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## Managing for Today's Cattle Market and Beyond

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March 2002

# *Profiting from the Cattle Cycle: Alternative Cow Herd Investment Strategies*

By  
*John D. Lawrence<sup>1</sup>, Iowa State University*

Beef cowherds are capital-intensive enterprises and should be viewed as other capital investments. Like other assets there is an initial investment followed by a stream of future earnings that provides a return on the original investment. Heifers are retained and developed or purchased and raise calves over the coming years to generate income. And like many other businesses, the cattle industry is cyclical. When you invest impacts your return because the cycle impacts the investment cost and future earnings.

Can producers use knowledge of the cattle cycle to make more profitable investment decisions? Yes, if two basic principles of economics are applied. First, "buy low and sell high," and second, "find out what everyone else is doing and do the opposite." While easier said than done, this paper will evaluate alternative heifer retention strategies to put these principles into practice to profit from the cattle cycle.

### *Where do cycles come from?*

The cattle cycle is largely driven by the economics of the beef cow enterprise. One explanation is that cash flow needs drive heifer retention decisions. When calves are cheap, ranchers sell more calves (steers and more of the heifers) to meet cash flow obligations. As prices increase, they do not have to sell as many to meet their needs and

can thus retain more heifers to rebuild and expand their herd.

This analysis evaluates four alternative heifer retention strategies over the 30-year period between 1970 and 1999, using annual returns and wealth produced over the period. Four alternative heifer retention strategies are modeled for a representative beef cow-calf producer. The starting point for all strategies is a January 1, 1970 inventory of 82 bred cows, 18 bred first calf heifers, 21 virgin heifers being developed and 5 bulls. University extension budgets for each year were used to determine non-feed variable costs, the amount of inputs used, hay prices and bull purchase price (Iowa State University Extension). Table 1 summarizes the budgeted weights and nominal prices and costs for 1999 as a point of reference.

Selling prices were based on USDA reported prices for 1970-1999 (USDA, AMS). Prices and expenses were deflated using in the GDP deflator with 1996=100. Steer and heifer calves, cull cows, heifers and bulls were assumed sold in November at the monthly average price. January herd inventory value is based on November prices but with expected weight gains. Bred cows and heifers were valued 50 percent over the cull value.

Performance assumptions in the model were as follows: Conception rates for cows and heifers 85 percent, death loss for calves 4 percent and 2 percent for cows, and the culling rate for cows was 16

percent annually inclusive of the open cows. The number of breeding females per bull did not exceed 25:1. Market weight of calves and cull heifers and cows were based on university budgets, but were averaged from year to year to reflect the trend in weights rather than periodic increases as budgets were updated. Retained heifers were expensed into the herd at their cost of production rather than their market value opportunity cost.

**Table 1. Beef Cow Budget Values, 1999 Values**

Revenue	Amounts	(\$/cwt)
Cull cows (average weight)	1150	37.88
Steer calves (average weight)	551	90.98
Heifer calves (average weight)	511	80.41
Open Cull Heifers (average weight)	907	74.76
Percent calf crop	90%	
<b>Operating cost per cow</b>		
Pasture (acres)	2.5	\$26.50
Corn (Bu)	4	\$1.80
Supplement (lbs.)	50	\$0.16
Hay (tons)	2.1	\$67.00
Vet & health		\$15.00
Mach & equip, fuel		\$15.00
Marketing/misc		\$20.00
Interest		9.0%
Labor	7.0	\$6.00
<b>Fixed cost per cow</b>		
Mach, equip, fences		\$27.00
Interest, insurance		\$87.00
Bull deprec/repl		\$10.00

Because the focus of the analysis is to compare heifer retention strategies, some simplifying assumptions were made. First, the model ignores weather variability that can impact forage availability. Second, initially it is assumed that the rancher has a flexible land base that can be increased or decreased at the going rental rate. This assumption is relaxed later to determine if the results hold for producers with a fixed land base.

#### **Four alternative strategies**

**Steady size (SS):** The producer retains the *same number* of heifers each fall to maintain the same size of cowherd. This strategy is common among cattle producers who manage the cowherd to match a fixed land base. The SS strategy serves as the baseline for comparison to the other strategies.

