PROFIT PROFILES:
FACTORS DRIVING CATTLE FEEDING PROFITABILITY

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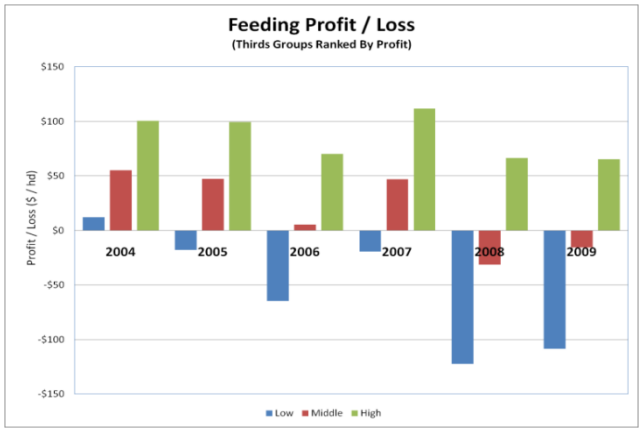
Profitability Points

- ***Regardless of the market, there are always cattle that make more money than others***
- ***The range in profit/loss within a month is more than $200/head, so there is obviously room for the low profit lots to improve***
- ***Top 1/3 of lots averaged $90.26/head profit, bottom 1/3 had $39.15/head loss***
- ***Most profitable steers had***
  - ***highest weight gain***
  - ***heaviest carcasses***
  - ***highest percent Choice and Prime***
  - ***highest percent Yield Grade (YG) 4s and 5s***
- ***Added weight can overcome heavy carcass and YG 4 and 5 discounts***
- ***Carcass based sales can***
  - ***provide more sale weight***
  - ***widen marketing window***
- ***Monitor performance and weight to maximize profit***
- ***Adapt feeding and marketing programs to the changing market conditions***

ANALYZE DISCOVER ANSWER

The purpose of this paper is to analyze feedlot performance and carcass data to better understand which factors most contribute to improved feeding profitability. Data used for this analysis come from multiple sources including Certified Angus Beef LLC (CAB) Feedlot Licensing Program (FLP) data compiled by Professional Cattle Consultants (PCC). The dataset spans a 6-year period starting in January 2004 and ending in December 2009. Only steers are used for the analysis and any non-hormone-treated (NHTC) or naturally fed cattle have been excluded. The total headcount for the dataset is 443,129 head. The time frame covers a full range of Choice-Select spreads from $0 to $23 per hundredweight (/cwt.). During this same period, ration prices more than doubled from $153/ton in March 2006 to $315/ton in July 2008. Fed cattle prices ranged from a low of 75¢/pound (lb.) to a high of $1/lb.

Over the last 40 years or so, the sum total of cattle feeding profitability adds up to about zero. To be more specific, the average net in the PCC database (starting in 1973) is a $1.50/head loss, with a range in monthly average profitability of $250/head loss to $350/head profit. The monthly profit or loss (P&L) includes interest, but doesn't account for risk management. **However, the monthly average only tells part of the story.** The change in profitability over time is, of course, market driven. Yet, regardless of the market, there are nearly always individual lots that are making money and some that are losing money. The following graph of the monthly average *Feeding Profit / Loss* illustrates the wide range in cattle returns. In fact, the average of several monthly ranges exceeded $350/ head.



It was this great degree of variation in monthly profitability that encouraged us to begin this investigation into the reasons some cattle are more profitable than others. The method of analysis we have employed is to categorize the dataset into thirds-groups based on several factors, starting first with profitability. We will also examine third-groupings for quality grade, average daily gain, days on feed, and carcass weight.

Calculating lot-by-lot profitability in a dataset such as this can be problematic. Often, as in the case of retained ownership there is no "cost in" because the feeder cattle price is unavailable, or the owner- or feedyard-assigned in-cost is not applied in a standardized manner. In addition, PCC analysis of actual feeder cattle prices compared to a weekly average price, such as the CME Feeder Cattle Price Index, has shown very little correlation of purchase price to feedlot or carcass performance. This is not to say that premiums paid for higher quality feeder cattle or calves are inappropriate, but varying market conditions, selling location/region and marketing or procurement methods overshadow actual quality differences across a dataset such as this. Therefore, in order to reduce noise in the dataset, the cost-in variable – one that can lead to significant differences in profitability – has been standardized by assigning a feeder cattle price using a weekly average CME Feeder Cattle Price Index with a 5-cent slide applied either way from 750 lb.

