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The Profit Potential of Different Beef Breeding and Marketing Strategies

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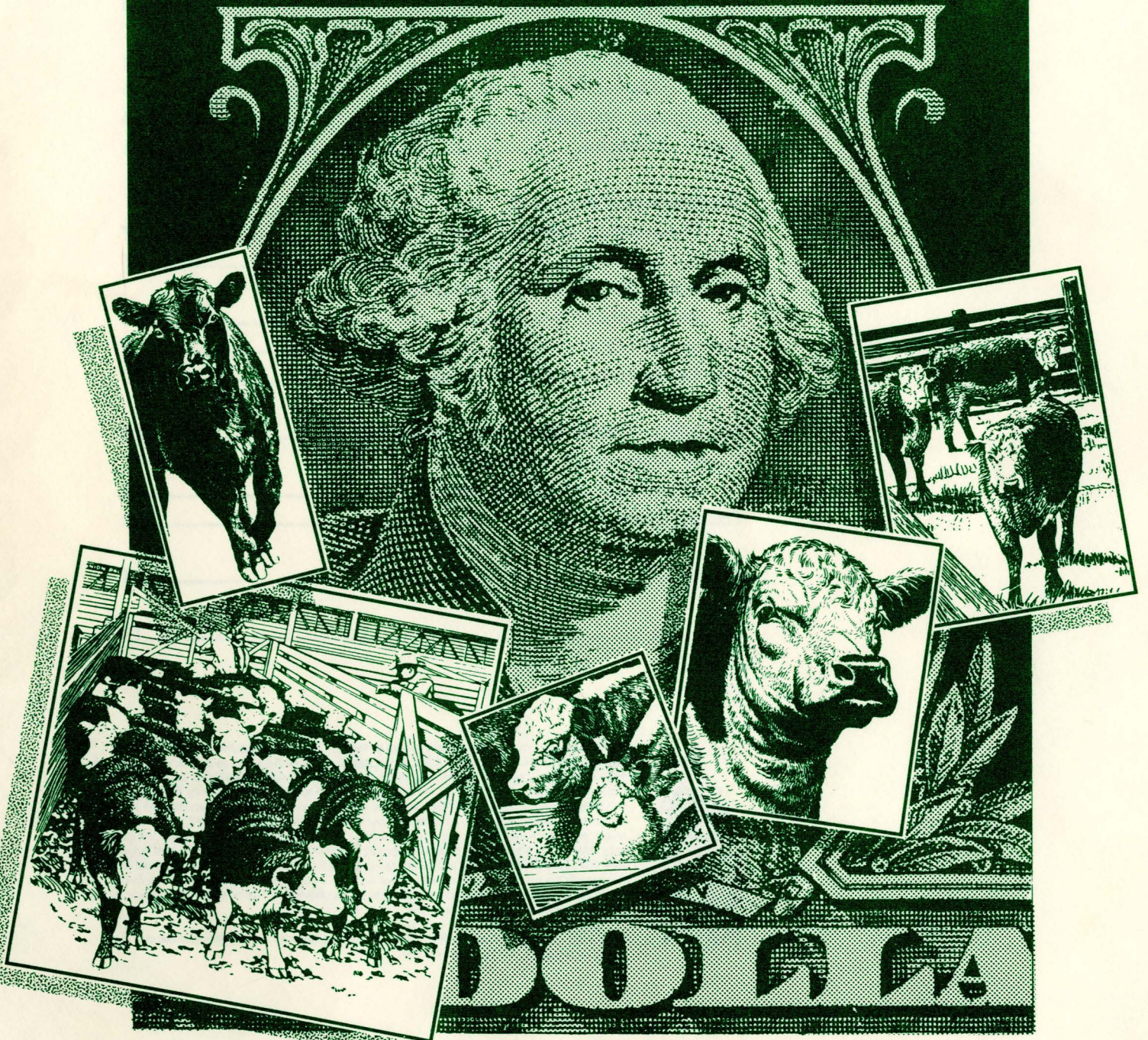
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The profit potential of different beef feeding and marketing strategies



Agricultural Experiment Station • South Dakota State University • U.S. Department of Agriculture

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The profit potential of different beef feeding and marketing strategies

Dillon M. Feuz and John J. Wagner

Calf prices were relatively high over the last several years when prices averaged around \$100/cwt for weaned steer calves from 1988 to 1993. These were profitable times for many cow-calf producers, and they sold their calf crops at weaning and smiled all the way to the bank.

This long period of higher calf prices is without precedent in the U.S. cattle industry. Historically, cow-calf producers have had a few years of higher prices, followed by several years of lower prices (Fig 1). Many in the cattle industry believe that calf prices will decline and remain at

lower levels for the next several years. If this is the case, what marketing and management strategies can cow-calf producers use to maximize their profits?

Retained ownership is a marketing strategy in which the cow-calf producer holds on to ownership of the calves beyond weaning, the traditional selling time.

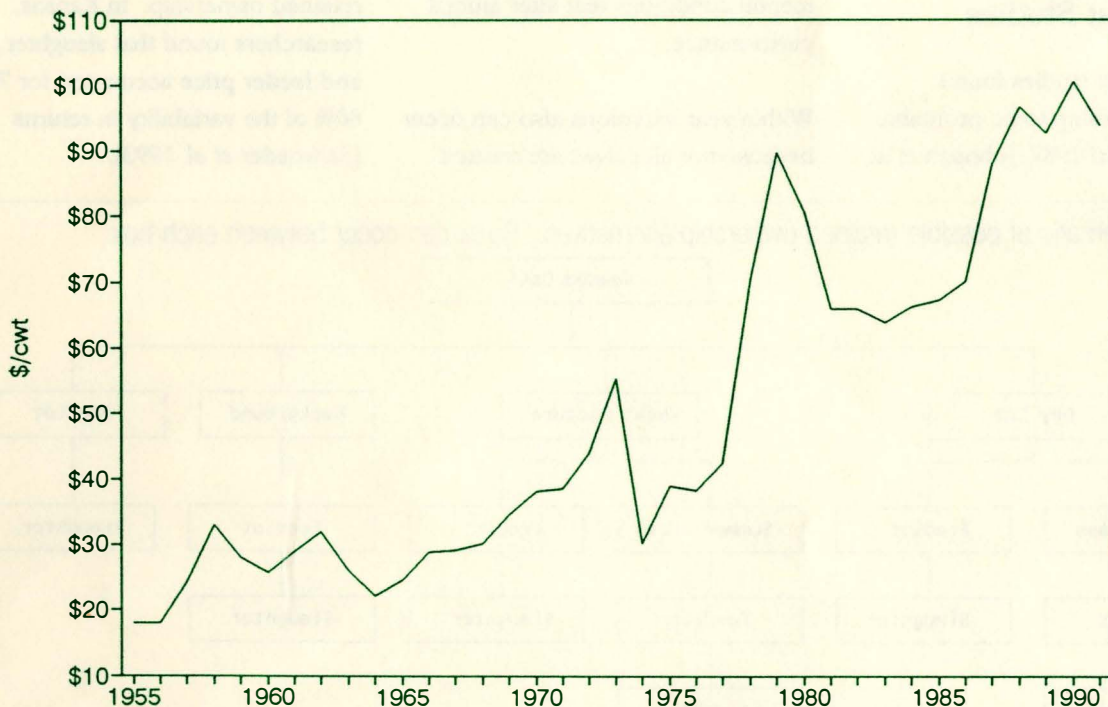
The length of time calves are held can vary considerably, depending upon the goals of the cow-calf producer. Calves may be retained for only a couple of months to shift

income into the next year, or ownership may be maintained until the animals are slaughtered. Retained ownership may occur on the cow-calf producer's farm or ranch, in a neighbor's pasture or feedlot, or in a custom feedlot some distance away.

