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Optimal Marketing Date of Steers Depends on Marketing Strategy

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Summary

Seven research trials conducted over five years at the University of Nebraska–Lincoln were summarized to determine how animal performance changes through the finishing period on a live and carcass weight basis. Live weight, carcass weight, carcass ADG, and carcass feed efficiency all changed quadratically throughout the feeding period; live ADG and live feed efficiency declined linearly. During times of negative profit margins, optimal profitability for steers marketed on a live-basis occurred by selling early, whereas optimal profitability was achieved by feeding steers marketed on a carcass-basis longer.

Introduction

Optimal marketing date is defined as marketing when the cost of additional gain equals the price received for the additional gain. Continuing to feed cattle when the cost of gain surpasses the price received for the gain is not profitable. It is well recognized that feed efficiency is an important contributor to cost of gain and is especially important during times of high feed costs. Intuition is that feed efficiency declines throughout the feeding period, so steers should be marketed early when costs of gain are high. However, cattle may be marketed either on a live-weight basis or carcass-weight basis, so it is important to understand how cost of gains change both in the live animal and the carcass. A previous report (*2007 Nebraska Beef Cattle Report*, pp.55-57) evaluated the changes in animal performance throughout the feeding period. The purpose of this report is to expand on the previous data set and to apply an economic evaluation to demonstrate if optimal marketing date differs when selling on a live-basis vs. selling on a carcass-basis.

Procedure

Five years of data were compiled to evaluate the change in animal performance and carcass performance throughout the feeding period. The data set included 298 pens (2,380 head) of steers from seven research experiments conducted at the University of Nebraska–Lincoln. This analysis expands upon a data set previously described (*2007 Nebraska Beef Cattle Report*, pp.55-57). Experiments were selected where steers were on similar diets, or where dietary treatment had no effect on animal performance. Additionally, the data set was limited to experiments where individual animal weights were collected at approximately 30-day intervals. The experiments selected provided four or five interim weights for each steer. Initial BW was collected on two or three consecutive days following a period of limit-feeding. However, interim weights were single day full weights which were pencil-shrunk 4%. Interim carcass weights were calculated using a changing dressing percentage throughout the feeding period as previously described (*2007 Nebraska Beef Cattle Report*, pp.55-57). Average initial BW was 769 lb (SD = 47 lb) and steers were on feed from 117 to 159 days from May to October. The target marketing endpoint for all cattle was 0.50 inch backfat and the average backfat was 0.51 inch.

Changes in weight, weight gain, dry matter intake, feed efficiency, and transfer of live weight gain to carcass weight gain were calculated for each interim period and expressed on a shrunk BW and carcass weight basis. Linear and quadratic regression coefficients were calculated for each pen of cattle using the mixed