Profit Profiles

"Profiling," or simply grouping data into thirds-groups, will be the primary method of analysis for this paper. The table below shows various descriptive, feeding performance and carcass performance indicators grouped by Profit Group. To accomplish this, the P&L of each lot is ranked within the month the lot closed and then assigned by that rank to the low, middle or high group. The result is a "profile" for low profit lots vs. average profit lots vs. high profit lots as shown in the table below. As mentioned above, there is clearly a wide range in profitability, even when the market effect has been minimized by ranking profits by month.

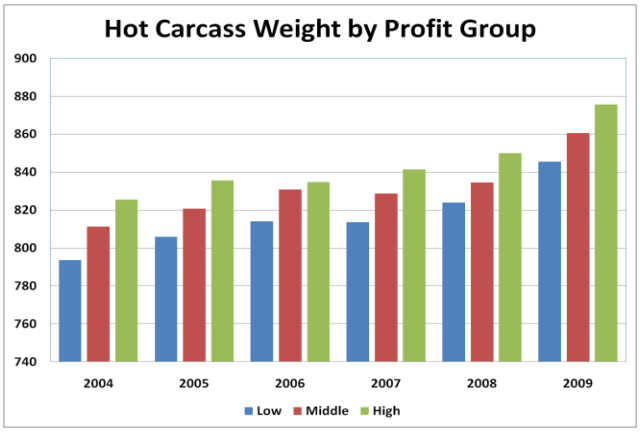
Profit Profile

	Low	Middle	High	All Groups
Feedlot Placement Weight, lb.	736	729	719	728
Feedlot Finish Weight, Live, lb.	1,270	1,290	1,311	1,290
Days on Feed	181.4	181.3	181.6	181.4
Gain In The Feedlot, lb.	501	559	591	550
Average Daily Gain, lb.	2.80	3.13	3.31	3.08
Average Carcass Weight, lb.	811	827	839	826
% Choice or Higher	49.83	51.66	56.20	52.55
% CAB® or Upper 2/3 Choice Premium	9.60	10.88	12.28	10.91
% YG 1&2	51.75	51.47	46.54	49.93
% YG 4&5	11.01	12.12	12.96	12.02

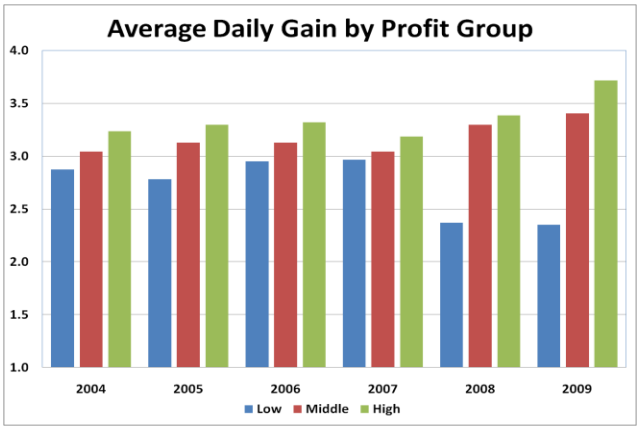
There are some trends that jump out by just scanning the table. Average daily gain (ADG) is probably the most obvious. High profit lots had a 3.31-lb. ADG compared to 2.8 lb. for the least profitable lots. **Also noteworthy is that live and carcass performance both contributed to improved profitability.** High profit lots had 56.20% Choice or higher carcasses with 12.28% in the "premium Choice" category, while low profit lots had 49.83% Choice or better and 9.6% premium Choice carcasses. Of equal interest is the fact that the high profit lots had almost 13% YG 4s and 5s compared to 11.01% for low profit lots. The additional carcass weight and improved quality grade overcame the YG discounts (and probably additional carcass weight discounts) netting more profit to the bottom line.

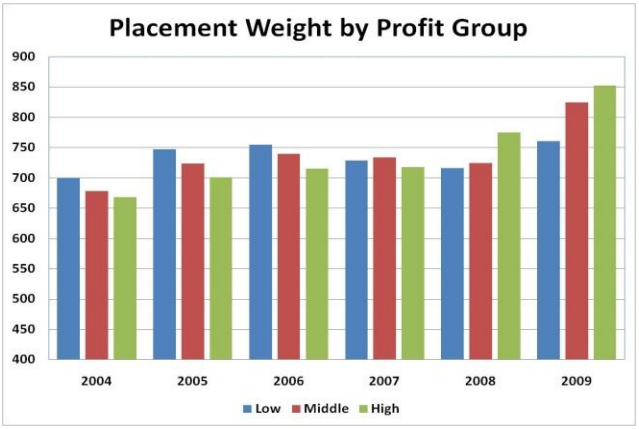
Drilling down in the Profit Profile—to determine how the data breaks down by year—yields some interesting perspectives as well. For example, the *Average Daily Gain by Profit Group* graph below really shows how important gain and feed efficiency are when ration prices are high. In 2006 the average ration price was $166/ton on a dry matter basis. Ration prices doubled between 2006 and 2008, topping out at $315/ton in July 2008 for that time period, with the effects first showing up in 2008 closeouts. The profiling result was that poorer gaining cattle were shifted into the low profit group. The spread in ADG between the low and high profit groups was .97 lb. (2.95 lb. to 3.37 lb.). In 2009, when closeouts reflected that high in ration prices set in the last half of 2008, the ADG spread widened to 1.37 lb., with a range of 2.35 lb. to 3.71 lb.