There are a number of different retained ownership strategies (Fig 2). Weaned calves can be 1) dry lotted at the ranch at a relatively low rate of gain (.75-1.25 ADG), 2) placed on wheat pastures (1.25-1.75 ADG), 3) backgrounded in a feedlot (1.75-2.25 ADG), or 4) fed out directly to slaughter in a feedlot (2.5-3.25 ADG).

Dry lotted calves and calves on wheat pastures can be sold, placed on summer grass, or fed out to slaughter in a feedlot. Backgrounded calves can be either sold or finished in a feedlot. Calves coming off summer grass can be sold or finished out in a feedlot.

Fig 1. Historical calf prices, 500-lb steers, 1955-1992.



Each retained ownership strategy has advantages and disadvantages, and different cattle types work best in each strategy. This must be clearly understood by producers and their lenders. They must also consider the stage of the cattle price cycle (Fig 1) when they are evaluating retained ownership alternatives, as the cycle often affects the price relationships between weaned calves and feeder and/or finished cattle.

Questions in three important areas need to be settled: In what years is retained ownership profitable? What type of cattle are most suitable for each type of program? If cattle are retained to a slaughter weight, does marketing method affect profit? The answers are based on 1) relative prices of calves, feeders, and fed cattle, 2) impact of genetic differences in cattle on profitability in various retained ownership programs, and 3) the effect of marketing method on profits for various types of cattle.

Past Studies

In general, past studies found retained ownership to be profitable (Feuz and Kearl 1987, Johnson *et al.*

1989, Simms and Maddux 1990, and Ethridge *et al.* 1990). These studies were limited in the number of retained ownership alternatives and were fairly site specific.

A more general study was conducted by Cattle-Fax Inc., a private consulting firm which estimated the average profitability of retaining a 475-lb calf in each of the alternatives depicted in Figure 2 from 1980 to 1993 (1993) (Table 1). These returns are based on averages over a large geographic area and may be significantly different in some localities due to availability and costs of feedstuffs, type of cattle, and environmental conditions.

The numbers do show the average profitability and the variability of retained ownership returns. Year-to-year variations in profit can be expected because the prices of calves relative to feeder cattle relative to slaughter cattle are not constant. Feeding costs also vary due to changing feed prices and environmental conditions that alter animal performance.

Within-year variations also can occur because not all calves are created

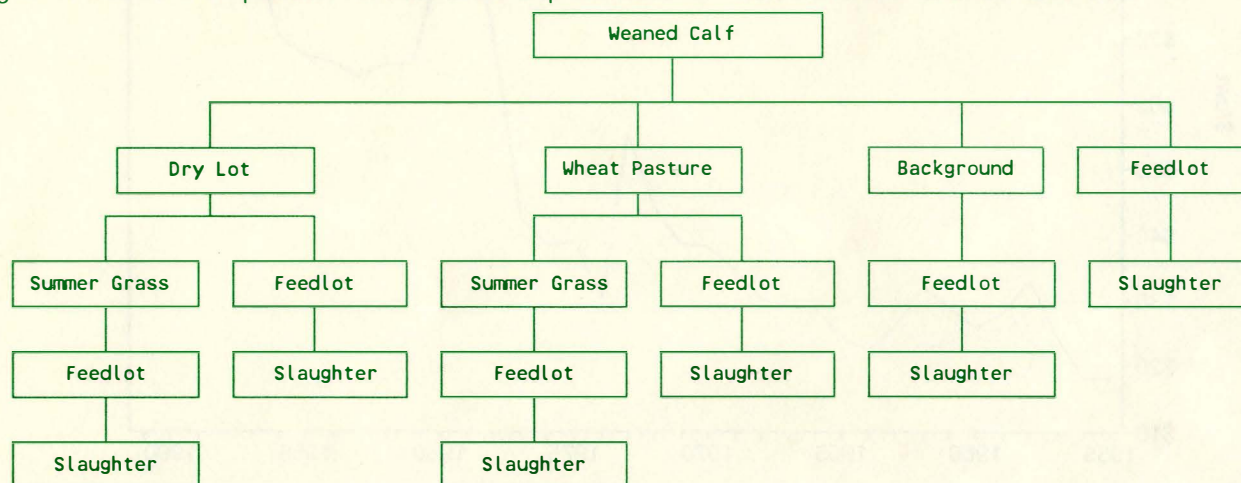
equal. Weaning weights and performance through the retained ownership program will vary based on genetics and prior management of the calves.

In a one-year retained ownership demonstration in South Dakota, the background, background to feedlot, and direct to feedlot alternatives were evaluated by Wagner and Feuz (1991). Average profit and range in profitability for 1991 are in Table 2. Feed costs, weather conditions, feedlot management, and market conditions were identical for all pens of cattle. The differences in profit are primarily due to differences in the genetic potential of the calves.

Cattle Prices

The relative price difference between weaned calves and feeders, yearlings, or fed cattle at the end of a retained ownership program is the most important determinant of profit from retained ownership. In Kansas, researchers found that slaughter price and feeder price accounted for 70 to 80% of the variability in returns (Schroeder *et al.* 1993).

Fig 2. A schematic of possible retained ownership alternatives. Sales can occur between each box.



The actual price level determines the profitability of cow-calf producers, but does not determine retained ownership profits. Profits can be made, or losses incurred, in both relatively high-price and relatively low-price years with retained ownership, **depending upon the price differentials.**

If producers knew these price differentials, they could choose the correct retained ownership alternative or choose to sell the calves at weaning, if that were most profitable. However, while the actual weaned calf price is known in the fall, the prices for yearlings, feeders, or fed cattle for the following year are not known with certainty. The futures market gives one estimate of what these prices may be, and livestock market analysts often provide price outlook information.

Another source of information (one often used by market analysts in developing their outlooks) is historical price patterns and relationships. Analyzing past patterns often gives insight into future prices.

So then, what are the price relationships for dry lot, background, and direct to feedlot retained ownership alternatives?

