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Summary

This study evaluated 96 Angus-sired heifers that were managed to a regular feedlot endpoint (approx. 0.45 in. fat cover) for harvest or a nonregular (longer) time on feed (approx. 0.70 in. fat cover). Heifers were scanned either 3 or 4 times from approximately 10 months of age through just prior to harvest. This study indicates that when heifers are fed for a longer period, they are able to bring more revenue from increases in quality and hot carcass weight. However, value/cwt was higher for the regular fed heifers when compared to long fed heifers. This is primarily because of the increase in discounts from higher yield grades on long-fed heifers.

Introduction

The beef cattle industry today uses a value-based marketing system and carcass composition plays a big role in the value of each individual animal. It is extremely important that producers manage cattle correctly to increase opportunities for premiums and decrease discounts. One way to increase premiums is to feed cattle high grain diets for a longer period of time to improve quality grades. However, when cattle are fed longer they also tend to deposit more subcutaneous fat, increasing yield grades and the chances of receiving a yield grade discount. This study was conducted to compare Angus-sired heifers that were fed for a regular period of time (RF) vs. heifers that were fed for a longer time (LF).

Materials and Methods

Ninety-six (96) Angus-sired heifers were used in this study. Animals were scanned by an Ultrasound Guidelines Council (UGC) field certified technician. A Classic Scanner 200 (Classic Medical Supply, Tequesta, FL) with a 3.5 MHz 18 cm animal science probe was used to collect images on all animals. Images were brought back to the Iowa State University image interpretation lab and interpreted by an UGC lab certified technician with software developed by Iowa State University. Measures collected were: weight, rump fat thickness (URUMPFT), 12th rib fat thickness (URIBFT), 12th rib ribeye area (UREA), and percent intramuscular fat (UPFAT).

All heifers were scanned at least three times and heifers in harvest groups 2 and 3 were scanned four times. There were 55 days between scan 2 and scan 3 for all heifers. Heifers in harvest groups 2 and 3 were scanned for the fourth time 13 and 56 days after scan 3, respectively.

Heifers were divided into three harvest groups, with 28 heifers in harvest group 1 (RF), 20 heifers in harvest group 2 (RF) and 48 heifers in harvest group 3 (LF). Heifers that were harvested at an optimum time (RF) were in the first two harvest groups and the LF heifers made up the third harvest group. The second group was harvested 22 days after the first group. The LF heifers were harvested 60 days after the first group. The LF heifers averaged 51 days on feed longer than the RF heifers. Heifers selected for the LF group were the heifers nearest the average for weight at approximately 45 days before harvest 1, thus RF heifers were more variable for most traits, especially weight, at scan 2 and 3.

Animals were harvested at the Iowa Quality Beef harvest facility in Tama, IA. Carcass data were collected by trained personnel from Iowa State University and Iowa Quality Beef. Measures collected were: hot carcass weight (HCW), carcass ribeye area (CREA), carcass 12th rib fat thickness (CFT), and marbling scores (CMS). Marbling scores were called by the USDA grader to the nearest 10th of a marbling degree and then were converted to a numeric marbling score with Small^{00} = 5.00. Yield grade (YG) was calculated with the USDA equation YG = {2.5 + (2.5 * CFT, in) + (0.2 * 2.5, assumed KPH %) + (0.0038 * HCW, lbs) – (0.32 * CREA, in^2)}, a 2.5 % KPH was used for all animals. There were two animals in the RF group that did not have carcass data.

Results and Discussion

Ultrasound measurement means, standard deviations, and ranges for scan sessions 2, 3, and 4 are presented in Tables 1, 2, and 3, respectively. Data from scan 2 (Table 1) shows that heifers in both groups were quite similar in mean levels of age, weight, URUMPFT, URIBFT, UREA, and UPFAT. At scan 3 (Table 2) RF and LF heifers remained at similar weight, URUMPFT, URIBFT, and UREA, however, at this time the LF heifers were a little higher in UPFAT. RF heifers were still more variable than LF heifers at scan 3.

Twenty-eight heifers from the RF group were harvested 2 days after scan 3 and the remaining 20 heifers from the RF were kept for an extra 14 days. Results from scan 4 (Table 3) show that RF heifers were younger, lighter, leaner (less URIBFT and URUMPFT), had smaller UREA, and had less UPFAT than LF heifers at scan 4. This is partially because of the difference in number of days after scan 3 for scan 4 in LF (56 d) vs. RF (13 d) heifers. However, the selection

criteria within the RF heifers for harvest 1 to harvest the heaviest, fattest, highest UPFAT heifers first should also have impacted these traits. The RF heifers were less variable at scan 4 than the LF heifers. Heifers in the RF group were harvested earlier because they were determined to be market ready and discounts for YG 4 or 5 were to be avoided.