Carcass weights were on the rise through the 6-year period these data were collected. This dataset also reflects the industry-wide trend very well. Although the average weights increased, the Profit Profile for carcass weight remained very similar within each year: a 26- to 30-lb. range between the high and low profit groups.

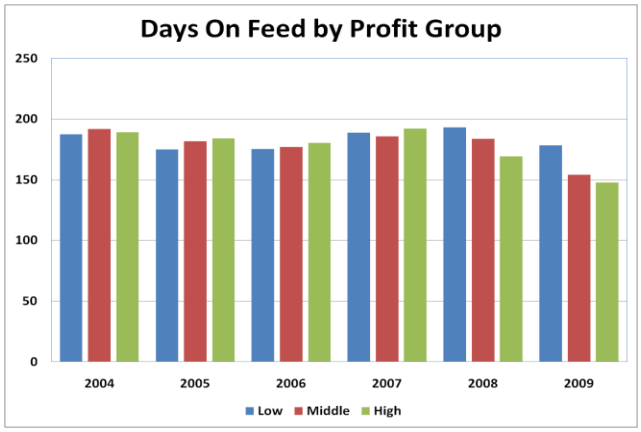


Increasing ration costs caused the Profit Profile for placement weights to change as well. During 2004, 2005 and 2006, lighter weight cattle that were fed to heavier carcass weights were the most profitable. By 2009 that had completely reversed and the most profitable cattle averaged 100 lb. heavier when placed on feed than the least profitable cattle.

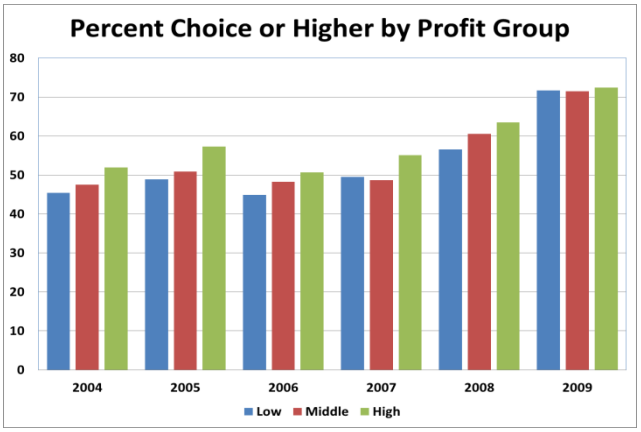




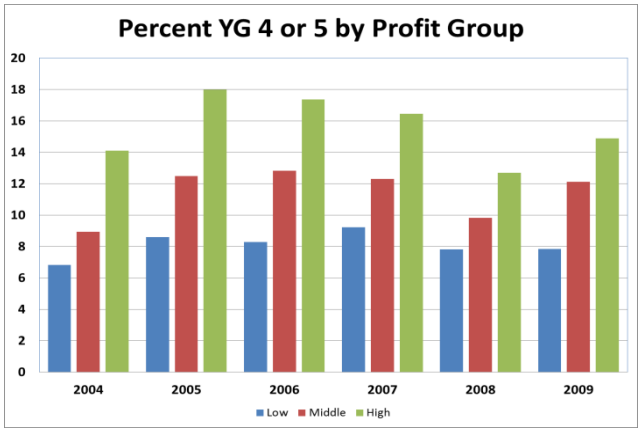
Days on feed were affected, too, reflecting the trend in placement weights.