Dry Lot Alternatives

Historical price relationships for calves retained in a dry lot feeding program from 1973 to 1992 are shown in Figure 3. Prices are based on a 525-lb steer calf sold on November 1, a 675-lb short yearling sold on April 1, a 925-lb long yearling sold on September 15, and a 1200-lb fed steer sold on December 15.

Table 1. Retained ownership profit from 1980-1992.

<i>Program</i>	<i>Average profit</i>	<i>Best year</i>	<i>Worst year</i>	<i>Years profitable</i>
Dry lot	-\$32	24	-106	3/13
Dry lot to grass	33	136	-78	9/13
Dry lot to feedlot	1	131	-117	7/13
Dry lot to grass to feedlot	33	139	-113	8/12
Wheat pasture	35	78	-21	11/13
Wheat to grass	84	163	-25	12/13
Wheat to feedlot	55	153	-68	10/13
Wheat to grass to feedlot	92	175	-40	12/13
Background	5	74	-98	5/13
Background to feedlot	0	151	-134	5/13
Direct to feedlot	67	213	-32	10/13

Source: Cattle-Fax, Englewood, Colorado

Table 2. Variations in profit (\$/head) on three retained ownership programs in 1991.

<i>Program</i>	<i>Average profit</i>	<i>Best pen</i>	<i>Worst pen</i>
Background	-1.84	51.14	-62.03
Background to feedlot	16.69	57.26	-39.57
Direct to feedlot	38.75	131.36	-56.75

The calf price for November in Figure 3 is for one year earlier than shown in the graph. In other words, the first prices shown are 1972 for the November 1 fall calf sale and 1973 for all of the retained ownership sales. In this manner, prices are compared for the same calf crop.

In hindsight, the prices in Figure 3 show when profit could have been made if calves had been sold or retained (of course, feeding costs also must be considered).

Three generalities seem apparent: 1) The price differentials between

calves, yearlings, and slaughter steers are wider in relatively high-price years than in relatively low-price years. 2) In the relatively low-price years (mid 1970s and mid 1980s) yearling steer and fed steer prices actually exceeded steer calf prices in some years. 3) If feeding costs remain constant, then retained ownership should be more profitable in relatively low cattle price years.

Background Alternatives

The historical prices for calves retained in a backgrounding program

and then fed to a finished weight show a similar pattern to the dry lot case (Fig 4). The calf price is once again for a 525-lb steer sold November 1. The feeder price is for an 825-lb feeder steer sold April 1, and the fed steer is a 1200-lb slaughter steer sold August 1. The calf price is again for the fall of the year prior to retained ownership sales.

It would appear from the price differentials in Figure 4 that retained ownership through backgrounding would be more profitable in years of relatively lower cattle prices. In some of these years of relatively lower calf prices, feeders and finished cattle actually sold for a higher price per pound than did lighter weight calves.

Producers in South Dakota often retain ownership of calves in a dry lot setting or a background lot for a

shorter time period than is shown by this data. Frequently, calves are sold in January or February after 75-100 days on feed. The price relationships for these retained ownership alternatives would be similar to those for short yearlings (Fig 3) or feeders (Fig 4) compared to calves.

However, the short yearling and feeder weights would be lighter and the seasonal feeder steer price would be slightly higher.

So, the price differential between calves and short yearlings or feeders should be narrower in years of higher prices and may be more positive in years of lower prices.

Direct to Feedlot

The price differential between a 525-lb steer calf sold on November 1 and

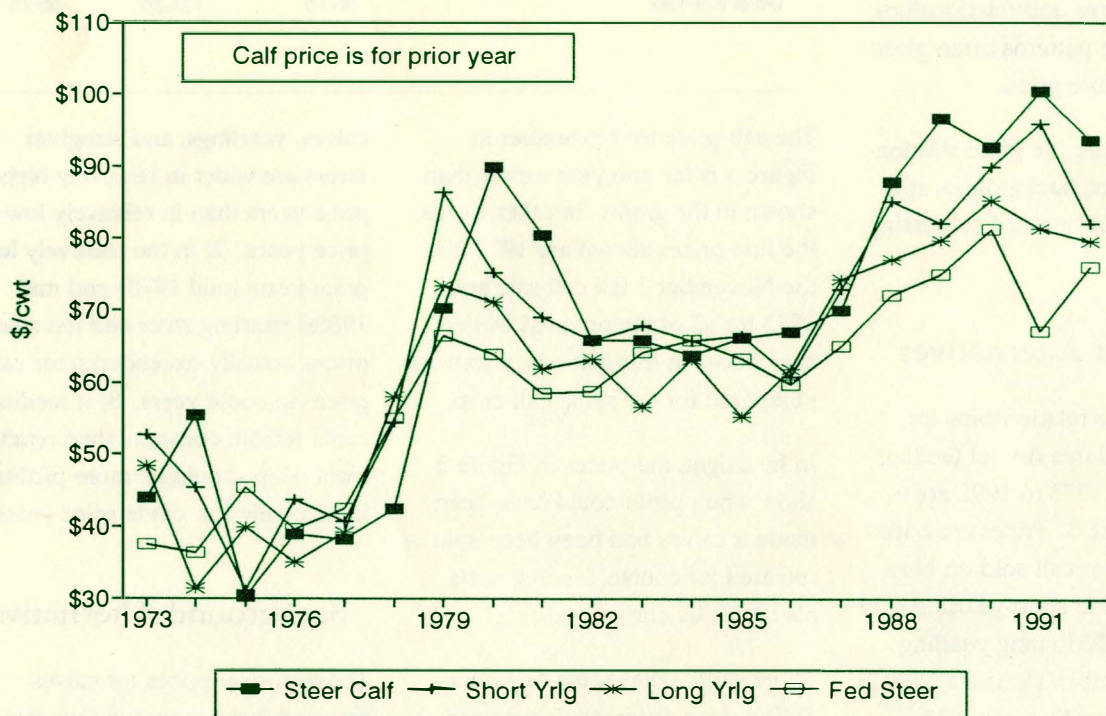
an 1110-lb finished steer sold the following year on May 15 is displayed in Figure 5. Again, it would appear to be more profitable to retain calves in years of relatively lower prices.

So far, this discussion has oversimplified a complex decision.

Relative prices of calves, feeders, and slaughter cattle are not the only determinants of retained ownership profits. Feed and interest costs also vary from year to year; not only do they affect retained ownership profits but they also affect the observed cattle price differentials.

Environmental conditions and genetic ability of calves influence average daily gain in any retained ownership program and can have a big impact on profitability even when feed and cattle prices remain constant.

Fig 3. Prices for calves sold at weaning or through three types of dry lot retained ownership alternatives.



Genetics and Retained Ownership Alternatives

Three retained ownership strategies are evaluated: 1) accelerated finishing, 2) traditional two-phased backgrounding and finishing, and 3) moderate rate of gain backgrounding-only. Some reference also will be made to on-ranch dry lot and summer pasture programs.