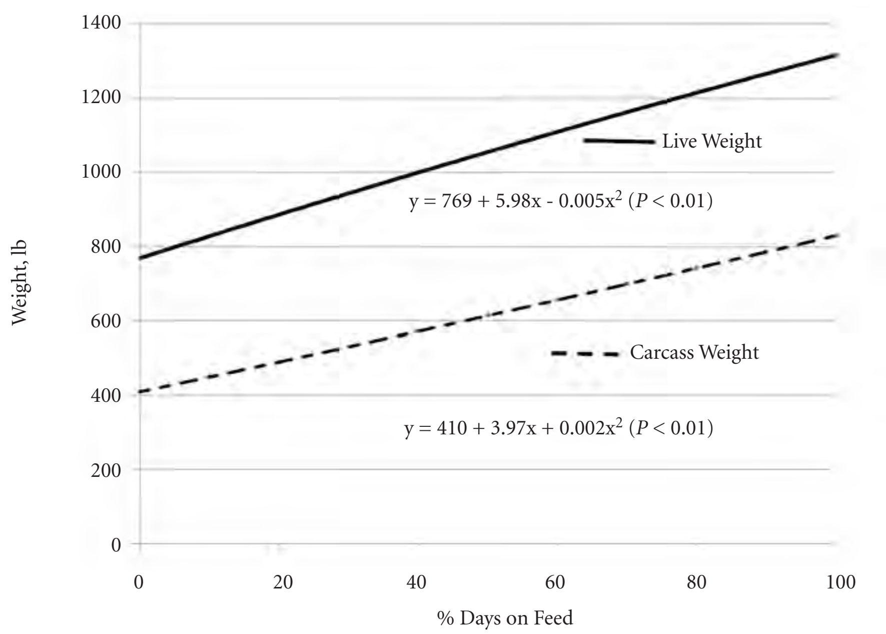

Figure 1. Change in BW and carcass weight throughout the feeding period.

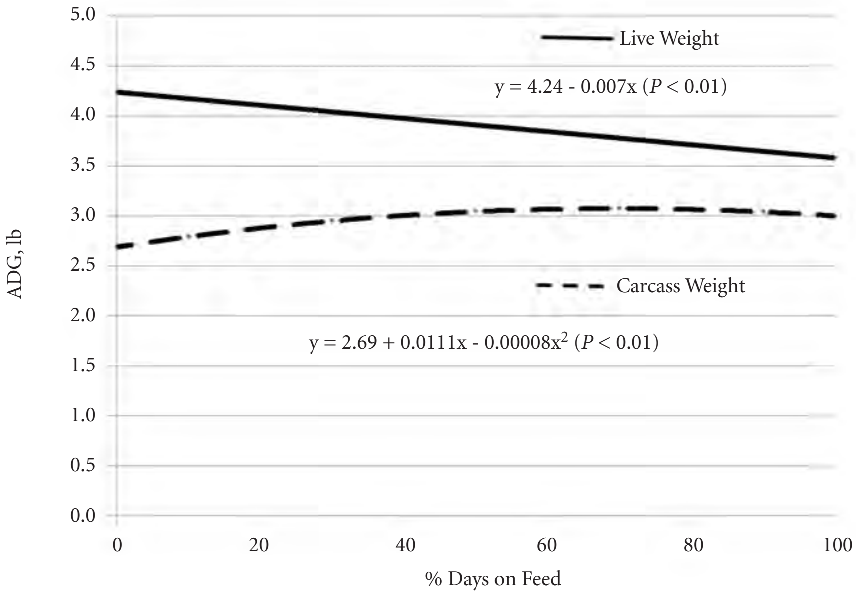

Figure 2. Change in ADG on a live weight and carcass weight-basis throughout the feeding period.

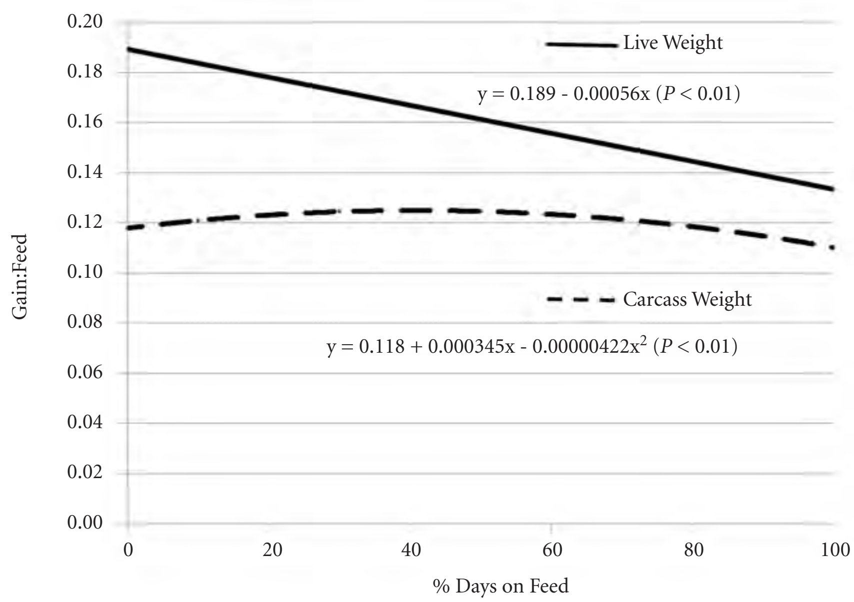

Figure 3. Change in feed efficiency on a live weight and carcass weight-basis throughout the feeding period.