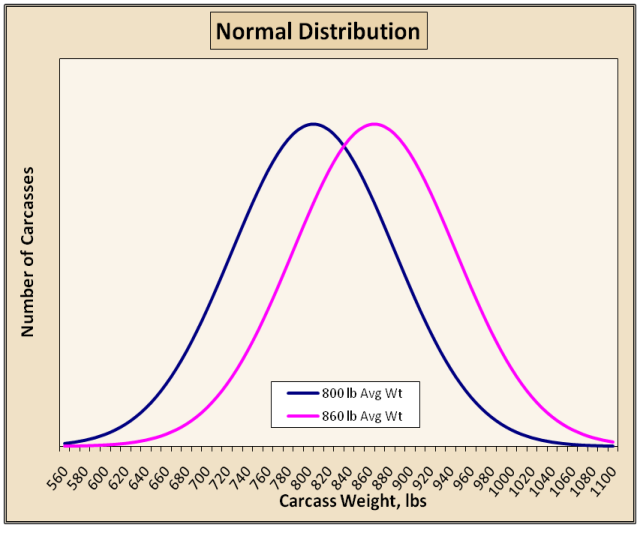
Yearly breakdown in carcass aspects of the Profit Profiles are also notable. From 2006 to 2009 as Choice-Select spreads narrowed, ration costs magnified the effect of feeding performance, average quality grade improved, and quality grade became less of a factor in influencing profitability. When Choice-Select spreads are wider and when ration costs are lower, such as in the first three years of the dataset, quality grade is more of a factor.



The *Percent YG 4 or 5 Profile Group* by year matches the aggregate Profit Profile but at different levels. We know from the carcass weight profiles that the most profitable pens tend to be heavier. The YG data show that they are also fatter. With the exception of 2009, when grade was higher across the board, the more profitable cattle also graded higher matching the YG 4 and 5 trend.



This is probably a good time to reinforce an important point. This analysis is based on pens of cattle, not on individuals. For the most part, this is the way we feed cattle today – as a pen, not as individuals. As such, you are dealing with a biologically diverse population within each pen. Biological populations roughly fall into "normal distributions," so as you change the makeup of a population using management practices such as adding more days on feed you are essentially shifting the population. Measures such as carcass weight are going to change in a linear fashion. However, measures that evaluate a percentage of the population such as Choice or higher, YG 4s or 5s, percent heavy carcasses,



etc., are going to increase exponentially as you approach the mean of the group. Take the carcass weight graph shown here (page 4). If the cutoff for heavy carcasses were 950 lb., the group with an 800-lb. average carcass weight would have 5% "heavies." Adding just 60 lb. to the average carcass weight almost triples the heavies bringing that share to 13%. But, just as the most profitable group had more YG 4s and 5s, nearly tripling the number of discounted heavy carcasses isn't all bad. If it took you 30 days to add 60 lb. of carcass weight and it cost you $2/day to add the weight, you would still be about $10/head better off across the whole pen. This is not to say that you can ignore the effect of carcass discounts. In fact, the best scenario would be to work on reducing variation in the pen, so that you could increase carcass weight and improve quality grades without incurring discounts for heavyweight carcasses or for additional YG 4s or 5s.

Quality Grade Profile

The next step in the profile analysis process is to regroup the dataset (by month as before) for each of the significant measures. The table below shows the *Quality Grade Profile*. The high Quality Grade cattle gained 3.18 lb./day compared to 2.97 lb. for the low grading cattle. **A common perception is that you have to give up feeding performance to get grade, yet the higher grading cattle also tended to gain better in this thirds-group analysis.** We typically think that as an animal attains a higher degree of finish, its live performance declines.

This is true when evaluating performance at various days on feed. But, if we look at it from a feed utilization standpoint, the *Quality Grade Profile* actually makes a lot of sense. If poorer gain is the result of a less efficient use of feed nutrients, assuming intake is not limiting, we could also expect the poor nutrient utilization to limit fat deposition. We would expect to see more YG 1s and 2s, and fewer Choice and Prime carcasses. On the other hand, if an animal is more efficient at utilizing feed nutrients for gain there is potentially more energy available for fat deposition, meaning fewer YG 1s and 2s, and more Choice and Prime carcasses. This is, of course, dependent on the level of feed intake.

Days on feed and placement weight were not significantly different between the high and low grading groups. As you would expect, the highest grading cattle had almost twice as many YG 4s and 5s as the low grading cattle (16.2% vs. 8.2%). Still, higher grading cattle were about twice as profitable as low grading cattle with an average return per head of $35.21 compared to $18.03.

	Quality Grade Profile			
	Low	Middle	High	All Groups
Feedlot Placement Weight	729	731	724	728
Feedlot Finish Weight Live	1,276	1,291	1,305	1,290
Days on Feed	182	179	184	181
Pounds Gained In The Feedlot	532	547	571	550
Average Daily Gain	2.97	3.09	3.18	3.08
Average Carcass Weight	819	826	832	826
% Choice or Higher	33.3	51.9	72.8	52.6
% CAB or Upper 2/3 Choice Premium	5.0	9.9	18.0	10.9
% YG 1 &2	61.3	50.6	37.6	49.9
% YG 4 & 5	8.2	11.7	16.2	12.0
Calculated Profit / Loss	18.03	24.02	35.21	25.70