Accelerated Finishing Program

Average per-head profits of steers fed in an accelerated finishing program as part of the South Dakota Retained Ownership Demonstration were \$38.75, \$26.00, and \$113.70 for 1991, 1992, and 1993, respectively.

However, profits per head varied greatly within each year of the pro-

ject. Profit ranged from -\$56.57 to \$131.36 in 1991, from -\$53.01 to \$98.55 in 1992, and from \$52.86 to \$177.36 per head in 1993 (Wagner *et al.* 1991, 1992, and 1993). Clearly, the range in profits each year exceeds the range in average profit over the 3 years.

So what are the differences between the more profitable and less profitable steers?

The data on the 750 steers were divided into low-, middle-, and high-profitability groups (Tables 3, 4, 5). The high-profitability groups earned a profit of nearly \$100 per head.

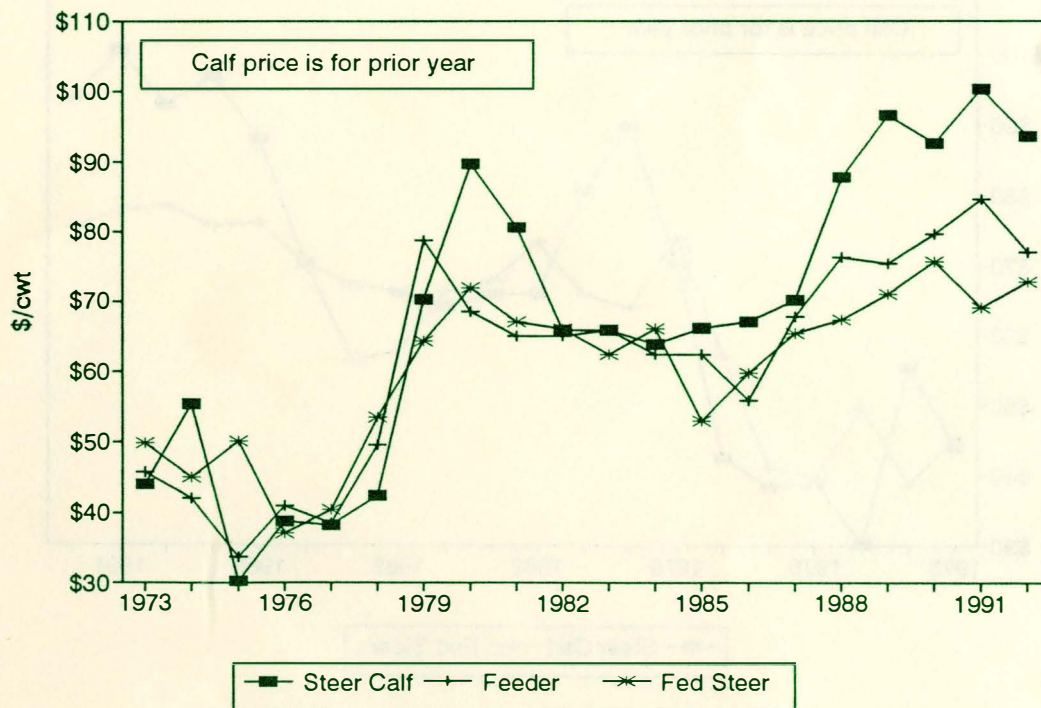
Differences in initial weight, frame size, condition, and age were very minimal across profit groups. However, the high-profit group gained weight more rapidly, had a

higher dressing percent, and graded an average of 66.8% Choice. Clearly, growthier cattle that produced a high yielding carcass with the propensity to grade Choice were well suited for the accelerated finishing program. Cattle without the ability to gain 3 lb daily and without the capability of grading Choice were not well suited for accelerated finishing.

Only a few breed differences were found. Average daily gains were similar for all breeds. Breeds with the ability to grade Choice or to produce a high yielding carcass tended to be more profitable than those breeds that lacked this ability.

These differences in profit may be more attributable to the marketing method used (grade and yield) than to performance. The effect of marketing method are discussed later.

Fig 4. Historical price relationships for background programs.



Granted that great differences between more- and less-profitable cattle may not be apparent at time of feedlot placement, can these two classes still be identified at this time?

Wagner and Feuz (1994) used data available on each steer in the accelerated feeding program to predict profitability: initial weight, height, back fat, and age; management history on creep feeding, vaccinations, and weaning date; and breed of sire and dam. All of these variables combined could only explain 17% of the variation in profit. By including data on average daily gain, dressing percent, and quality grade, 83% of the variation in profit could be explained.

Can average daily gain, dressing percent, and quality grade be predicted at feedlot placement?

Using the same initial variables, Wagner and Feuz were only able to account for 8% of the variation in gain, 14% of the variation in dressing percent, and 16% of the variation in quality grade.

However, in another study at SDSU, calves from the same cow herd at the Antelope Range Livestock Station were retained in an accelerated feeding program over a 7-year period (Marshall and Wagner 1990, Marshall 1992). The performance of these calves was very consistent from year to year. Average daily gain could be expected to range from 3.07 to 3.27 lb, and percentage choice was expected to be between 63.8 and 74.2%.

The implication of these studies is that there is considerable genetic variability that is hard to measure or

account for, but that known genetics have very repeatable and consistent performance.

Traditional Two-Phase Backgrounding and Finishing Program

Average profits of 145 steers fed a traditional, two-phased program as part of the South Dakota Retained Ownership Demonstration have been essentially zero over 2 years. In 1991, 90 head averaged \$16.69 per head profit, but in 1992, 55 head lost an average of \$28.74 per head.

There was considerable variation in profit within each year. Profitability of the 18 groups of five head varied from -\$39.57 to \$57.26 per head in 1991, and the range for the 11 groups of five head was -\$63.72 to

Fig 5. Historical price relationship for an accelerated finishing program.