procedures of SAS (SAS Institute, Inc., Cary, N.C.). The significance of the linear and quadratic coefficients were tested for each response variable using the mixed procedures of SAS. Experiment was considered a fixed effect.

Changes in cost of gain were estimated for three different diet cost scenarios. Cost of gain was calculated by dividing feed efficiency by sum of the diet cost plus yardage and interest. Change in feed efficiency was estimated by the regression equations from the analysis of seven experiments. Diet costs were assumed to be equivalent to \$4.00, \$6.00, and \$8.00 per bushel corn. Yardage and interest charges were assumed to be \$0.45 per head per day calculated on a live and carcass-basis.

A profitability analysis was generated for three corn price scenarios to illustrate how ideal marketing time may differ depending on marketing strategy and corn price. The three corn prices were \$4.00, \$6.00, and \$8.00 per bushel equivalent to DM diet costs of \$165.15, \$247.73, and \$330.31/ton DM, respectively. Assumptions for the profitability analysis were: feeder price = \$1.50/lb; yardage + interest = \$0.45/head/day; miscellaneous charges = \$12/head. Live cattle price was assumed to be \$1.25/lb and carcass price was \$1.98 which assumes a 63% dressing percentage. Profit/loss was calculated on a live and carcass-basis from the difference between total costs per steer and the revenue received per steer. Marketing date was altered to be 75% of normal (105 days on feed) to illustrate the effects of selling early, 100% of normal (140 days on feed), and 125% of normal (175 days on feed) to illustrate the effects of feeding longer. Estimates of feeding 125% of normal are an extrapolation of the seven-trial analysis from which performance was estimated.

Results

Live weight and carcass weight both increased in a quadratic manner ($P < 0.01$; Figure 1). The quadratic term for live weight was slightly negative whereas the quadratic term for carcass weight was slightly positive. This suggests that live weight increases at a decreasing rate whereas carcass weight increases at an increasing rate. Live weight ADG decreased linearly throughout the feeding period ($P < 0.01$; Figure 2) while carcass ADG changed quadratically ($P < 0.01$). Carcass ADG increased early in the feeding period before slightly declining late in the feeding period. It was previously reported that both live weight and carcass weight increased linearly and carcass ADG remained constant throughout the feeding period (*2007 Nebraska Beef Cattle Report*, pp. 55-57). The additional observations in the current data set provided a more

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robust analysis which allowed for the detection of quadratic changes in these variables. Live weight ADG linearly declined in both analyses. Similarly, live weight feed efficiency declined linearly ($P < 0.01$; Figure 3) and carcass weight feed efficiency changed in a quadratic manner ($P < 0.01$). Dry matter intake increased quadratically ($P < 0.01$; Figure 4) with a positive quadratic term. This suggests DMI increased at an increasing rate. The increase in DMI at the end of the feeding period could be related to the fact that the data set consisted entirely of summer-fed yearlings finished in the fall so that temperatures were cooling at the end of the feeding period. Temperature changes may have allowed DMI to increase at the end of the feeding period which may be a function of environment and not biology.

Transfer of live weight gain to the carcass increased linearly ($P < 0.01$; Figure 5) and was approximately 90% at the end of the feeding period. This suggests that 90% of every additional pound of gain is added to the carcass at the end of the feeding period. The high percentage of weight transfer is economically meaningful since the price difference between live and carcass weight is based on dressing percentage (typically 63%). To put this in perspective, 1 lb of additional live weight gain would equate to 0.90 lb of additional carcass weight gain. If market steers were valued at $125/cwt on a live basis and $198/cwt on a carcass basis (63% dress), the additional revenue generated by adding a pound of live gain would be $1.25 if selling live and $1.78 (0.9 lb at $198/cwt) if selling in the beef. Therefore, each additional pound would generate $0.53 more revenue by marketing on a carcass-basis.