Average Daily Gain Profile

Average daily gain stood out as the factor most strongly related to feedlot profitability in the *Profit Profile*. The drilldown into profit profiles by year showed how higher ration prices made ADG stand out even more. In the *Average Daily Gain* Profile the high gaining group (upper third for each month) gained 3.66 lb./day compared to 2.44 lb/day for the low gainers (low third). The high gainers also made an average $41.08/head more than the slower gaining cattle. As before, gain and grade are still correlated, with the high gain group grading 56% Choice or better compared to 49.2% for the slower gaining third. There was also a small increase (11.3% vs. 10.3%) in upper Choice. The high gainers were almost 40 lb. heavier when they went on feed, but they also gained more in the feedlot achieving an out-weight that was 121 lb. heavier than the slower gaining cattle in the bottom third, and they did it with 41 fewer days on feed.

Days on Feed Profile

There was no difference in days on feed by profit group, but in the yearly breakdown we did see other differences. As ration price increased through 2008 and 2009, there was a shift in the profit profiles. We saw both heavier in-weights and fewer days on feed in the high profit group, while there were lower in-weights and more days on feed in the low profit group. Still, to be complete in our analysis, we also ran a profile for days on feed as shown below. The low-third

Average Daily Gain Profile

	Low	Middle	High	All Groups
Feedlot Placement Weight	714	717	753	728
Feedlot Finish Weight Live	1,213	1,289	1,334	1,290
Days on Feed	201	183	160	181
Pounds Gained In The Feedlot	499	571	581	550
Average Daily Gain	2.44	3.15	3.66	3.08
Average Carcass Weight	782	825	847	826
% Choice or Higher	49.2	52.3	56.1	52.6
% CAB or Upper 2/3 Choice Premium	10.3	11.2	11.3	10.9
% YG 1 &2	55.3	51.4	43.0	49.9
% YG 4 & 5	11.2	11.8	13.1	12.0
Calculated Profit / Loss	4.32	27.69	45.40	25.70

Days on Feed Profile

	Low	Middle	High	All Groups
Feedlot Placement Weight	816	729	638	728
Feedlot Finish Weight Live	1,301	1,289	1,281	1,290
Days on Feed	143	178	224	181
Pounds Gained In The Feedlot	470	549	633	550
Average Daily Gain	3.27	3.10	2.86	3.08
Average Carcass Weight	827	826	824	826
% Choice or Higher	52.1	51.9	53.6	52.6
% CAB or Upper 2/3 Choice Premium	11.0	10.9	10.9	10.9
% YG 1 &2	49.5	52.2	48.1	49.9
% YG 4 & 5	10.6	11.7	13.8	12.0
Calculated Profit / Loss	24.68	23.98	28.44	25.70

group had 143 days on feed compared to 224 for the high third, so while the Profit Group analysis showed no difference in days on feed by profit group, there was a wide range in days in this sample. This range in feeding days is, again, explained by in-weights and by weight-gain differences.

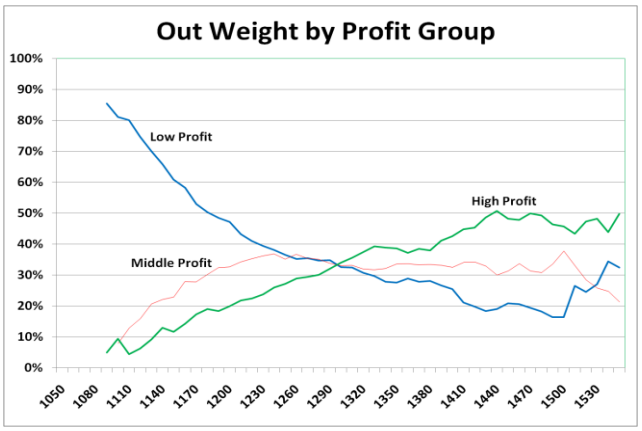
Carcass Weight Profile

The heavier out-weight cattle group averaged 71 lb. heavier at placement and had an extra 93 lb. of carcass weight than the lightest placement weight group, but had only four fewer days on feed. There are twice as many YG 4s and 5s, and with an average carcass weight of 872 lb., there will be more heavyweight discounts, but the extra weight gain was enough to net a $31/head advantage. The additional pounds evidently overshadowed the increase in YG 4s and 5s. Once again, we see that grade increases as out-weight and ADG increases.

Profit Profile Threshold Analysis

The Profit Profile analysis, thus far, has shown trends that help us to understand the factors that are most highly correlated to profitability. However, it would obviously be incorrect to assume that those trend lines extend to infinity. The next set of graphs takes a different approach but still uses the thirds-groups to show some threshold levels at which profitability ceases to improve and then begins to drop off.