The carcass data summary is shown in Table 4. Results show that RF heifers had lighter carcasses, less CFT, CREA, CMS, and lower YG. These results were expected because the LF heifers were kept on feed for a longer period. Tables 5 and 6 show the frequency of quality grades (QG) and yield grades (YG), respectively for RF and LF heifers. Heifers that were RF had 85 % of carcasses graded Choice and 15 % Select. Heifers that were LF were 19 % Prime, 79 % Choice and 2 % Select. When heifers were RF, most of the YG were 2 and 3 (72 % and 26 %, respectively) while the LF were mostly YG 3 (60 %). The LF group had 17 % YG4, which is not desirable because YG4 is generally heavily discounted ($20/cwt in this grid). It was expected that the LF were going to grade better than RF, and also that the YG were going to be higher.

Table 7 shows the significance and estimated effect of feed period management group on carcass traits. Heifers that were LF were harvested 51 days later than RF. Heifers that were LF had higher HCW, CFT, CREA, CMS and YG, and feeding group was a highly significant factor for differences in all traits.

Estimates of tissue deposition rates per day for each harvest group are shown in Table 8. The results show that between scan 2 and 3, only average daily gain (ADG) was significantly different between harvest groups with a P-value < 0.01. All other traits had P-value > 0.10. Between scan 3 and 4, only harvest groups 2 and 3 were evaluated. ADG and ribeye area daily gain (UREADG) were significantly different between harvest groups with P-values 0.03 and 0.01, respectively. Rib fat thickness daily gain (URIBFTDG) approached significance (P-value = 0.07). It may have been difficult to establish rates of tissue deposition in harvest group 2 cattle since there were only 13 days between scan 3 and scan 4 on this group of cattle. Heifers in the LF group had the highest ADG between scan 2 and scan 3, however, between scan 3 and 4 these heifers' ADG decreased 0.5 lb/d. This would lead to a higher cost of gain for LF heifers during the extended feeding period.

Dollar values for each animal were calculated using the Iowa Quality Beef grid (Tables 9 and 10) for comparisons. Values were calculated based on prices for April 21, 2005. Calculations were performed on a spreadsheet provided by Iowa Quality Beef (Tables 9 and 10). When evaluated on the Iowa Quality Beef pricing grid, heifers that were LF had an average carcass value of $1,059.96 ($147.64/cwt) and RF $949.39 ($150.11/cwt). Results show that even with an increase in YG, the LF heifers were able to bring more revenue than RF heifers. Table 11 shows total value for each lot, value/head, and value/cwt (on a carcass basis).

Implications

Based on these results, feeding the heifers longer did obtain a higher average value per head, however lower value per cwt. If animals are not being sorted with the use of real-time ultrasound, producers have to be careful when feeding animals for a longer period of time. An additional 51 days on feed (beyond approx. 0.45 in fat cover) resulted in an additional 85 lb HCW, an increase in percent Choice from 85 % to 98 %, and an increase in YG 4 cattle from 0 % to 17 %. Extended feeding can increase total revenue with increases in carcass weight and improved quality grades. However, increases in YG and YG discounts are likely as well and need to be considered before choosing to extend the feeding period. Analysis of feed cost was not done, so we were not able to compare the cost of the long feeding period.

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Iowa Quality Beef, Ames, IA

Table 1. Simple statistics of ultrasound measurements for scan session 2.

	n	Mean	SD	Min	Max
Regular fed					
Age, d	48	322	15	289	344
Weight, lb	48	856	110	654	1096
URUMPFT, in	48	0.32	0.09	0.13	0.61
URIBFT, in	48	0.29	0.09	0.12	0.54
UREA, in^2	48	9.84	1.09	7.64	12.29
UPFAT, %	48	5.29	0.95	3.38	7.73
Long fed					
Age, d	48	318	12	282	339
Weight, lb	48	836	42	754	962
URUMPFT, in	48	0.31	0.07	0.13	0.46
URIBFT, in	48	0.27	0.06	0.14	0.39
UREA, in^2	48	9.86	0.75	8.47	11.56
UPFAT, %	48	5.25	0.83	3.13	7.31

Table 2. Simple statistics of ultrasound measurements for scan session 3.

