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Summary

This trial was designed to evaluate how various factors impact the value added process of feeding cull cows. Specific management criteria evaluated included initial body condition, days on feed, implants, and cow age. Feedlot performance and carcass trait changes due to these factors were compared. Prolonging the feeding period from 50 to 77 or 105 days tended ($P = .10$) to increase average daily gain and dry matter intake ($P < .01$) and had no ($P > .15$) effect on feed/gain. This response is similar to short term adaptation and feeding of young cattle. Added days on feed increased ($P < .001$) dressing percentage, ribeye area, and ribfat thickness while decreasing ($P < .001$) lean age. Days on feed did not improve fat color. Older cows gained slower ($P < .001$) and were lighter muscled than young cows. Longer feeding periods progressively increased the number of high quality carcasses produced.

Key Words: Cows, Carcass, Implant, Feedlot

Introduction

Cull cows can be looked upon as a by-product of the feeder calf industry. In the fall at weaning these cows are typically in thin condition and market value is low. Previous research has indicated that these cows can be fed efficiently for periods of 50 or 60 days to increase market weight and to take advantage of the seasonality of slaughter cow prices. Previous management has typically involved feeding programs with substantial proportions of roughage. The experiment described here evaluated the impact of days on feed, trenbolone acetate implants, and other factors on the feedlot performance and carcass traits of cull cows fed a typical feedlot finishing diet.

Materials and Methods

Cull cows were purchased from sale barns throughout South Dakota during November and December, 1991. The cows were fed a mix of grass hay and wheat straw during assembly and up to initiating the feeding study. Only 231 of the 306 cows purchased were suitable to feed. Advanced pregnancies were the primary reason cows were culled from the group. Others had to be eliminated because of severe emaciation.

Cows were sorted based on condition into two groups. Condition score on the very thin cows ranged from 1 to 2.5. Condition score of the remaining cows ranged from 3 to 6. Age was determined by dental examination. Young cows were 4 years and younger. Middle aged cows were up to 8 years of age. Old cows were up to 10 or 11 years of age. Very old cows had few if any teeth remaining. Individual weight and breed type were noted.

Allotment was done to allow age, breed type, and allotment weight to be stratified across implant and days on feed groups but within condition score since cows in better body condition would have a greater initial weight. Cows were sorted into 36 pens of 6 cows each.

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The allotment weight was taken 5 days before the study began to accommodate the complex allotment scheme. Initial test weights were taken on two consecutive days and averaged. At this time cows received a labeled dosage of Tramisol[3] and cows designated for implant treatments received Finaplix-H[4]. The finishing diet (Table 1) was fed starting 2 days before initial weights were taken. Initially (4 days) feed deliveries were restricted to 13.55 lb per head per day to normalize fill and allow adaptation to diet. Feed deliveries were then gradually increased to appetite. Cows were fed once daily.

Table 1. Finishing diet for feeding cull cows

Item	%, DM basis
Corn silage	15.00
Whole shelled corn	75.63
Soybean meal	5.77
Liquid supplement	3.60
Crude protein	11.3
Calcium	.503
Phosphorus	.309
Potassium	.949
NE_m, Mcal/cwt	93.6
NE_g, Mcal/cwt	62.5
Vitamin A, IU/lb	1350
Monensin, g/T	26.77

In the final arrangement there were 18 pens of thin cows and 18 pens of cows carrying more condition. Eighteen pens of cows received implants and 18 pens of cows were not implanted. Age and breed were stratified across pens. On each slaughter date 12 pens of cows were removed from the test. Initial body condition and implant treatments were equally represented in each slaughter date. This allotment required 216 cows. The 15 cows remaining were selected to be representative of the entire population and served as an initial slaughter group for measuring carcass changes with time on feed. Subsequent slaughter dates were 50, 77, and 105 days after the initial body weights were determined. Two consecutive final body weights followed a 4-day intake restriction to 16.15 lb to normalize fill. The following morning cows were slaughtered at Federal Beef, West Fargo, ND.

Dependent variables considered were average daily gain (ADG), average daily dry matter intake (DMI), feed conversion (F/G), carcass weight, ribfat thickness, ribeye area, fat color (1 to 9, 9 = yellow), marbling score, lean age and bone age. Feedlot performance variables were evaluated on a pen mean basis. Carcass traits were evaluated using individual observations as the experimental unit. The data were analyzed by procedures appropriate for a 2 x 2 x 3 arrangement of treatments (condition x implant x days on feed) using the GLM model in SAS. To evaluate age effects on cow feeding performance, data were re-evaluated with a model including only age. Preplanned age comparisons of least square means were accomplished using the PDIFF option in the GLM model of SAS.