Out Weight by Profit Group shows a very clear trend in profitability as out-weight increases to beyond 1,400 lb., at which point the percentage of lots in the high profit group levels off. Once



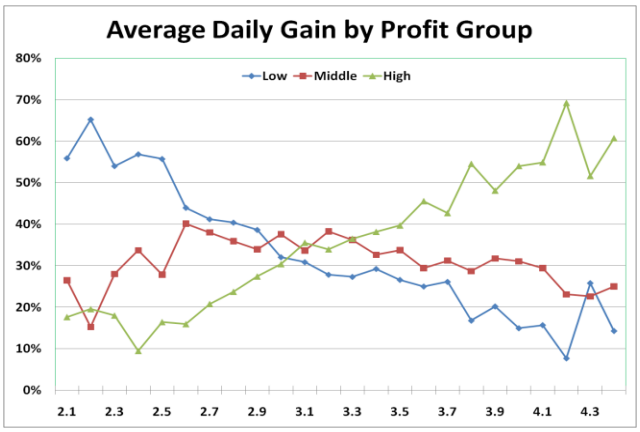
out-weight begins to approach 1,500-lb. levels, the number of **less profitable** lots begins to increase sharply.

The *Average Daily Gain by Profit Group* graph shows an ADG threshold at about 4.3 lb./day, as

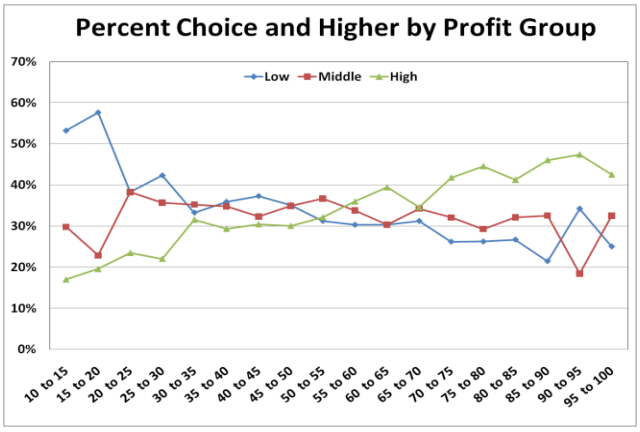
Carcass Weight Profile

	Low	Middle	High	All Groups
Feedlot Placement Weight	690	734	761	728
Feedlot Finish Weight Live	1,223	1,292	1,358	1,290
Days on Feed	185	178	181	181
Pounds Gained In The Feedlot	517	552	582	550
Average Daily Gain	2.84	3.13	3.26	3.08
Average Carcass Weight	779	826	872	826
% Choice or Higher	50.5	51.3	55.9	52.6
% CAB or Upper 2/3 Choice Premium	11.3	10.7	10.8	10.9
% YG 1 &2	55.1	51.3	43.2	49.9
% YG 4 & 5	8.8	11.2	16.1	12.0
Calculated Profit / Loss	8.57	28.25	40.49	25.70

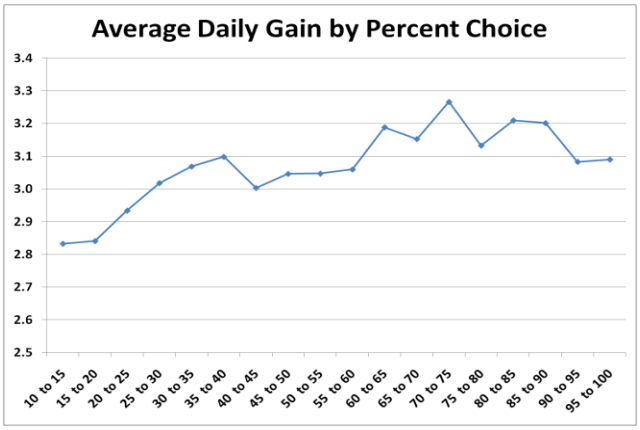
cattle that out-perform expectations begin to push through the weight ceiling and get too much of a heavy weight discount to offset the value of the additional weight.



Profit tends to improve as quality grade improves (more Choice or higher carcasses). However, about 30% of the cattle grading 90% Choice or higher were still in the low profit group.