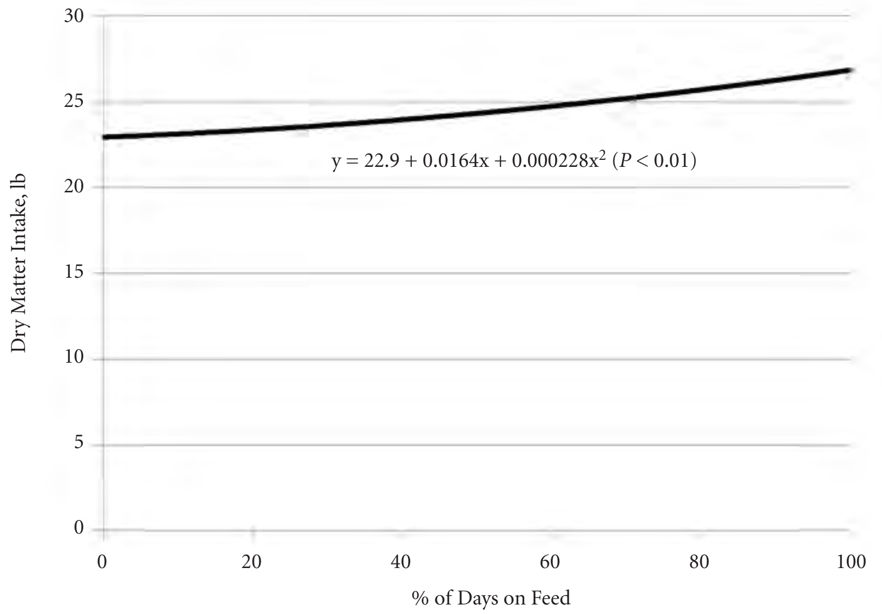

Figure 4. Dry matter intake throughout the feeding period.

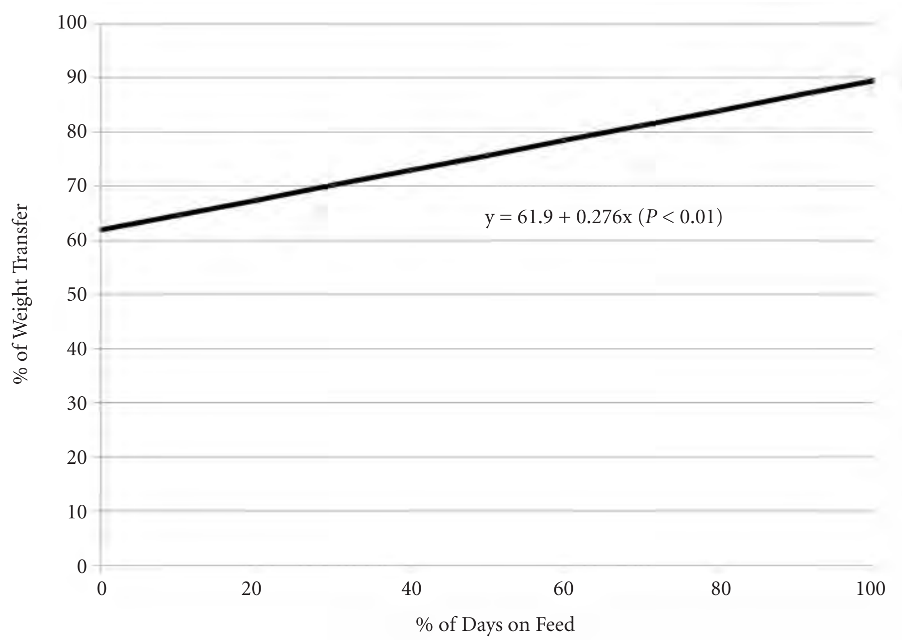

Figure 5. Percentage of live weight gain transferred to carcass weight gain throughout the feeding period.