	n	Mean	SD	Min	Max
Regular fed					
Age, d	48	377	15	344	399
Weight, lb	48	1015	119	826	1342
URUMPFT, in	48	0.43	0.11	0.21	0.76
URIBFT, in	48	0.45	0.14	0.21	0.81
UREA, in^2	48	11.55	1.21	8.67	14.50
UPFAT, %	48	6.42	1.03	4.05	9.47
Long fed					
Age, d	48	373	12	337	394
Weight, lb	48	1016	65	912	1236
URUMPFT, in	48	0.43	0.09	0.22	0.67
URIBFT, in	48	0.43	0.11	0.21	0.70
UREA, in^2	48	11.81	0.77	10.07	13.62
UPFAT, %	48	6.75	1.12	4.12	9.79

Table 3. Simple statistics of ultrasound measurements for scan session 4.

	n	Mean	SD	Min	Max
Regular fed					
Age, d	20	382	16	357	412
Weight, lb	20	945	65	854	1098
URUMPFT, in	20	0.41	0.11	0.24	0.67
URIBFT, in	20	0.43	0.12	0.26	0.70
UREA, in^2	20	10.70	0.69	9.30	11.82
UPFAT, %	20	6.55	1.25	4.48	9.16
Long fed					
Age, d	48	429	12	393	450
Weight, lb	48	1173	78	1046	1448
URUMPFT, in	48	0.58	0.14	0.33	1.00
URIBFT, in	48	0.66	0.17	0.35	1.04
UREA, in^2	48	12.54	0.87	11.19	14.84
UPFAT, %	48	7.34	1.37	4.96	11.13

Table 4. Carcass data summary statistics by feed group.

	n	Mean	SD	Min	Max
Regular fed					
HCW, lb	46	632	62	516	792
CFT, in	46	0.44	0.13	0.24	0.80
CREA, in^2	46	11.73	1.29	9.21	14.71
CMS[a]	46	5.60	0.69	4.30	7.50
YG	46	2.75	0.45	1.66	3.76
Long fed					
HCW, lb	48	718	44	619	861
CFT, in	48	0.68	0.13	0.28	1.00
CREA, in^2	48	12.58	0.96	11.00	15.00
CMS[a]	48	6.20	1.16	4.60	8.90
YG	48	3.40	0.55	1.91	4.60

[a]$Traces^{00}$ =3.00, $Slight^{00}$ = 4.00, $Small^{00}$ = 5.00, $Modest^{00}$ = 6.00, $Moderate^{00}$ = 7.00

Table 5. Quality grade frequency shown by feed group.

	Sel (%)	Ch- (%)	Ch (%)	Ch+ (%)	Pr (%)
Regular fed, n	7 (15.22)	30 (65.22)	6 (13.04)	3 (6.52)	0 (0)
Long fed, n	1 (2.08)	25 (52.08)	11 (22.92)	2 (4.17)	9 (18.75)

Table 6. Yield grade frequency shown by feed group.

	YG 1 (%)	YG 2 (%)	YG 3 (%)	YG 4 (%)
Regular fed, n	1 (2.17)	33 (71.74)	12 (26.09)	0 (0)
Long fed, n	1 (2.08)	10 (20.83)	29 (60.42)	8 (16.67)

Table 7. Significance and effect of feed group on carcass traits.

	Estimate			
Traits	Regular fed	Long fed	Model R^2	P-Value
HCW, lb	632	718	0.39	<0.0001
CFT, in	0.44	0.68	0.46	<0.0001
CREA, in^2	11.73	12.58	0.13	0.0005
CMS[a]	5.6	6.1	0.09	0.0030
YG	2.7	3.4	0.30	<0.0001

[a]$Traces^{00}$ =3.00, $Slight^{00}$ = 4.00, $Small^{00}$ = 5.00, $Modest^{00}$ = 6.00, $Moderate^{00}$ = 7.00

Table 8. Estimates of tissue deposition rates and the significance of harvest group as a predictor of rate of tissue deposition.

			Estimates		
	R^2	P-Value	Harvest group 1	Harvest group 2	Harvest group 3
Scan 2 to 3					
ADG, lb/d	0.10	0.0084	2.98	3.05	3.28
URUMPFTDG, in/d	0.04	0.1794	0.002	0.002	0.002
URIBFTDG, in/d	0.02	0.4223	0.003	0.002	0.003
UREADG, in^2/d	0.04	0.1739	0.031	0.031	0.036
UPFATDG, %/d	0.00	0.1445	0.021	0.020	0.027
Scan 3 to 4					
ADG, lb/d	0.07	0.0323	-	3.30	2.79
URUMPFTDG, in/d	0.00	0.7877	-	0.003	0.003
URIBFTDG, in/d	0.05	0.0714	-	0.003	0.004
UREADG, in^2/d	0.09	0.0111	-	-0.004	0.013
UPFATDG, %/d	0.01	0.4610	-	0.003	0.011

Table 9. Iowa Quality Beef grid, April 21, 2005 for regular fed heifers.