**Cash flow (CF):** This producer's objective is to maintain the *same cash flow* each year. All steer calves, cull cows and bulls are sold. Next, enough heifers are sold to reach the cash flow objective and the remaining heifers are retained for the breeding herd. If there are not enough heifers to achieve the cash flow objective additional cows are sold to achieve the needed income. The annual cash flow is equal to the average annual cash flow of the SS strategy. When calf prices are high (low) more (fewer) heifers are retained for the breeding herd.

**Dollar cost averaging (DCA):** This strategy follows the time-tested method for stock market investments in pension plans. The producer retains the *same dollar value* of heifers each fall. When calf prices are low (high) the producer retains a higher (lower) number of heifers. The annual amount of investment in heifers is equal to the average SS investment in heifers, but the timing of the investment is different. Because of the cyclical nature of cattle prices and the biological lag in production, the lower priced heifers tend to sell higher priced calves and vice versa.

**Rolling average value (RAV):** The producer retains the *10-year average value* of heifers each fall. The annual investment is equal to the 10-year average value of 21 head of heifers; the same numbers as the SS strategy. Like the DCA strategy, RAV uses the value of heifers based on prices to determine how many heifers to retain each year for the breeding herd.

#### **Results**

Table 2 summarizes the animal inventories by strategy. The SS strategy retained 21 heifers each fall as designed, and calved the same number of cows each spring. Notice that the animal units (AUs) increased over time reflecting the move to genetically larger cattle over the 1970-1999 time frame. The DCA and RAV strategies kept an average of one more heifer than SS, but there was much greater variation from year to year. The range was from 15 to 43 a year for DCA and 13 to 33 for RAV. The CF strategy had the greatest variation in the number of heifers retained, 0 to 55 head a year and on average it kept fewer heifers.

RAV calved the same number of cows as SS, but had a range of 91 to 120 head. The DCA strategy averaged more cows calved, had a wider

range in number calving, 86 to 138, and ended the 30 year period with 4 more cows than the SS herd. The CF herd averaged fewer cows calving and ended with the smallest herd.

There is much greater variation in AUs in the DCA, RAV, and CF strategies compared to the SS because of the variable investment decisions. It is assumed that the producer rents pasture by the AU rather than by the acre which may be an important restriction. The analysis will address this issue later in the paper.

**Table 2. Heifers Retained, Cows Calving, and Animal Units by Strategy, 1970-1999**

	Average	Minimum	Maximum	Ending
<b>Heifers Retained per Year</b>				
SS	21	21	21	21
CF	15	0	55	0
DCA	22	15	43	21
RAV	22	13	33	23
<b>Number of Cows Calving per Year</b>				
SS	100	100	100	100
CF	85	32	144	32
DCA	106	86	138	104
RAV	100	91	120	120
<b>Annual Animal Units</b>				
SS	159	152	170	170
CF	132	47	229	47
DCA	169	142	215	179
RAV	160	139	206	206

Table 3 shows the gross revenue and returns over economic and cash costs by strategy. DCA had the largest average revenue and the largest range in revenue. Most of the variation came on the upside with revenues as high as \$96,218. CF had the lowest average revenue.

All of the strategies had a long run average return over total economic costs near zero. While disappointing, this result should not be surprising given the declining demand the beef industry suffered from 1980 through the late 1990s. Also, economic cost includes a payment to all resources used in the enterprise, including depreciation and interest on owners' equity. SS had the lowest average return and a range of more than \$35,000. DCA had the highest average return and largest range of variation in returns. CF had the smallest

range in returns, but the lowest maximum return. CF's lower returns came in part from selling off the cowherd as the ending inventory in Table 2 was only 47 cows.

Return over cash costs (excluding debt service) more closely reflects the rancher's checking account and potentially his/her decision framework. DCA had the highest average cash return (33% over SS) and the widest range. RAV had the second highest average (15% over SS). SS was next in the average and did have a higher minimum. CF had the lowest average return over cash cost (15% under SS). It was the most stable given its objective to produce a target cash flow each year.