Figures 6 and 7 show the change in cost of gain at $4.00, $6.00, and $8.00/bu corn on a live and carcass-basis, respectively. It is not surprising that the cost of gain increases with increasing corn price, nor is it surprising that cost of gain increases throughout the feeding period. However, it is interesting to note that both the linear and quadratic terms are positive for cost of gain on a live weight-basis ($P < 0.01$; Figure 6) whereas the linear term is negative and the quadratic term is slightly positive for cost of gain on a carcass weight-basis ($P < 0.01$; Figure 7). This illustrates that while cost of gain is increasing both on a live and carcass-basis, the incremental increase is greater on a live-basis.

The projected close-out performance for steers marketed at 75%, 100%, or 125% of the normal market-

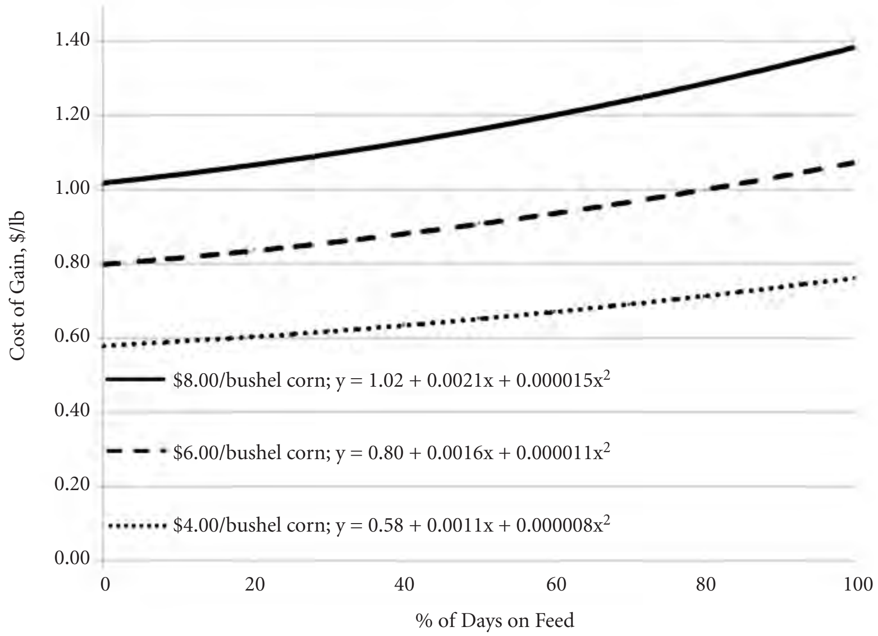

Figure 6. Change live weight cost of gain at three different corn prices throughout the feeding period.