Grade	YG	Head	Weight	Cost/cwt	Total Cost
Prime	1	0	0	$ 159.30	$ -
Prime	2	0	0	$ 158.30	$ -
Prime	3	0	0	$ 155.30	$ -
Prime	4	0	0	$ 135.30	$ -
Prime	5	0	0	$ 130.30	$ -
Choice	1	0		$ 153.30	$ -
Choice	2	20	12984	$ 152.30	$ 19,774.63
Choice	3	10	6158	$ 149.30	$ 9,193.89
Choice	4	0	0	$ 129.30	$ -
Choice	5	0	0	$ 124.30	$ -
Select	1	0	0	$ 140.89	$ -
Select	2	5	3304	$ 139.89	$ 4,621.97
Select	3	2	1196	$ 136.89	$ 1,637.20
Select	4	0	0	$ 116.89	$ -
Select	5	0	0	$ 111.89	$ -
CAB	1	1	701	$ 156.80	$ 1,099.17
CAB	2	5	2903	$ 155.80	$ 4,522.87
CAB	3	3	1847	$ 152.80	$ 2,822.22
> 999 lbs Choice	0.00%	0	0	$ 114.30	$ -
> 999 lbs Select	0.00%	0	0	$ 101.89	$ -
< 550 Choice	0.00%	0	0	$ 114.30	$ -
< 550 Select	0.00%	0	0	$ 101.89	$ -
951-999 Choice	0.00%	0	0	$ 141.30	$ -
951-999 Select	0.00%	0	0	$ 128.89	$ -
Standards	0.00%	0	0	$ 121.89	$ -
Commercial/>30 mo.	0.00%	0	0	$ 115.11	$ -
Utilities	0.00%	0	0	$ 115.11	$ -
Darks	0.00%	0	0	$ 115.11	$ -
Totals		46	29093		$ 43,671.95

Table 10. Iowa Quality Beef grid, April 21, 2005 for long fed heifers.

Grade	YG	Head	Weight	Cost/cwt	Total Cost
Prime	1	0	0	$ 159.30	$ -
Prime	2	2	1299	$ 158.30	$ 2,056.32
Prime	3	5	3489	$ 155.30	$ 5,418.42
Prime	4	2	1494	$ 135.30	$ 2,021.38
Prime	5	0	0	$ 130.30	$ -
Choice	1	0	0	$ 153.30	$ -
Choice	2	4	2806	$ 152.30	$ 4,273.54
Choice	3	17	12305	$ 149.30	$ 18,371.37
Choice	4	6	4366	$ 129.30	$ 5,645.24
Choice	5	0	0	$ 124.30	$ -
Select	1	0	0	$ 140.89	$ -
Select	2	0	0	$ 139.89	$ -
Select	3	0	0	$ 136.89	$ -
Select	4	1	770	$ 116.89	$ 900.05
Select	5	0	0	$ 111.89	$ -
CAB	1	1	700	$ 156.80	$ 1,097.60
CAB	2	2	1451	$ 155.80	$ 2,260.66
CAB	3	8	5781	$ 152.80	$ 8,833.37
> 999 lbs Choice	0.00%	0	0	$ 114.30	$ -
> 999 lbs Select	0.00%	0	0	$ 101.89	$ -
< 550 Choice	0.00%	0	0	$ 114.30	$ -
< 550 Select	0.00%	0	0	$ 101.89	$ -
951-999 Choice	0.00%	0	0	$ 141.30	$ -
951-999 Select	0.00%	0	0	$ 128.89	$ -
Standards	0.00%	0	0	$ 121.89	$ -
Commercial/>30 mo.	0.00%	0	0	$ 115.11	$ -
Utilities	0.00%	0	0	$ 115.11	$ -
Darks	0.00%	0	0	$ 115.11	$ -
Totals		48	34461		$ 50,877.94

Table 11. Values based on Iowa Quality Beef grid, April 21, 2005.

Group	n	Value for lot, $	Value/head, $	Value/cwt, $
Regular fed	46	43,671.95	949.39	150.11
Long fed	48	50,877.94	1,059.96	147.64