A less risky cash flow is an admirable objective for producers and particularly for their lenders. However, the variability or range in returns alone is not a good measure of risk. A more meaningful measure is the downside variation. How large are the losses and how long do they last? The DCA and RAV strategies' minimum was \$7,000 and \$4,500 less than the worse SS return, making them more risky. At least a portion of this lower cash return is due to retaining more heifers at low calf prices meaning there is less income and more expense from developing additional heifers. Producers using one of these strategies must be financially prepared to weather periods of larger losses in order to be in position for higher returns in the good years.

**Table 3. Annual Revenue, Return Over Economic Cost and Return Over Cash Cost, by Strategy, 1970-1999**

	Average	Minimum	Maximum	Ending
<b>Total Revenue</b>				
SS	\$43,676	\$26,877	\$64,707	\$39,564
CF	36,417	14,002	65,081	14,002
DCA	47,374	24,710	96,218	41,773
RAV	43,853	22,504	75,119	49,221
<b>Return Over Total Economic Cost</b>				
SS	-\$1,817	-\$16,332	\$19,406	\$545
CF	-924	-11,172	2,872	2,666
DCA	108	-21,146	37,465	1,740
RAV	-449	-17,577	27,792	3,097
<b>Return Over Cash Cost</b>				
SS	\$4,869	-\$7,861	\$27,178	\$5,900
CF	4,152	2,873	6,387	4,757
DCA	6,474	-14,900	48,054	7,135
RAV	5,581	-12,399	35,934	8,356

Table 4 reports the accumulated cash over 1970-1999 period and the value of the cattle inventory at the end of 1999 to measure the change in net worth resulting from the strategy. The accumulated cash results from returns over cash costs compounded annually at the annual real interest rate. As expected, the strategies with the largest returns over cash cost also had the largest increase in accumulated cash and herd net worth. Compared to SS, DCA had 34 percent higher accumulated cash and 30 percent higher herd net worth. RAV produced 21 percent higher accumulated cash and ended with 23 percent higher inventory value. CF ended with the least amount of cash and inventory value.

**Table 4. Accumulated Cash and Herd Net Worth, 1970-1999, by Strategy**

	Accumulated Cash	Value of Inventory	Herd Net Worth
<b>Values at the end of 1999</b>			
SS	\$492,110	\$70,846	\$562,955
CF	383,853	15,576	399,429
DCA	659,843	74,308	734,150
RAV	596,510	86,974	683,484
<b>Compared to Steady Size</b>			
CF	-22%	-78%	-29%
DCA	+34%	+5%	+30%
RAV	+21%	+23%	+21%

**Table 5. Total Animals Sold and Average Value per Head, by Strategy, 1970-1999**

	Steers	Heifers	Cows
<b>Total Number Sold</b>			
SS	1440	810	480
CF	1221	762	399
DCA	1532	858	503
RAV	1443	788	473
<b>Average Value per Head</b>			
SS	468	370	534
CF	459	329	541
DCA	471	391	542
RAV	469	383	531

Given that the performance variables are the same for all strategies, where does the difference in returns come from? As is shown in Table 5, the

DCA and RAV strategies sold more total cattle and at higher average prices than the SS and CF strategies because of the timing of investment in heifers. Cattle sold in the DCA strategy received a higher average price suggesting that it sold more cattle during the high price period of the cycle and fewer during the low price period than did the other strategies. This was particularly true of heifer prices. The RAV strategy was second highest on steer and heifer values.

### Fixed Land Base

Most cow-herds have a fixed land base rather than a flexible one as modeled above. The producer owns or rents a specific area of pasture (acres). Often this land base is difficult to increase or decrease, and if additional land is available it is often in "lumpy" proportions rather than one AU at a time. The SS strategy matches a fixed land base because it keeps the herd the same size each year. The DCA and RAV strategies have higher average returns and net worth growth, but vary the herd size and the required land base over the cattle cycle. If the land base is fixed are the returns to DCA and RAV still as high?