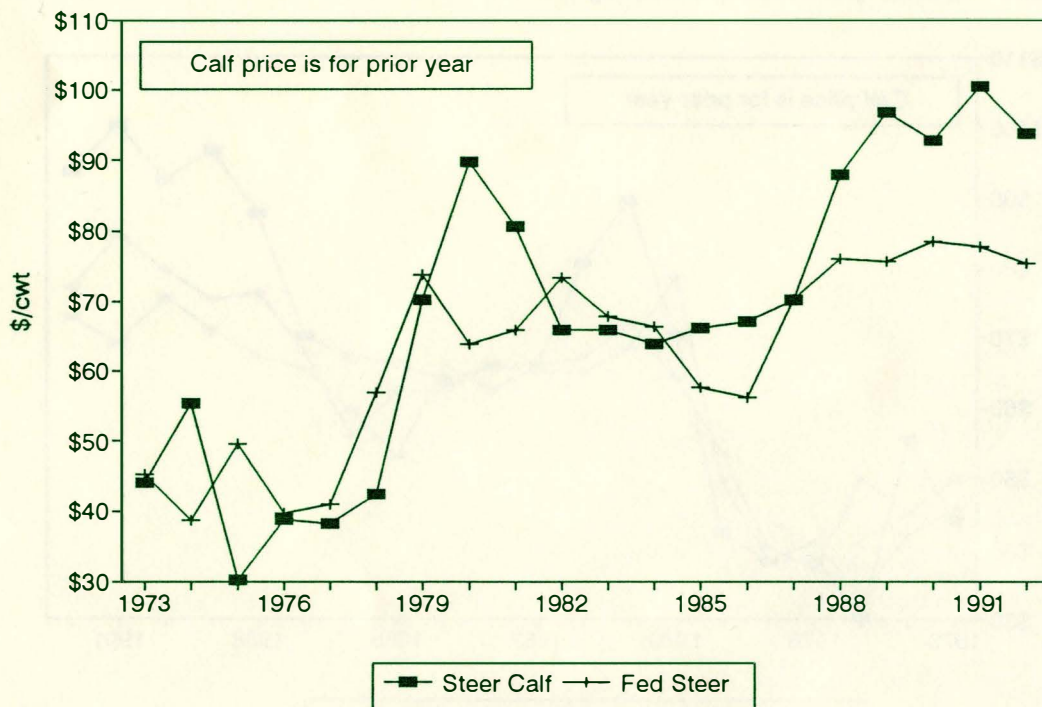


Table 3. Profitability and initial data for steers fed accelerated finishing diet.

<i>Profit group</i>	<i>Profit</i>	<i>Initial weight</i>	<i>Initial height</i>	<i>Initial fat</i>	<i>Initial age</i>
Low 1/3	-3.33	564	44.55	.09	204
Middle 1/3	50.14	566	44.61	.09	207
High 1/3	99.29	569	44.95	.09	209

Table 4. Profitability and feedlot performance and cost data of steers fed accelerated finishing diet.

<i>Profit group</i>	<i>Profit</i>	<i>Feedlot ADG</i>	<i>Days fed</i>	<i>Slaughter weight</i>	<i>Cost of gain</i>
Low 1/3	-3.33	2.78	192	1097	55.97
Middle 1/3	50.14	3.06	187	1135	53.70
High 1/3	99.29	3.20	191	1179	53.10

Table 5. Profitability and carcass data for steers fed accelerated finishing diet.

<i>Profit group</i>	<i>Profit</i>	<i>Hot carcass weight</i>	<i>Dressing percent</i>	<i>Fat thickness</i>	<i>Ribeye area</i>	<i>Yield grade</i>	<i>Percent Choice</i>
Low 1/3	-3.33	688	62.70	.40	12.20	2.69	20.3
Middle 1/3	50.14	721	63.57	.44	12.53	2.84	45.0
High 1/3	99.29	766	64.93	.45	12.99	2.91	66.8

These cattle typically were marketed in May and June each year, and the discount for select carcasses was \$6 to \$8 compared to a \$2 to \$3 discount in March and April. With the larger select discount and the typical pattern for fed cattle prices to decline from seasonal highs in March and April to seasonal lows in the summer, it appears necessary for the two-phase background-to-finish steers to grade a high percentage Choice to earn a profit.

In year-to-year profits from the accelerated and the two-phase background-to-finish programs, the accelerated program appears to be more profitable. Cattle with the capability of gaining rapidly and reaching an acceptable market weight early should be pushed accordingly, especially if they do not have the potential to grade Choice. It also would appear that, if the goal of a farmer-feeder is to market silage and other feed through cattle, this goal can be successfully achieved with the upper two thirds of the cattle. The bottom third will lose money and will not pay back as much for their feed and/or labor.

Background-Only Program

Average profitability of the backgrounded steers from the South Dakota Retained Ownership Demonstration would have been \$1.84 if they had been sold in February. By feeding these cattle through slaughter, an average of \$18.53 additional profit per head was earned in 1991 and 1992.

Splitting the data into the upper-, middle-, and lower-third profitability

\$2.94 per head in 1992. As with the accelerated finishing program, within-year variation in the two-phase backgrounding to finish program was greater than year-to-year variation.

Tables 6, 7, and 8 display the information for the low-, middle-, and high-profitability groups from the two-phase program. The high-prof-

itability groups averaged \$43.13 per head profit over the 2 years. These cattle were slightly older and larger framed initially. They gained weight more rapidly, had lower costs of gain, had higher dressing percentages, and graded an average of 70% Choice. Cattle in the lowest-profitability group appeared to lack the ability to reach the Choice grade.

groups reveals an interesting trend (Tables 9 and 10). Cattle in the high-profitability group averaged \$23.88 per head profit and weighed 452 lb when they entered the feedlot.

Cattle in the low-profitability group lost an average of \$29.06 per head and weighed 556 lb at start.

Profitability of cattle in the low-profitability group was improved by \$64.06 per head when fed to slaughter.

Profitability of the middle- and high-profitability cattle was reduced by \$1.20 and \$7.25 per head when fed to slaughter. The low-, middle-, and high-profitability groups correspond exactly to the high, middle, and low initial weight groups, respectively.

Therefore, this information suggests that lighter weight (perhaps younger weaned) calves could be back-grounded and sold profitably as feeders. Profitability is reduced by feeding these calves to slaughter. These lighter calves may also have greater potential in an on-ranch yearling program.

Dry Lot to Summer Grass Program

A study on Wyoming ranches showed that ranch profitability could be increased by retaining calves through a dry lot program and running them on grass as yearlings (Feuz and Kearl 1987).

Weaning weights of calves were 400 and 425 lb for heifers and steers, respectively. However, if weaning weights of calves were increased to 480 and 510 lb, it was more profitable to feed the calves on a back-

Table 6. Profitability and initial data for steers fed two-phase growing and finishing diet.

<i>Profit group</i>	<i>Profit</i>	<i>Initial weight</i>	<i>Initial height</i>	<i>Initial fat</i>	<i>Initial age</i>
Low 1/3	-44.71	505	42.44	.08	191
Middle 1/3	0.54	495	42.59	.08	197
High 1/3	43.13	508	43.26	.08	199

Table 7. Profitability and feedlot performance and cost data of steers fed two-phase growing and finishing diet.

<i>Profit group</i>	<i>Profit</i>	<i>Feedlot ADG</i>	<i>Days fed</i>	<i>Slaughter weight</i>	<i>Cost of gain</i>
Low 1/3	-44.71	2.60	207	1042	56.21
Middle 1/3	0.54	2.79	210	1081	54.15
High 1/3	43.13	2.96	204	1110	52.05

Table 8. Profitability and carcass data for steers fed two-phase growing and finishing diet.

