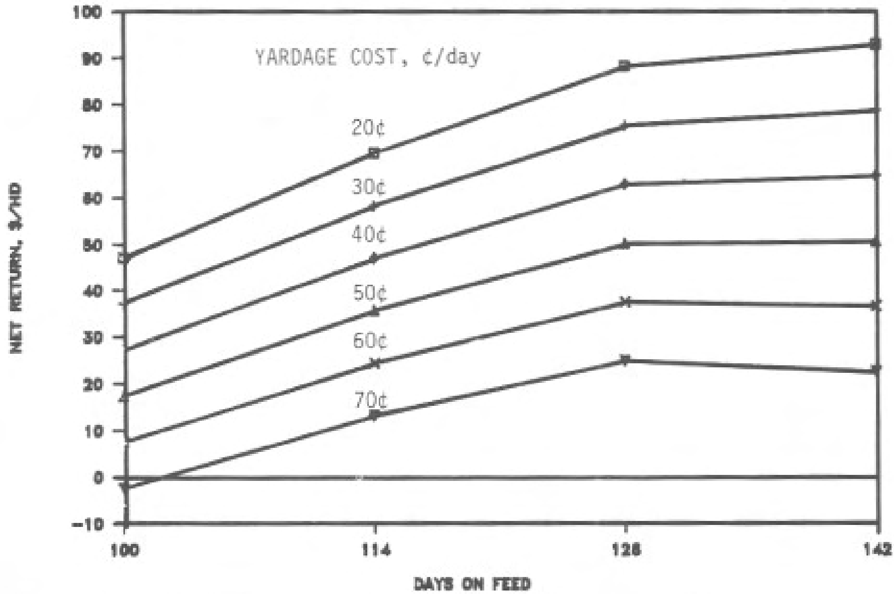

Figure 4. Effect of yardage (non feed fixed) cost on net returns per head.

mined that an incentive of $8.84/cwt would have to be paid for yield grade 1 and 2 carcasses before the net return per head for the 114 day cattle would equal that of the 128 day cattle. Even with this incentive, the cattle killed at 100 days would return $17.57/head less than the cattle killed at 128 days.

Carcass value is always calculated as the multiple of quality grade, cutability and quantity. Though increased fat cover is an undesirable cutability factor, marketing cattle at lighter weights to increase cutability will decrease carcass weight. Results from this experiment indicate that, at current prices, increased carcass weights more than counterbalanced the decreases in carcass cutability. To adequately reward for carcass cutability, higher premiums will need to be paid for cutability to balance the economic benefits of the increased carcass weights of longer-fed cattle. Marketing cattle for maximum carcass cutability (less fat cover) under the current pricing structure would be extremely costly to cattle feeders.

NOTE: A Lotus 123 data disk with all of the live and carcass data from all 480 steers is available for $3.50 from Room 210 Animal Science, Oklahoma State University, Stillwater, OK 74078. This program allows the user to change the cost and carcass pricing structure as desired.