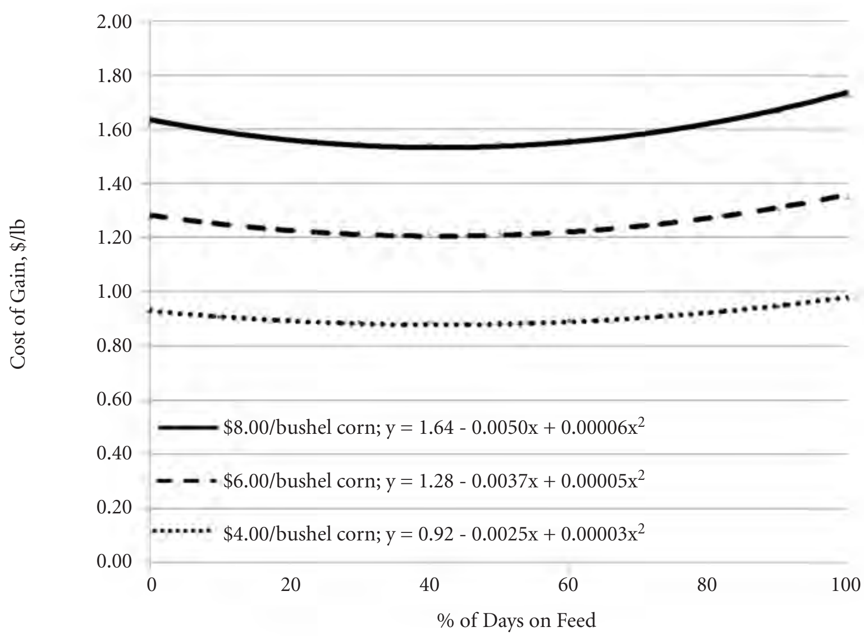

Figure 7. Change in carcass weight cost of gain at three different corn prices throughout the feeding period.

ing date (days to achieve 0.50 inch back fat) using the analysis from the seven experiments is provided in Table 1. The profit/loss analysis is provided in Tables 2, 3, and 4 for diet prices equivalent to $4.00, $6.00, and $8.00/bu corn, respectively. When the diet cost was equivalent to $4.00/bu corn, all marketing scenarios resulted in positive profitability and profit was improved by feeding longer regardless of marketing strategy. Similarly, at a diet cost equivalent to $6.00 corn, profit improved by feeding longer, regardless of marketing strategy. However, when the diet cost was greatest (equivalent to $8.00/bu corn), the optimal marketing date for steers sold on a live-basis was achieved by selling at the earliest time, 75% of normal, to minimize losses. However, the optimal marketing date for steers sold on a carcass-basis was achieved by feeding to 125% of normal. Additionally, the best case scenario for a live marketing strategy was $141.48/head loss whereas the best scenario for a carcass marketing strategy was $107.20/head loss. Profitability of steers marketed on a carcass-basis appear to benefit from additional days on feed during times of expensive feed and negative profitability compared to steers marketed on a live-basis. Across all market scenarios, cost of gain increased on a live-basis and decreased on a carcass-basis.

A central principal in feeding steers longer is the distribution of costs over more weight. The reason cost of gains decreased in the carcass marketing scenarios is related to the relative gain in live weight and carcass weight with increasing days on feed. The carcass weight gain (final carcass weight minus initial carcass weight) was 64, 69, and 73% of the live weight gain (final live weight minus initial live weight) for 75, 100, and 125% of days on feed, respectively. The cost of gain decreases on a carcass basis because the weight gain that the costs are distributed over is increasing in the carcass relative to the live steer weight. The same principal can be applied to initial purchase price of the steer. The purchase price was $150/cwt and the live market price was $125/cwt. Therefore, $25/cwt of the purchase weight must be made up by a cost of gain lower than $125/cwt. For a 769 lb steer, the negative margin that must be overcome is $192.25/steer (769 lb x $25/cwt). At 0.50 inch of rib fat, the live gain is 548 lb and the negative margin would equate to $35/cwt of gain. If the same steers were fed 25% longer, the live gain is 669 lb and the negative margin from purchase price

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is $29/cwt because it is spread over more weight.

Feeding longer than 0.50 to 0.55 inch of rib fat is an extrapolation of the data set. Feed efficiency may decline more rapidly beyond 0.50 inch rib fat than the equations in this data set predict. Therefore, we cannot ensure that feeding 25% longer will improve profit when selling on a carcass-basis. Feeding beyond 0.50 inch rib fat is clearly more profitable, but the optimum additional time on feed cannot be established with this data set.

Feeding steers longer than 0.50 inch rib fat increases yield grades, quality grades, and carcass weight. Few discounts are currently given for overweight carcasses. Premiums for improved quality grade may compensate for discounts given for greater yield grades. Finally, more carcass weight results in more beef on the market and potentially lower prices in the short-term. However, if we expect consumers to purchase more beef, we need to produce it; they consume what is produced.