<i>Profit group</i>	<i>Profit</i>	<i>Hot carcass weight</i>	<i>Dressing percent</i>	<i>Fat thickness</i>	<i>Ribeye eye area</i>	<i>Yield grade</i>	<i>Percent Choice</i>
Low 1/3	-44.71	658	63.17	.44	12.00	2.72	6.3
Middle 1/3	0.54	690	63.87	.46	12.37	2.79	37.5
High 1/3	43.13	717	64.60	.46	12.64	2.82	70.8

ground ration and not take them on to summer grass.

These findings tend to substantiate the South Dakota study, that heavier calves with the ability to grow should be grown as quickly as possible, while feeding lighter weight calves may be more profitable in back-ground-only or yearling stocker programs.

Slaughter Cattle Marketing Method

There are three main slaughter cattle marketing methods used in the U.S.: live weight, dressed weight or in-the-beef, and dressed weight and grade or grade and yield. Some feedlots also market on a formula basis with a particular packer. These formulas

Table 9. Profitability and initial data for backgrounded steers.

<i>Profit group</i>	<i>Profit</i>	<i>Initial weight</i>	<i>Initial height</i>	<i>Initial fat</i>	<i>Initial age</i>
Low 1/3	-29.06	556	44.58	.11	204
Middle 1/3	-.35	504	42.78	.11	190
High 1/3	23.88	452	42.33	.09	198

Table 10. Profitability and performance data for backgrounded steers.

<i>Profit group</i>	<i>Profit</i>	<i>ADG</i>	<i>Cost of gain</i>	<i>Final weight</i>
Low 1/3	-29.06	2.37	58.89	821
Middle 1/3	-.35	2.15	58.20	745
High 1/3	23.88	2.21	54.20	700

are often tied to grade and yield pricing with some modified premiums and discounts.

How is price actually determined in each of these marketing methods?

On at least a daily basis, each major packer examines its movement of box beef and byproducts and evaluates the number of cattle it has purchased and the number of cattle it needs to purchase in the next few days. The packer also closely monitors fed cattle prices, box beef prices, byproduct prices, and futures market prices.

From this information the packer establishes a price it would like to pay for par cattle, generally the price for a USDA Choice, Yield Grade 1-3, 550-950-lb carcass. The packer then establishes discounts for USDA Select or lower quality grades, Yield Grade 4-5, and light and heavy carcasses. Discounts change throughout the year depending upon the

type of cattle being supplied and the demand for USDA Choice vs. no-roll (Select or lower grade) beef. Buyers for the packer are given this information and attempt to buy cattle at these prices.

If a seller chooses to sell on a Grade and Yield basis, the price offered is simply the par price with appropriate discounts. If the seller accepts such an offer, the sale is confirmed. However, a check is not written until after the cattle are slaughtered and graded by a USDA grader.

The seller in this case bears the risk of cattle not meeting the par specification and being subject to the various discounts. Since the price is based on the actual carcass weight, not live weight, the seller also bears the risk of dressing percent, or yield as the packers would say.

If a seller chooses to sell in-the-beef (hot carcass weight), then the buyer must estimate what percent of cattle

will meet the par specifications and what percent will be subject to the various discounts. The buyer then offers the seller a carcass weight price for the cattle.

In this case the buyer bears the risk of the cattle not being of the expected quality and yield grades. However, the seller still is subject to the risk associated with dressing percent, and the check is not written until the cattle are slaughtered and the carcass weight determined.

Lastly, if a seller chooses to sell on a live weight basis, the buyer must estimate not only the cattle quality, but also the expected yield or dressing percent. The buyer then offers the seller a live weight bid, based on the estimated quality and yield.

If the seller accepts this bid, the cattle are weighed and the seller receives a check. In this case, the buyer bears all of the risk associated with quality and yield.

When buyers buy more or fewer cattle than the packer wants, the par price and discounts may be adjusted down or up to adjust to the competition and to the sellers' willingness to sell.

Is there an advantage to selling by one method or another? The answer depends upon the seller's knowledge of the cattle and the buyer's estimate of the quality and yield of the cattle.

Cattle Characteristics Rewarded Under Each Marketing Method

Detailed data was collected on 750 steers in the accelerated feeding pro-

gram as part of the South Dakota Retained Ownership Demonstration (Wagner *et al.* 1991, 1992, 1993).

Data include initial weight, height, back fat, and age; management history on creep feeding, vaccinations, and weaning date; breed of sire and dam; average daily gain, total cost of gain, days on feed, and slaughter weight; and hot carcass weight, dressing percent, yield grade, quality grade, rib eye area, and fat over the 12th rib for each steer. Profit for each steer was calculated based on the actual grade and yield price. Average market prices for live weight and dressed weight marketing were used to generate profits, had the steers been sold on that basis.

Regression analysis, a mathematical technique to detect relationships among variables, was used to determine which of all of the initial data variables, feedlot performance variables, and carcass characteristics were of greatest importance in explaining variations in profit under each marketing method. The results of the regression analysis are in Appendix Table A1; a discussion on computing the coefficient of separate determination also is contained in the appendix. This coefficient of separate determination was used to determine the relative importance of each of the variables in explaining differences in profit.

Figure 6 contains three pie charts which graphically depict this information. If steers are marketed on a live weight basis, average daily gain accounts for 64.5% of the variation in profit. Total cost of gain accounts for an additional 21.3% of the variation. Inclusion of all other variables

only accounts for an additional 3% of the variation.

Differences in dressing percent and quality grade are not significant. However, the average live weight price was not altered in the analysis to reflect expected yield and quality grade differences in the steers. If buyers are able to correctly estimate dressing percent and quality grade, those variables would likely account for some differences in profit by selling on a live weight basis.

Under dressed weight marketing, average daily gain and dressing percent account for most of the variation in profit, 41% and 38.5%, respectively. Total cost of gain accounts for an additional 8.8%, and the other variables only account for another 3.2% of the variation.

With grade and yield marketing, dressing percent accounts for 29.8% of the variation in profit, and average daily gain accounts for 27.8%. The USDA quality grade explains an additional 15% of the variation in profit, and total cost of gain accounts for 5.7% of the variation.

There are several implications from this analysis: 1) Feedlot performance is critical to profitability of retained ownership, regardless of slaughter cattle marketing method used. 2) Different cattle types are more profitable under different slaughter cattle marketing methods. Those without the ability to grade Choice probably should not be sold grade and yield, and poorer yielding (lower dressing percent) cattle may be more profitable selling on a live weight basis. 3) Initial variables on weight, height, fat, age, and manage-

ment history are of little or no value in choosing a marketing method.

However, as shown by the calves from the South Dakota Antelope Range Research Station herd, knowing the history of the calves can be very helpful in choosing the marketing method. Calves fed on a consistent program from year to year will have consistent performance.

How can knowing expected dressing percent and percent of cattle expected to grade Choice actually help in making the marketing method decision? A pricing example may help.