Results and Discussion

One cow suffered polioencephalomalasia and did not recover. Two carcasses were condemned at slaughter. Data for these individuals were deleted from the overall data set. In a commercial situation, these losses are critical, but this experiment was not large enough to establish a typical death/carcass loss value. Seventy of the original 306 cows purchased were more than 5 months pregnant and were resold as breeding cows. Purchase price on the cows averaged $500. Sale price on the pregnant cows averaged slightly over $700. Commercial feeders

[3]Pitman Moore, Inc., Mundelein, IL.
[4]Hoescht-Roussel, Somerville, NJ.

should do pregnancy diagnosis to determine how cows will be handled. Effectiveness of abortaficents decline in pregnancies greater than 150 days and should not be used at that stage of pregnancy. Slaughtering pregnant cows lowers the dressing percentage and value of the carcass. Because of these factors, resale of cows in advanced pregnancy becomes an attractive alternative regardless of the breeding cow market.

Gains were quite good throughout the 105-day feeding period and tended to increase ($P = .1016$) with days on feed (Table 2). This is probably a response to the initial level of feed intake and to environmental factors. Weather during February and March was very undesirable for feeding cattle. Implanting and body condition did not affect rate of gain. Feed intakes were high considering the energy density of the diet. The adaptation to diet that occurred during the initial 21 days on feed caused DMI to be lower for the cows slaughtered at day 50. Feed intake patterns up to 50 days were similar for all three slaughter groups. Implanted cows consumed less ($P<.05$) feed than nonimplanted cows. This was an unexpected response. Comparable studies are not available to determine if this is a consistent response in mature beef cattle. Cows receiving implants were also more ($P=.0534$) efficient than nonimplanted cows. Thin cows tended to consume less feed ($P<.10$) than fleshy cows but did not exhibit more efficient gains. The fleshy cows in this study were still thin enough to exhibit compensatory gains if indeed this phenomenon occurs in mature animals. Feed/gain values of 9 are high compared to values for younger cattle. Processing the grain component may have been beneficial considering the high dry matter intakes observed.

Carcass weight continued to increase ($P<.001$) through 105 days, although dressing percentage peaked after 77 days (Table 3). Fleshy cows produced heavier ($P<.0001$) carcasses as expected from the heavier initial weights. Being fleshy also resulted in a higher ($P<.001$) dressing percentage. Ribeye area increased ($P<.0001$) markedly with longer feeding periods. This is a good indication that lean tissue accretion was occurring in these cows and that fat is not the only component of weight gains. Fleshy cows had larger ($P<.001$) ribeyes than cows that were initially thin. This is consistent with previous research from our labs indicating that muscle atrophy occurs when cows drop below a condition score of 4. Implants tended ($P=.1016$) to increase ribeye area which is consistent with their effects in young growing animals.

Lean age decreased ($P<.0001$) quadratically with increasing days on feed. Feeding beyond 105 days would have made little improvement in this trait. Marbling scores followed a similar favorable pattern as changes in lean age. Based on regression analysis, feeding another 10 to 15 days would have produced optimal carcass traits. Beyond that point, increases in carcass quality would be minimal and ribfat thickness would become excessive.

Older cows (>8 years) gained slower ($P<.0001$) and produced lighter ($P<.0001$) carcasses with smaller ($P<.001$) ribeyes than younger cows (Table 4). The differences in carcass traits observed can be related to the slower gains and lighter weights at the time of slaughter. The older cows were not fatter, suggesting that other physiological, genetic, or anatomical (dentures) factors were limiting growth.

After 105 days, nearly half of the carcasses produced in this study graded average utility or higher (Table 5). Regression analysis predicted that an additional 10 to 15 days on feed would probably increase this to a maximum of about 60% quality cow carcasses which would improve their retail value. After 77 days, selling cows on the rail increased their market value over live price bids. This margin of return increased even further after 105 days. Increases in dressing percentage and quality grades both contribute to the positive margins noted for selling cows on the rail. Crude profitability can be calculated for these cows. Base figures used were purchase cost 995 lb at $47/cwt, yardage 20¢/day, carcass

Table 2. Effects of days on feed, implants and initial body condition on feedlot performance of cull cows

	Days on feed			Implant		Initial body condition		P^a		
	50	77	105	Control	Finaplix-H	Thin	Fleshy	DOF[b]	Implant	Condition
Initial wt, lb	1009	995	995	999	1000	965	1034	.0574	NS	.0001
Final wt, lb	1150	1223	1321	1224	1238	1195	1268	.0001	.0956	.0001
ADG[c], lb	2.81	2.97	3.10	2.89	3.03	2.95	2.97	.1016	NS	NS
DMI[d], lb	24.89	27.04	28.04	26.97	26.35	26.57	26.75	.0001	.0370	.0984
Feed/gain	8.99	9.20	9.09	9.44	8.74	9.09	9.09	NS	.0534	NS

[a]Probability.
[b]Days on feed.
[c]Average daily gain.
[d]Dry matter intake.