Perhaps the most useful graph, thus far, is the direct comparison of Quality Grade to ADG in the next graph. As grade improves, so does ADG until 70% to 75% of the lot is Choice or higher, at which point ADG begins to drop off. It would appear that once cattle reach a threshold level of finish, gain drops off. This is interesting because it confirms a theory we have had at PCC that

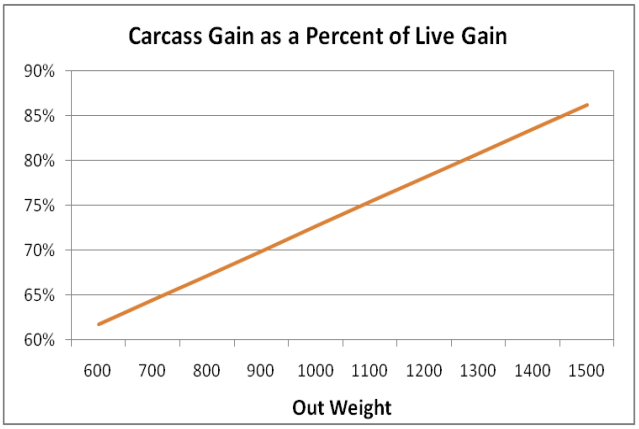


reaching a certain degree of finish flips a kind of biological trigger that starts limiting intake, which is often seen at the end of the feeding period. Also, as weight increases (and we assume grade is increasing) energy required for maintenance increases; therefore, if consumption does not increase correspondingly, gain slows.

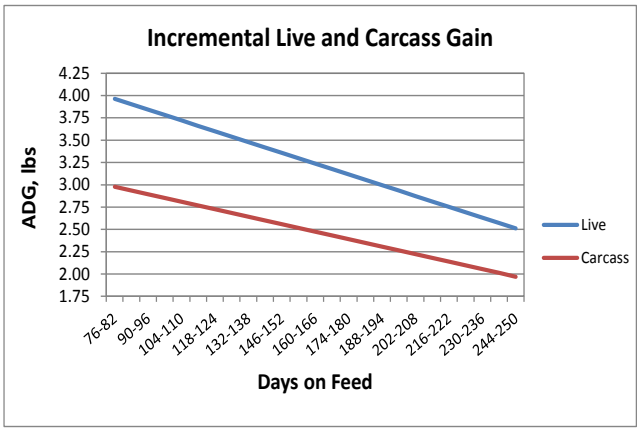
Consider the following scenario using current ration prices, energy levels reported to PCC, and some basic National Research Council (NRC) formulas to estimate gain from consumption at a given weight. A 1,000-lb. large framed steer consuming 20.3 lb. (dry matter) of a typical finishing ration (based on current PCC ration data) will gain close to 3.5 lb./day at a cost of 63¢/lb. of gain. If that steer is consuming the same amount of feed at 1,250 lb., ADG will drop to approximately 2.6 lb., with a corresponding cost of gain around 83¢. At 1,300 lb., ADG will be around 2.5 lb. with cost of gain at about 87¢, again assuming that consumption has remained constant. If consumptions are down by only 2 lb. incremental gain drops to 2.21 lb./day and incremental cost of gain increases to 92¢/lb.

Since all of the cattle in this study were sold on a carcass basis, we thought it would be good to include some discussion on how carcass gain and cost of gain is quite different from live gain. If the cattle in the analysis had been sold on a live-weight basis, there would probably be less of a spread in out-weight between the profit groups. This graph, showing carcass gain as a

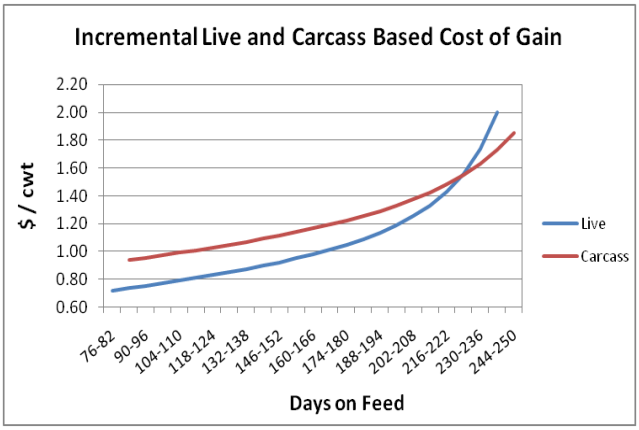
percent of live gain, is based on research by Dr. Mike Brown at West Texas A&M University. It illustrates how, as cattle approach finish weights, an increasingly higher percentage of live weight is actually due to an increase in carcass weight.



An important comparison for those who sell cattle on a carcass basis rather than live can be seen in the next graph. Keep in mind that, as shown in the previous graph, as live weight increases, a higher percentage of the additional weight gain is carcass weight. Thus, we see that the incremental live-weight gain decreases faster than the incremental carcass-weight gain.