Pricing Example

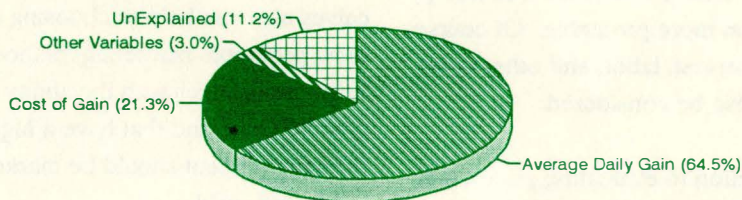
Assume that a packer establishes a par price of \$110/cwt for USDA Choice carcass beef. The discounts are set at \$5/cwt for Selects, \$20/cwt for Yield Grade 4's, \$15/cwt for light carcasses, and \$25/cwt for heavy carcasses.

Assume a feeder has 100 head of steers to sell that grade 70% Choice and that 5% of the Choice steers are Yield Grade 4. Their average live weight is 1200 lb, and their average carcass weight is 750 lb (this is an average dressing percent, or yield, of 62.5%). All 100 steers are within the acceptable carcass range.

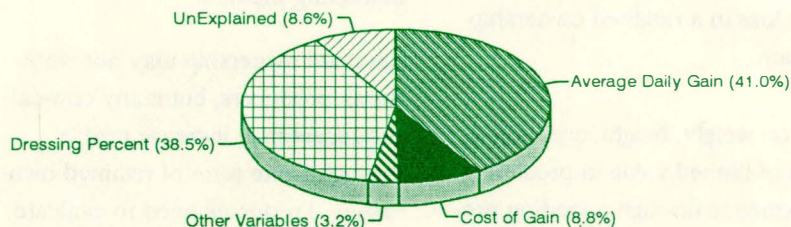
If these steers are sold on a grade and yield basis then the net carcass price will be \$107.50/cwt $[(65\text{hd} \times \$110 + 5\text{hd} \times (\$110 - \$20) + 30\text{hd} \times (\$110 - \$5)] / 100$, and total revenue will be \$80,625 [$\$1.075/\text{lb} \times 750 \text{ lb} \times 100 \text{ steers}$]. This would equate to an average live weight price of \$67.19/cwt [$(\$1.075/\text{lb} \times 750 \text{ lb}) / 1200 \text{ lb}$].

Fig 6. Proportion of variation in profit explained by each of the variables for the three marketing methods.

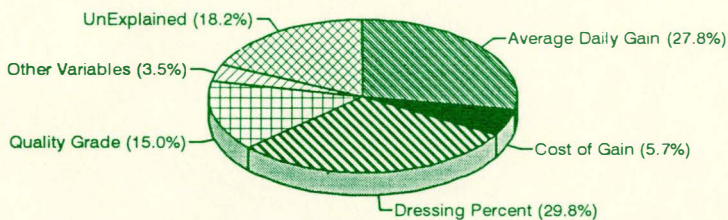
LIVE WEIGHT



DRESSED WEIGHT



GRADE AND YIELD



Actual revenue and prices may be slightly different from these computed because revenue is determined by multiplying the actual carcass weight, not the average, by the Choice, Select, or Yield Grade 4 price.

The buyer may look at these steers and estimate them to be 65% choice

with no Yield Grade 4's. The carcass price, in-the-beef offer would be \$108.25/cwt [(65% x \$110 + 35% x \$105)].

In this case, the seller would be better off with the in-the-beef offer than going grade and yield, and the buyer would bear the risk of incorrectly

estimating the number of Yield Grade 4's.

However, suppose the buyer correctly estimates that 70% of the steers will be Choice, but estimates that 10% of the Choice steers will be Yield Grade 4's. The in-the-beef price offer would be \$106.50/cwt [(60% x \$110 + 10% x \$90 + 30% x \$105)]. In this case the seller would benefit by selling grade and yield rather than in-the-beef.

The catch here is that neither buyer nor seller knows with certainty how the steers will look after the hide has been removed. Both must estimate this. Then, if the seller believes the cattle will do better than the buyer believes they will do, he can take the risk and market them on a grade and yield basis.

The same process is involved in making and evaluating live weight bids with the added component of estimating dressing percent.

For the live weight bid, assume that the buyer correctly estimates the percent Choice and the number of Yield Grade 4's, but estimates a yield or dressing percent of only 61%.

In this case, the live weight price would be \$65.58/cwt [\$107.50 x .61 = \$65.58]. The feeder would benefit by selling either in-the-beef or grade and yield because the buyer underestimated the dressing percent.

Other examples would show each of the marketing methods to be superior depending upon the type of cattle and the buyer's estimate of the cattle. The key for sellers is to know as much about their cattle and their feeding system as possible.

If sellers can establish a degree of consistency in their cattle, then they are in a better position to evaluate the offers of buyers. Buyers also will likely do a better job of bidding on cattle that they have purchased before and found to be consistent.

Summary

Calf prices have been relatively high the last few years, and many cow-calf producers have realized profits by selling calves at weaning. If the cattle industry is now moving toward relatively lower cattle prices, it may be more difficult for cow-calf producers to earn a profit by selling calves at weaning. However, by retaining ownership on some or all of their calves, cow-calf producers may be able to increase profits (or decrease losses).

Producers need to evaluate price relationships between calves, yearlings, feeders, and fed cattle to gain insight into when retained ownership

may be most profitable. Historically, the price spreads between these different classes of cattle are narrower during the lower price years of the cattle cycle. This narrower spread usually makes a retained ownership program more profitable. Of course, feed, interest, labor, and other costs must also be considered.

In addition to evaluating prices, it is important for producers to know cattle genetics. Some types of cattle are more profitable in one retained ownership program compared to another. Differences in cattle performance can mean the difference between earning a profit and incurring a loss in a retained ownership program.

Data on weight, height, age, breed, etc. is of limited value in predicting performance through a feeding program. However, performance of calves from the same herd appears to be very repeatable from year to year. It is imperative for producers to know as much as possible about their calves' ability to perform after

weaning to best evaluate the retained ownership program that offers the most profit potential.

If calves are retained up until slaughter, then knowing the history of the calves also can help in choosing the most profitable marketing method. In general, calves with the ability to grade Choice and that have a high dressing percent should be marketed grade and yield.

Calves that lack this ability may be more profitable when marketed on a live weight basis. However, this decision should be based on what the buyer is willing to pay under each marketing method.

Retained ownership may not work for all producers, but many cow-calf producers may increase profits through some form of retained ownership. Producers need to evaluate 1) current and expected market prices, 2) the ability of their calves to perform in a feedlot, and 3) the final carcass product to determine when and how to sell their calves to maximize their profit potential.