Table 3. Effects of days on feed, implants and initial body condition on the feedlot performance of cull cows

	Days on feed				Implant		Condition		P[a]		
	0	50	77	105	Control	Finaplix-H	Thin	Fleshy	DOF[b]	Implant	Condition
Carcass wt, lb	503	613	693	761	683	693	648	704	.0001	NS	.0001
Dressing percentage	48.1	53.3	57.1	57.6	55.9	56.0	55.0	55.9	.0001	NS	.0003
Ribfat, in.	.07	.18	.36	.49	.36	.33	.29	.36	.0001	NS	.0273
Ribeye area, $in.^2$	9.32	10.68	11.68	12.26	11.35	11.72	10.90	11.89	.0001	.1016	.0010
KPH, %	.039	.033	.077	.107	.067	.076	.062	.077	.0001	.0894	.0008
Marbling	131	218	334	367	315	297	290	300	.0001	NS	.0240
Fat color[d]	7.1	8.1	8.3	8.3	8.3	8.2	8.1	8.2	NS	NS	.0559
Bone age[e]	522	529	531	546	538	533	528	541	NS	NS	NS
Lean age[e]	586	465	409	389	418	424	420	443	.0001	NS	NS

[a]Probability level.
[b]Days on feed.
[c]Devoid = 0; practically devoid = 101 to 200; traces = 201 to 300.
[d]1 = white; 10 = yellow.
[e]A0 to A100 = 101 to 200; B0 to B100 = 201 to 300.

Table 4. Effect of age on growth rate and carcass traits of cull cows[a]

	Age group[b]				P[c]		
	Young	Middle	Old	Very old	Y v M[c]	M v O	O v VO
Initial wt, lb	995	1015	994	927	NS	NS	.0222
Final wt, lb	1292	1325	1238	1178	NS	.0011	.1137
ADG, lb	3.25	3.35	2.74	2.64	NS	.0001	NS
Carcass wt, lb	724	709	655	608	NS	.0008	.0389
Dressing percentage	56.8	55.9	55.2	54.1	NS	NS	.1161
Ribfat, in.	.30	.36	.31	.29	NS	NS	NS
Ribeye area, $in.^2$	12.3	12.0	11.0	10.1	NS	.0005	.0209
KPH, %	0.5	0.7	0.7	0.7	NS	NS	NS
Marbling[d]	279	296	293	302	NS	NS	NS
Fat color[e]	8.5	7.8	8.3	8.8	.0344	.0009	.0589
Bone age[f]	466	506	556	596	.0956	.0001	.0236
Lean age[f]	426	423	438	441	NS	NS	NS

[a]Least squares means.
[b]Y = Young; M = Middle; O = Old; VO = Very old.
[c]Probability.
[d]Devoid = 0; Practically devoid = 101 to 200; Traces = 201 to 300.
[e]1 = White; 9 = Yellow.
[f]A0 to A100 - 101 to 200; B0 to B100 = 201 to 300.

Table 5. Frequency distribution of quality grades with time on feed[ab]

	Canner	Cutter			Utility			Commercial			Standard			Choice
		-	0	+	-	0	+	-	0	+	-	0	+	-
Day 0	64	0	14	14	7	0	0	0	0	0	0	0	0	0
Day 50	17	25	0	31	18	4	1	0	0	0	1	0	0	0
Day 77	8	7	0	14	43	14	7	3	1	0	0	0	1	1
Day 105	0	4	0	15	32	34	7	6	0	0	0	0	1	0

[a]Values within a row represent the percentage of those cows slaughtered on the designated date.
[b]Effect of days on feed ($P<.0001$).

price \$97/cwt, and feed costs \$90/T. Crude returns were \$53.49/head, \$82.97/head, and \$105.10/head for cows fed 50, 77, or 105 days, respectively. Changes in carcass price to reflect improvements in quality grades would have further increased the profitability of an extended feeding period.

The quality of carcasses produced by cull cows can be markedly improved by feeding high grain diets for over 100 days. Although feed conversions were poorer than observed when feeding young cattle, this is still a very profitable practice. Further research into the form of grain used may improve feed efficiency. The gross value of cull cows can be increased well over \$250 per head by feeding, which could translate into \$45,000,000 annually in South Dakota. Further steps should be taken to refine the practice of feeding cull cows and to ensure these programs are made available to local beef producers.