This difference between the incremental live and carcass gain is important when considering the cost of either measure of weight gain and the number of days cattle could be fed as shown in *Incremental Live and Carcass Gain*. The cost of gains shown on the graph was based on $225/ton ration DM costs and the PCC Incremental Days-On-Feed Performance Model. Using fed cattle market values for the week ending January 15, 2010 ($85/cwt live-weight basis and $136 to $138/cwt carcass basis) and the incremental cost of gain estimates, a lot of steers placed at an average 750 lb. and marketed on a live basis would need to be sold before approximately 140 days. This is when the cost of production begins to exceed the returns. However, if marketed on a carcass-weight basis, the same lot could be fed for an extra 40 days. In a higher trending market, the decision to put extra days on feed is a simple one. If the market is trending lower, or potentially near a top, then changing market conditions need to be more closely accounted for.



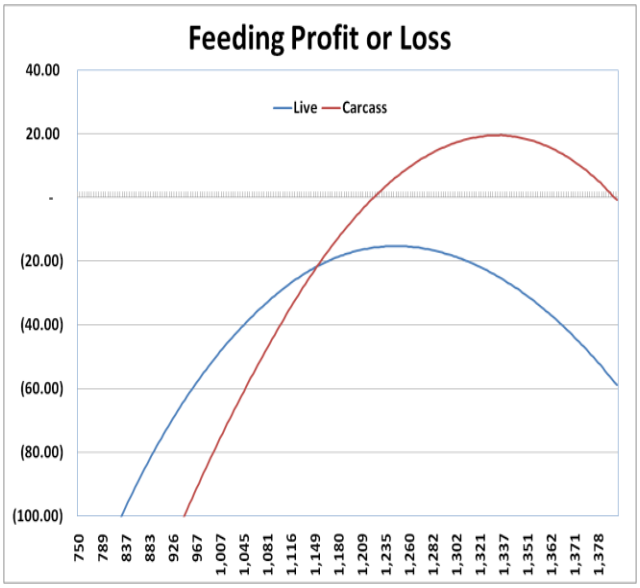
The bottom line is that selling on either a live- or carcass-weight basis does affect the point at which you can no longer add weight profitably.

The last graph, *Feeding Profit or Loss*, illustrates that selling on a carcass basis widens the marketing window by several weeks when compared to selling on a live basis. A lower trending market can narrow that window, while a higher trending market actually widens it further.

Whatever marketing method is utilized, feeders need to be aware of changing performance at the end of the feeding period and how that affects incremental cost of gain − live or carcass.

Summary

Each month, there are cattle that close out with profits that are at least $100/head over and $100 under the average industry profitability. When there is a large degree of variability, it generally means that there is opportunity for improvement. By studying "profiles" of high- and low-profit cattle, we can learn more about the most and least profitable cattle, and perhaps improve the profitability of cattle that we feed.



This analysis showed the most profitable cattle were the best gainers, had significantly heavier out-weights, and were fed to a higher degree of finish as indicated by higher quality grades and more YG 4s and 5s. However, the analysis also underscored the importance of adapting to changing market conditions and placing cattle at appropriate weights going into the feedyard, adjusting days on feed accordingly, and monitoring intakes and gains at the end of the feeding period to balance carcass performance and cost of gains.

The analysis appears to disprove some common perceptions about tradeoffs between feeding and carcass performance. High grading cattle had better average daily gains, heavier carcass weights and were more profitable than low grading cattle. The threshold analysis showed that ADG improved as grade improved, or until about 75% to 80% Choice, at which point ADG starts to drop off.

We can also learn some lessons from the least profitable cattle. One of the most obvious is that underfeeding cattle – whether you measure that by out-weight or degree of finish – rarely pays off in terms of improved profits. The least profitable cattle had fewer YG 4s and 5s, and had a lower number of Choice and Prime carcasses. In fact, the threshold analysis showed that cattle needed to be fed to 50% Choice or higher to get out of the low profit group.

Using the Profit Profiles for threshold analysis also showed that over-performing cattle – either the top gainers or the best grading cattle – have a risk of dropping into the middle or low profit groups if not monitored closely. This is simply because of the risk related to overfeeding and the accompanying risk of high carcass weights or YG 4 and 5 discounts. However, it also showed that the most profitable lots did have more YG 4s and 5s, and with an average carcass weight of 835 lb., probably had some heavy discounts as well. Still, the high ADG and additional sellable pounds more than overcame the discounts.

There is no magic formula for feeding cattle profitably.

However, by studying the characteristics of high and low profit lots, we have learned that feeding cattle to an "optimum" end point – which may be a little heavier, and a little more finished than is typical – tends to improve profitability. It is important to monitor performance and weight at the end of the feeding period because there are threshold levels at which profitability drops quickly. Finally, some grid discounts for heavy carcasses and YG 4s and 5s are tolerable as long as lot-level profitability is improving.