Appendix

Regression analysis under the framework of the SAS Regression procedure was used to explain the variation in profit with each marketing method. Coefficients of separate determination were used for each marketing method to determine the influence of each independent variable on profit. The sum of the coefficients of separate determination is equal to the R^2 value for each regression equation. By accounting for the correlation between and the variability of each of the independent variables, the coefficient of separate determination effectively separates out the amount of variation in the dependent variable explained by each independent variable. The first step in calculating this coefficient is to calculate a beta coefficient (β) defined as the regression coefficient for that variable multiplied by the ratio of that variable's standard deviation to the standard deviation of the dependent variable (Ezekiel and Fox 1959). Burt and Finley (1968) have shown that for the n variable case the coefficient of separate determination is equal to:

$$C_1 = \sum_{i=1}^n \beta_1 \beta_i r_{1i}$$

$$\vdots$$

$$C_n = \sum_{k=1}^N \beta_n \beta_k r_{nk}$$

where β is the beta coefficient and r is the simple correlation coefficient. The results of the regression procedures are contained in Table A1.

Table A1. Regression results for explaining variations in profit per head for live weight, dressed weight, and grade and yield marketing.

Variable	Units	Marketing method		
		Live weight	Dressed weight	Grade and yield
Intercept		-106.776** (21.0010)	-1005.952** (22.0153)	-1087.940** (41.0922)
Initial weight	lb	0.090** (0.0142)	0.145** (0.0153)	0.121** (0.0278)
Initial height	inches	-0.419 (0.3379)	-0.275 (0.3637)	-1.432* (0.6611)
Initial back fat	inches	-37.670** (10.9374)	12.128 (11.7735)	-6.477 (21.4010)
Creep fed	0/1	2.136** (0.5966)	1.844** (0.6422)	2.990* (1.1674)
Pre-weaned	0/1	4.348** (0.9036)	4.560** (0.9727)	5.457** (1.7680)
Pre-vaccinated	0/1	-4.639** (1.1769)	-4.427** (1.2669)	-4.314 (2.3028)
Average daily gain	lb	63.207** (1.9268)	78.923** (2.0741)	74.449** (3.7702)
Total cost of gain	\$/lb	-3.005** (0.1666)	-2.726** (0.1793)	-2.612** (0.3260)
Live slaughter weight	lb	0.017 (0.0145)	-0.080** (0.0156)	-0.006 (0.0283)
Dressing percent	%	2.109** (0.3417)	15.388** (0.3678)	17.340** (0.6686)
Quality grade	0/1	0.176 (0.8626)	0.356 (0.9285)	35.692** (1.6878)
Yield grade	1-5	-11.310** (3.8851)	-0.606 (4.1820)	-6.798 (7.6018)
Rib eye area	inches ²	-6.392** (1.3163)	-2.939* (1.4169)	-6.611* (2.5756)
Fat thickness, 12th rib	inches	20.929* (10.3428)	-13.684 (11.1334)	-26.420 (20.2375)
Adj R ²		88.54	91.25	81.43
F statistic		392.126**	529.036	223.000

Note: Standard errors are in parentheses and significance is denoted with a single asterisk at the .05 level and a double asterisk at the .01 level.

Table A2 contains regression results with only the variables depicted in the pie charts in Figure 6 included in the analysis. The coefficients are thought to be less biased because the full models may have problems of multi-collinearity.

Table A2. Regression results for explaining variations in profit per head for live weight, dressed weight, and grade and yield marketing, reduced model.

Variable	Units	Marketing method		
		Live weight	Dressed weight	Grade and yield
Intercept		-61.46 (8.4461)	-970.821 (18.3167)	-1052.044 (30.6958)
Average daily gain	lb	61.954 (1.3020)	66.618 (1.4803)	65.929 (2.4892)
Total cost of gain	\$/lb	-2.307 (0.1092)	-2.050 (0.1256)	-1.992 (0.2106)
Dressing percent	%		13.829 (0.2586)	14.847 (0.4335)
Quality grade	0/1			34.674 (1.6846)
Adj R ²		85.71	88.15	78.18
F statistic		2246.970	1858.596	671.726

Note: Standard errors are in parentheses. All coefficients are significant at the .01 level.

References

- Burt, O.R. and R.M. Finley. 1968. Statistical analysis of identities in random variables. *Amer J of Ag Econ* 50:733-744.
- Cattle Fax. 1993. Retained ownership, 2nd ed. Englewood, Colo: Cattle Marketing Information Service Inc.
- Ethridge, D.E., P. Zhang, B.E. Dahl, R.T. Ervin, and J. Rushemeza. 1990. Cattle ranching production and marketing strategies under combined price and weather risks. *West J of Ag Econ* 15:175-185.
- Ezekiel, M. and K.A. Fox. 1959. *Methods of correlation and regression analysis*, 3rd ed. New York: John Wiley.
- Feuz, D.M. and W.G. Kearl. 1987. Economic analysis of enterprise combinations on Mountain Valley cattle ranches. Department of Agricultural Economics and Wyoming AES RJ-207.
- Johnson, L.A., K.W. Ferguson, and E.L. Rawls. 1989. Risk-return comparisons of Tennessee feeder cattle backgrounding systems. *J of Amer Soc of Farm Managers and Rural Appraisers* 53:41-46.
- Marshall, D.M. 1992. Update on retained ownership: case study of calves born at the Antelope Range Livestock Station. *South Dakota Beef Report CATTLE* 92-14:50-52.
- Marshall, D.M. and J.J. Wagner. 1990. Five-year case history of retained ownership. *South Dakota Beef Report CATTLE* 90-15:57-60.
- Schroeder, T.C., M.L. Albright, M.R. Langemeier, and J. Mintert. 1993. Factors affecting cattle feeding profitability. *J of the Amer Soc of Farm Managers and Rural Appraisers* 57:48-54.
- Simms, D.D. and A.G. Maddux. 1990. Kansas steer futurities: an economic analysis of retained ownership and a summary of cattle performance from 1974-1988. *Kansas CES C-725*.
- Wagner, J.J. and D.M. Feuz. 1994. Predicting the value of feeder cattle placed into an accelerated finishing program under dynamic market conditions. *South Dakota Beef Report CATTLE* 94-20:84-91.
- Wagner, J.J. and D.M. Feuz. 1991. Retained ownership revisited: balancing market prices and genetic potential. *Proc, 1991 Range Beef Cow Symposium, Fort Collins, Colo.*
- Wagner, J.J., D.M. Feuz, and B. Knutson. 1993. South Dakota retained ownership demonstration. 1993 *South Dakota Beef Report CATTLE* 93-18:81-91.
- Wagner, J.J., T.L. Goehring, D.L. Boggs, L.W. Insley, D.M. Feuz, G.E. Murra, D.E. Moore, and B. Knutson. 1992. South Dakota retained ownership demonstration. *South Dakota Beef Report CATTLE* 92-15:53-61.
- Wagner, J.J., T.L. Goehring, D.L. Boggs, L.W. Insley, D.M. Feuz, G.E. Murra, and D.E. Moore. 1991. South Dakota retained ownership demonstration. *South Dakota Beef Report CATTLE* 91-23:89-95.