The analysis assumes that a stocker operation is used to add flexibility to a fixed land base because the number of stockers purchased each spring can be adjusted to match available forage. If the cow inventory declines (increases), more (fewer) stockers are purchased. The stockers were purchased in April and sold in September at the monthly average price, respectively, and gained 200 pounds. The returns for this analysis were based on the change in gross value less \$25 per head. The land base was fixed at 215 animal units because it is the maximum herd size for the DCA strategy if it buys no stockers. SS maintains the same cowherd size and buys the same number of stocker cattle each year.

As with the earlier analysis, the DCA enterprise produced higher average revenue, returns over total economic and cash costs, accumulated cash and herd net worth (Table 6). However, the advantage was not as large as before, +22% versus +33%.

This analysis suggests that the DCA and possibly the RAV strategies that factor cattle market prices into the heifer retention decision outperform the SS strategy even with a fixed land base if stocker cattle are purchased to utilize forage not needed by the cowherd. While this analysis focused on the

cowherd investment and used stockers as a residual, operations with a larger stocker enterprise could use the same strategy to shift investment between cows and stockers over the cattle cycle.

**Table 6. Economic Returns to the DCA and SS Strategies with a Stocker Enterprise**

	Average	Min	Max	Last
<b>Total Revenue</b>				
DCA	49,393	22,860	96,461	44,005
SS	46,112	24,710	66,062	42,378
<b>Return over total cost</b>				
DCA	1,585	-19,486	37,468	3,924
SS	-151	-15,455	19,669	3,334
<b>Return over cash cost</b>				
DCA	7,931	-13,248	48,059	9,316
SS	6,511	-7,217	27,450	8,687
<b>Accumulated Cash</b>				
DCA	261,260	3,151	750,012	750,012
SS	218,248	5,099	615,598	615,598
<b>Herd Net Worth</b>				
DCA	363,794	88,738	824,320	824,320
SS	314,588	88,383	686,443	686,443

### ***Purchased cows or heifers***

The analysis described above was developed for producers retaining heifers rather than buying bred cows or heifers. Although the timing between the investment and the birth, production and sale of offspring is a year quicker with the purchase of bred females, the price sensitivity may be greater. This analysis valued retained heifer investment at cost of production plus heifer development expenses. Although there is not a good data series for bred female prices, there are clearly times when these animals can be bought for less than what it cost to produce them. Likewise, there are times when the selling price has a substantial premium built into it. The DCA concept should guide a producer's investment decision for purchased females as well as it does for raised heifers.

The DCA and RAV concepts should also work for purchased open heifers. The decision of how many to retain was based on the market value, but the actual investment was based on the cost of

producing the heifer. Actually buying the heifer at the market value would reduce investment cost during low calf prices and increase investment cost during high calf prices and should result in at least as large, if not a greater advantage to the DCA and RAV strategies.

### ***Summary***

Beef cowherd owners can benefit from incorporating price signals into their heifer retention decisions. While a perfect forecast of calf prices over the productive life of the heifer added to the herd would be ideal, such information is not available. However, simple decision rules that incorporate current or recent prices and the knowledge that the cattle cycle likely will repeat itself can help producers improve their investment decisions. A dollar cost averaging strategy that retains the same dollar value of heifers each year and a rolling average value strategy that retains a 10-year average value of heifers out performed strategies that sought to maintain a constant herd size or a constant cash flow.

The dollar cost averaging and rolling average strategies produced higher average annual revenue, returns over economic and cash costs and larger accumulated cash and herd net worth than the other strategies. These results hold for producers who have a fixed land base if a stocker enterprise can be used as a shock absorber for excess forages as the size of the cowherd fluctuates based on investment decisions. However, producers who retain and develop more heifers when calf prices are low and produce more calves and retain fewer heifers when calf prices are high, also have greater variation in returns. Producers who implement these strategies must be prepared financially to weather wider swings in cash flow.

### ***References***

- Iowa State University Extension, Livestock Enterprise Budgets, various years.
- USDA Agricultural Marketing Service, Livestock, Meat, and Wool various issues.

<sup>1</sup> Special thanks to Zhi Wang, Graduate Research Assistant, and Bridget Rockow, Undergraduate Research Assistant, Iowa State University, Ames Iowa