Optimal marketing date is dependent on the marketing strategy used. During times of high feed costs and negative profits, it may be beneficial to market steers early if selling on a live-basis. However, for producers who market on a carcass-basis, feeding steers longer than the industry average 0.50 inch rib fat may improve profit.

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Table 1. Predicted average performance of steers marketed at 75, 100, or 125% of expected days on feed.

	Marketing Date, % of normal to achieve 0.50 inch back fat		
Item	75%	100%	125%
Days on Feed	105	140	175
Initial BW, lb	769	769	769
Final BW, lb	1189	1317	1438
Initial Carcass Weight, lb	450	450	450
Final Carcass Weight, lb	720	830	939
DMI, lb	23.97	24.51	25.14
Live ADG, lb	3.99	3.91	3.83
Live F:G, lb/lb	5.94	6.20	6.48
Carcass ADG, lb	2.95	2.98	2.96
Carcass F:G, lb/lb	8.14	8.26	8.52

Table 2. Predicted profit/loss and cost of gain of steers fed corn priced at $4.00/bu and marketed at 75, 100, or 125% of expected days on feed.

	Marketing Date, % of normal to achieve 0.50 inch back fat		
Item	75%	100%	125%
Days on Feed	105	140	175
Costs			
Steer cost, $	1153.52	1153.52	1153.52
Diet cost, $	207.84	283.35	363.35
Yardage, $	47.25	63.00	78.75
Miscellaneous, $	12.00	12.00	12.00
Total Costs, $	1420.61	1511.87	1607.62
Live Marketing			
Revenue, $	1486.58	1646.00	1797.58
Cost of Gain, $/lb	0.64	0.65	0.68
Profit, $	65.97	134.13	189.96
Carcass Marketing			
Revenue, $	1429.09	1646.03	1868.75
Cost of Gain $/lb	0.99	0.94	0.93
Profit, $	8.48	134.16	255.48

Table 3. Predicted profit/loss and cost of gain of steers fed corn priced at $6.00/bu and marketed at 75, 100, or 125% of expected days on feed.

	Marketing Date, % of normal to achieve 0.50 inch backfat		
Item	75%	100%	125%
Days on Feed	105	140	175
Costs			
Steer cost, $	1153.52	1153.52	1153.52
Diet cost, $	311.76	425.03	545.03
Yardage, $	47.25	63.00	78.75
Miscellaneous, $	12.00	12.00	12.00
Total Costs, $	1524.53	1653.54	1789.29
Live Marketing			
Revenue, $	1486.58	1646.00	1797.58
Cost of Gain, $/lb	0.88	0.91	0.95
Profit, $	(-37.95)	(-7.54)	8.28
Carcass Marketing			
Revenue, $	1429.09	1646.03	1868.75
Cost of Gain $/lb	1.37	1.32	1.30
Profit, $	(-95.44)	(-7.51)	73.81

Table 4. Predicted profit/loss and cost of gain of steers fed corn priced at $8.00/bu and marketed at 75, 100, or 125% of expected days on feed.

	Marketing Date, % of normal to achieve 0.50 inch back fat		
Item	75%	100%	125%
Days on Feed	105	140	175
Costs			
Steer cost, $	1153.52	1153.52	1153.52
Diet cost, $	415.69	566.71	726.70
Yardage, $	47.25	63.00	78.75
Miscellaneous, $	12.00	12.00	12.00
Total Costs, $	1628.45	1794.22	1970.97
Live Marketing			
Revenue, $	1486.58	1646.00	1797.58
Cost of Gain, $/lb	1.13	1.17	1.22
Profit, $	(-141.87)	(-149.22)	(-173.39)
Carcass Marketing			
Revenue, $	1429.09	1646.03	1868.75
Cost of Gain $/lb	1.76	1.69	1.66
Profit, $	(-199.36)	(-149.19)	(-107.87)

